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**INFORMING ENVIRONMENTAL HISTORY WITH HISTORICAL ECOLOGY:
AGRICULTURAL WETLANDS IN NEW NETHERLAND, 1630-1830**

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Geography
by
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ABSTRACT

Informing Environmental History with Historical Ecology: Agricultural Wetlands in New Netherland, 1630-1830.

Many wetlands in northeastern North America should be considered relict agroecosystems as a result of widespread use for hay production and pasture during the colonial era. Open land in the heavily forested Northeast was frequently confined to areas with high water tables and colonists relied on graminoid-dominated wetlands to provide livestock fodder.

Although legacy effects are largely unknown, wetland function, stratigraphic integrity, and appearance were undoubtedly affected by mowing and grazing. Wetland management through ditching, burning, diking, and irrigating would also have had impacts. Identifying the lingering influence of such activities is especially relevant for the United States where the remaining half of original wetland acreage is highly valued for ecosystem services. This dissertation used archival texts (court minutes, tax rolls, probate records, journals), maps and property surveys, and proxy records (pollen, macrofossils, phytoliths, fungal spores, charcoal) to document wetland agriculture within the relatively understudied Dutch colony of New Netherland. Of specific interest are written references to the timing and frequency of disturbances like mowing and grazing. A regional-scale narrative of wetland use and management is developed based on results for New Netherland combined with what is known for French and English settlement groups. Because wetlands in the Northeast were similarly managed by different settlement groups, ecologists and historians working in this region may be able to carefully assume land-use histories based on wetland type and location. Possible short-term and legacy effects are suggested by contemporary ecological assessments from North America and Europe serving as modern analogs.

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Chapter 1

Introduction

Complex interactions between human and natural systems determine landscape function and structure although the impacts of past anthropogenic processes can be as subtle as they are pervasive. For example, past land-use has only recently been identified as a chief determinant of modern landscapes at the global scale. Agriculture in particular may be considered one of the most omnipresent factors in environmental change because it alters the physical environment and encourages certain species to become established at the expense of others.¹ Environmental historians often consider agriculture when explaining the relationships between human activity and ecological processes because food production intimately links societies, economies, technologies, and natural environments (Williams, 1994). Because changes in modes of production are triggered by changing perceptions of resource value, the focus tends to be on time periods of economic transformations.

“Ecological Revolutions”

In North America such transformative periods include the transition from indigenous to colonial society first detailed by William Cronon in his book *Changes in the Land* (1983) and later referred to as the “colonial ecological revolution” by Carolyn Merchant in *Ecological Revolutions* (1989). Both environmental historians considered the relationships between physical landscapes, Europeans, and Native Americans (Andrew Sluyter’s [2001] “colonial triangle”) in these evaluations of seventeenth- and eighteenth-century agriculture characterized by a hybrid of

¹ Christensen et al (1996); Cronon (1983); Dale et al. (2000); Foster et al. (2003); Foster & Aber (2004); Liu et al. (2007); Merchant (1989); Tansley (1935); Whitney (1994).

indigenous and European modes of production. The nineteenth-century transition from this subsistence-based agrarian economy to a capitalist market economy (Sellers' [1991] "Market Revolution") was termed the "capitalist ecological revolution" by Merchant who described it as a movement toward agricultural improvement, mechanization, and specialization. In *Nature Incorporated* (1991), Ted Steinberg described this as the most transformative economic and ecological change because nature became viewed as a collection of resources to be used, organized, and maximized.

Widespread adjustments in agricultural production occurred during these "revolutions" based on how humans perceived, used, and managed their physical environment. Changes in farming practices, for example, were often triggered by a perceived deficiency in natural resources and facilitated by development of new agrotechnologies. The introduction of plant and animal species also compensated for natural inadequacies. The adoption of new tools—like improved plow designs and mechanized harvesters—certainly resulted in broad-scale ecological change, but the human-mediated introduction, establishment, and dispersal of non-native organisms is among the most lingering agricultural legacies. These phenomena have been variously addressed by environmental historians and scholars of cultural biogeography, anthropology, and cultural, political, and landscape ecology. While other fields tend to focus on the process of domestication and ecological consequences of species introductions, however, an environmentally historical approach might consider non-native species as resources added to fill perceived environmental shortcomings.

This approach is as exemplified by two landmark narratives by Alfred Crosby describing species introductions from Europe to the Americas: *The Columbian Exchange* (1972) and *Ecological Imperialism* (1986). These works partially attributed European success in the New World to the "portmanteau biota" of crops, livestock, and disease brought across the Atlantic. Crosby's approach to describing early attempts to recreate European agricultural livelihoods and

landscapes was expanded in Thomas Dunlap's *Nature and the English Diaspora* (1999), which included Australia and New Zealand. On a more regional-scale, Cronon's *Changes in the Land*, Merchant's *Ecological Revolutions*, and Virginia Anderson's (2004) *Creatures of Empire* traced European-induced environmental changes in the colonial northeastern United States by considering livestock and plant introductions.

Over time the anthropogenic distribution of livestock, crops, and pests generally led to biotic homogenization with implications for ecosystem function. Among the most widely introduced and established non-native species are grasses, many of which were considered novel additions to the native flora by farmers transitioning between colonial mixed-husbandry agriculture and market-oriented capitalist production. Between 1820 and 1860, for example, much of the United States east of the Mississippi River became carpeted with European grasses and legumes introduced for hay and pasture (Kerr, 1964). In the Northeast the introduction and dispersal of exotic plants like forage species was encouraged by the combination of long settlement history, high concentration of ports, transportation networks, riparian corridors, and extensive commercial and landscaping activities (Lavoie et al., 2003; Mack, 2003; Pauchard & Shea, 2006).

However, while the colonial ecological revolution is accepted to have ended by the turn of the eighteenth century, less obvious is the timing of the transition to capitalism because new tools, practices, and species and were not simultaneously adopted by all sociocultural groups. The idiosyncratic outcomes resulting from different groups utilizing unevenly distributed resources may best be addressed through regional- and local-scale studies contextualized by larger-scale narratives of change, which Sluyter (2001, pg. 424) believed to make "complex material-cultural feedbacks" more manageable. Historical geographers similarly use a place-based approach to trace the capitalist expansion and its impacts on landscapes (Williams, 1994).

As much as agriculture has affected landscapes, so too has the abandonment of farmland as evidenced by the decline in grasslands, heathlands, shrublands, and associated biota when grazing and tillage end (Flather et al., 1998; Foster & Motzkin, 1998; Foster & Motzkin, 2003). Conversely, afforestation of abandoned farmland has resulted in the greatest tree cover since pre-colonial times (Foster & Aber, 2004) and the number of wetlands in some areas appears to be increasing as drainage systems are neglected (NYS DEC 2009a; Vispo, personal communication, 2009). Although the apparent restoration of forest and wetland habitats is viewed positively, these ecosystems are structurally and functionally different than in pre-colonial or even colonial times. Research on the short-term impacts and legacy effects of past land use in the Northeast has tended to focus on terrestrial ecosystems but interdisciplinary perspectives on hydrologic history are emerging. Scientists at Harvard Forest, for example, concluded that past land use is second only to landform as the most significant variable controlling current species richness in central New England forests (Gerhardt & Foster, 2002). Evidence has also been presented for the anthropogenic basis of openlands from Cape Cod to Staten Island (Bean & Sanderson, 2008; Foster & Motzkin, 2003; Motzkin & Foster, 2002). Similarly, the Northeastern Consortium for Hydrologic Synthesis demonstrated how water engineering, land cover change, and human decision-making have driven hydrologic change from the Chesapeake Bay to Maine (Pastore et al., 2010).

Changing Valuation of the Wetlandscape

The role of human perception of natural resources is especially important to environmental change because commonly-held ideals guide resource use (Merchant, 1989). Wetlands in North America, for example, have not been widely thought of as agricultural sites despite research indicating their use in colonial-era agriculture and the significant amount of

wetland acreage currently existing on farmland (e.g., Donahue, 2004; Gurwick, 1996). As a result, they are understudied as relict agroecosystems. Understanding the historical value of wetlands is central to investigating the influence of past human activity and is relevant in the United States where over half of the original wetland acreage has been lost to drainage, dredging, infilling, and flooding since the onset of European settlement (Dahl, 2000; Tiner, 1998).

It is difficult to ascertain how wetlands were perceived by indigenous people in the New World because written records are lacking, but archeological evidence indicates that late-Pleistocene and early Holocene encampments from Central America to Canada were frequently located near wetlands that provided both food and fiber.² In contrast, the dominant Euro-American discourse on wetlands has been one of long-term negative perceptions followed by a recent shift toward positive associations with conservation and ecosystems services. Wetland loss across North America has mainly been due to drainage occurring in two phases: at the height of agricultural “improvement” in the mid- to late-nineteenth century and again in the mid-twentieth century when government incentives pushed farmers to increase production on what were considered marginal lands.³ Wetlands were placed on the national conservation agenda following this second wave of drainage, with recognition of their provision of ecosystem services like water filtration, nutrient assimilation, nursery habitat, flood control, aesthetics, habitat for threatened and endangered biota, and refugia during drought. In addition, wetlands also provide paleoecologists and historical ecologists with natural archives for reconstructing environmental, climate, and sea-level change.⁴

The processes behind this paradigm shift are seen in environmental historian Ann Vileisis’ (1997) national-scale study of wetlands framed in terms of social values and the science

² Several chapters in Menotti and O’Sullivan’s (2013) handbook describe the correlation between indigenous settlements and wetlands. Differences between native and European perspectives and uses of natural resources are suggested by Cronon (1983), Tiner (1998), Vileisis (1997), and Anderson (2004).

³ Demaree (1941); Gates (1960); Marti (1971); Marti (1980); Prince (1997); Vileisis (1997).

⁴ Boesch & Turner (1984); Clark (1986); Farnsworth & Ogurcak (2006); Flather et al. (1998); Naiman & Décamps (1997); NYSFWA (1975); Smardon (1983); Status and Trends of Freshwater Wetlands in New York State (2009); Pederson et al. (2005); Varekamp & Thomas (1998); Wilson & Carpenter (1999).

system that “proves” those values. In *Discovering the Unknown Landscape*, Vileisis illustrated how wetland values and science have been variable in space and time but translated into national-scale action following government involvement. She explored American cultural attitudes toward wetlands since colonial times, emphasizing those in California, Florida, and the Mississippi floodplain, and concluded that there has been a generally positive shift in how wetlands are understood, perceived, and treated. Similarly, in *Wetlands of the American Midwest*, historical geographer Hugh Prince (1997, pg. 1) was explicitly concerned with “changes in peoples’ minds” regarding Midwestern wetlands from the early-nineteenth century to today. He considered the historical definitions, identifications, classifications, and delineations of wetlands in terms of science, politics, and economics. A similar approach is taken by the environmental historian Conevery Bolton Valencius (2002), who in *The Health of the Country* assessed settlers’ perceptions of place in Missouri and Arkansas in the first decades of the nineteenth century. She showed that the perceived connection between wetlands and bodily health continued to determine how those landscape features were managed long after medical advancements debunked myths linking disease with wet soils. The findings of these scholars may also be extended to include Canada, which is similar to the United States in terms of wetland types, economic development, and national-scale “improvement” agendas.

Although touched upon, generally missing from these narratives is the positive perception of wetlands by colonial farmers reliant on hydrophytes for livestock fodder. Wetlands around the world have long been valued as sources of hay and pasture (Gedan et al., 2009) and open, grassy areas on the otherwise-forested Atlantic coast were limited to areas with high water tables, poor soils, or where Native Americans had cleared land for their own settlements and agriculture. Grasslands were abundant over much of midwestern and western North America and the mild climate of the southern United States allowed year-round grazing in forests but the Northeast lacked native flora suitable for over-winter provisioning and pasture aside from a few upland

species and wetlands (Benson, 1937; Bidwell & Falconer, 1925; Gehrke, 1935). Wetlands supporting grassy vegetation—in English traditionally called *meadows*, and in French *prairies*—filled this deficit until European species were introduced after the late-seventeenth century (Bidwell & Falconer, 1925; Kerr, 1964). Identifying the pre-1800 agricultural use and management of wetlands in northeastern North America is integral to synthesizing historical wetland agroecology, its impacts, and legacy effects. A great deal of wetlands-related research has been done by historians and historical geographers considering the importance of wetlands to various northeastern settlement groups at the regional- and local-scales, particularly in New France and New England (Figure 1-1).⁵

Geographers Andrew Clark (1968) and Matthew Hatvany (2003) advanced the historical study of Acadian and Saint Lawrence tidal wetlands by adding information on vegetation types and the environmental consequences of agricultural management. Alongside vegetation and soil characteristics the biologist J. Sherman Bleakney (2004) also addressed the importance of Bay of Fundy salt marshes to Acadian colonists by stressing agriculture and material culture. The environmental historian Brian Donahue (2004) and historical ecologist David Foster (1999) likewise investigated the composition and use of freshwater meadows along the Sudbury River in Massachusetts in their respective books *The Great Meadow* and *Thoreau's Country*. However, the resource-management strategies of New France and New England should not be generalized to the entire northeastern region without considering those of other settlement groups. Ironically, wetland use is undocumented for *Nieuw-Nederland* (New Netherland), a colony settled primarily by colonists from areas of northern Europe with long traditions of wetland use and management (Figures 1-1 and 1-2).

⁵ Wetland use and management by English colonists are described by Anderson (2004), Baron & Bridges (1983), Donahue (2004), Foster (1999), Garrison (1987), Hudson (1889), and Smith et al. (1989). Wetland use and management by French colonists is described by Bleakney (2004), Butzer (2002), Clark (1968), Cunningham & Prince (1976), Hatvany (2001), MacNeill (1989), and Wynn (1985).



Figure 1-1. Extent of European settlement in Atlantic America, ca. 1750 (modified from Meinig, 1986).



Figure 1-2. Detail from “Novi Belgii Novæque Angliæ : nec non partis Virginie tabula multis in locis emendata / per Nicolaum Visscher nunc apud Petr. Schenk Iun,” 1685 (Library of Congress).

Nieuw-Nederland

In his 2005 book on the Dutch colony, historian Jaap Jacobs wrote that in the seventeenth century little was known about the region that became New Netherland despite nearly a century of European fishing excursions to the Grand Banks and establishment of settlements on the Virginia and Maine coasts. In 1609, however, the Dutch East India Company hired Henry Hudson to search for a Northwest Passage to Asia and in the process he sailed up what became known as the Hudson River. Three years later the first European structure on the river was built by the fur-trading Van Tweenhuysen Company on an island south of what is now Albany, New York (Fort Nassau). A number of other interested parties began trading in the area and jointly formed the New Netherland Company in 1614.

The company's fur-trading monopoly expired in 1618 and was effectively replaced by the Dutch West India Company (*West-Indische Compagnie*, or WIC) after its 1621 charter. The directors of WIC were referred to as the *Heeren XIX* (the Nineteen Lords) and represented five areas of the Dutch Republic plus the States General. WIC became active two years later when its investors produced sufficient capital, vessels, and personnel to send to New Netherland, then comprised of fur-trade entrepôts on the Hudson (*Noort*, or North) River, the Connecticut (*Versche*, or Fresh) River, and the Delaware (*Suyt*, or South) River. Like most scholarly assessments of New Netherland this dissertation focuses primarily on Dutch settlements within the watersheds of the New York-New Jersey Harbor and Estuary (Figures 1-3 and 1-4).⁶ The New York-New Jersey Harbor and Estuary Program (2011) estimated that 85% of this area's original wetland acreage was lost following European settlement, significantly more than the United States as a whole 50%).

⁶ Outposts on other rivers were only weakly held and settled primarily by the English (Connecticut River) and Swedes and Finns (Delaware River).

Methodologically, records for areas within what became New York State are also more accessible. Most importantly, Hinshalwood (1981) and Meinig (1986) argued that the area around the Hudson River should be considered a cultural region alongside New England, Pennsylvania, the Chesapeake/Virginia, and Carolina.

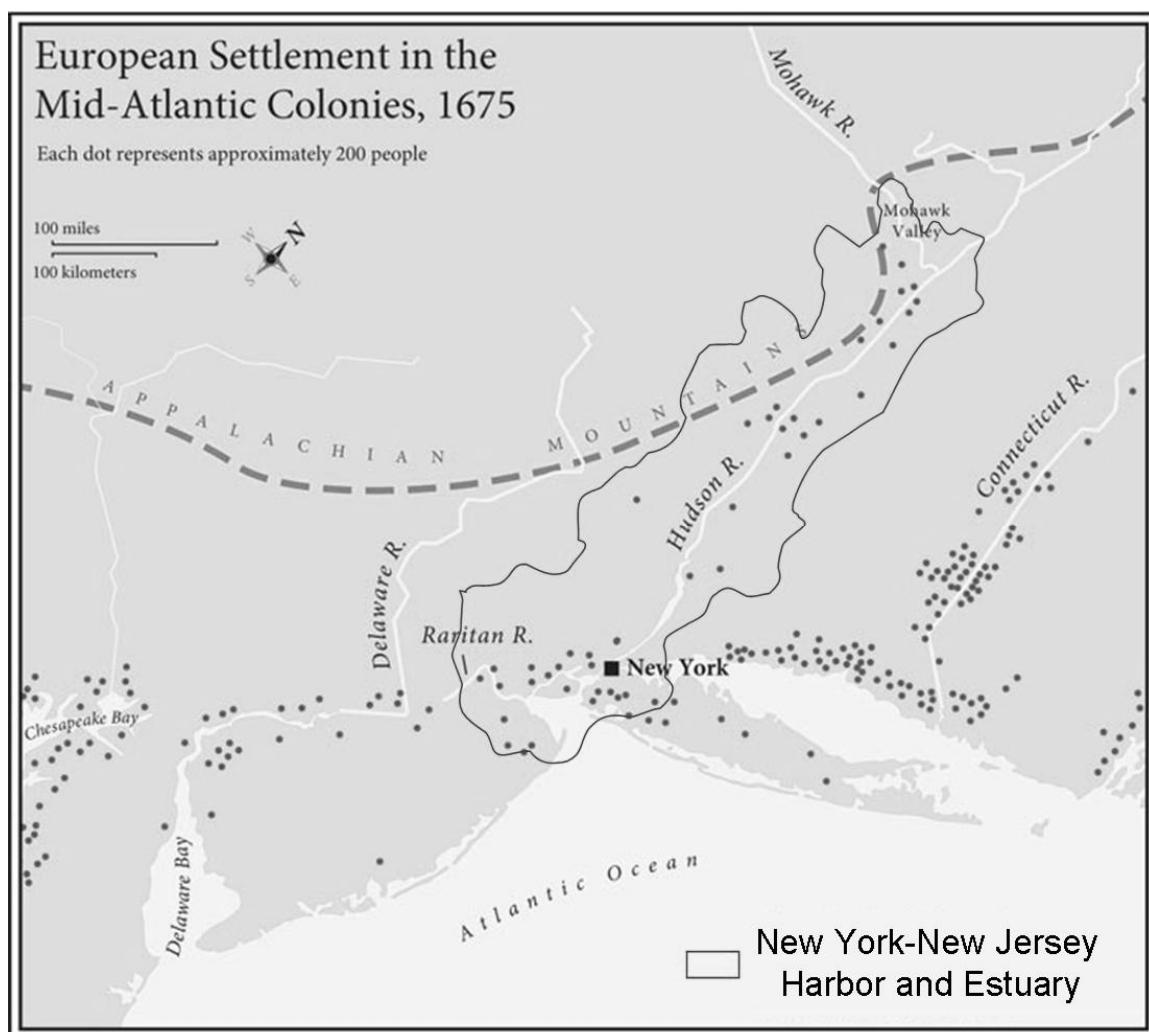


Figure 1-3. Study area (Hornsby, 2005; New York-New Jersey Harbor & Estuary Program, 2013).

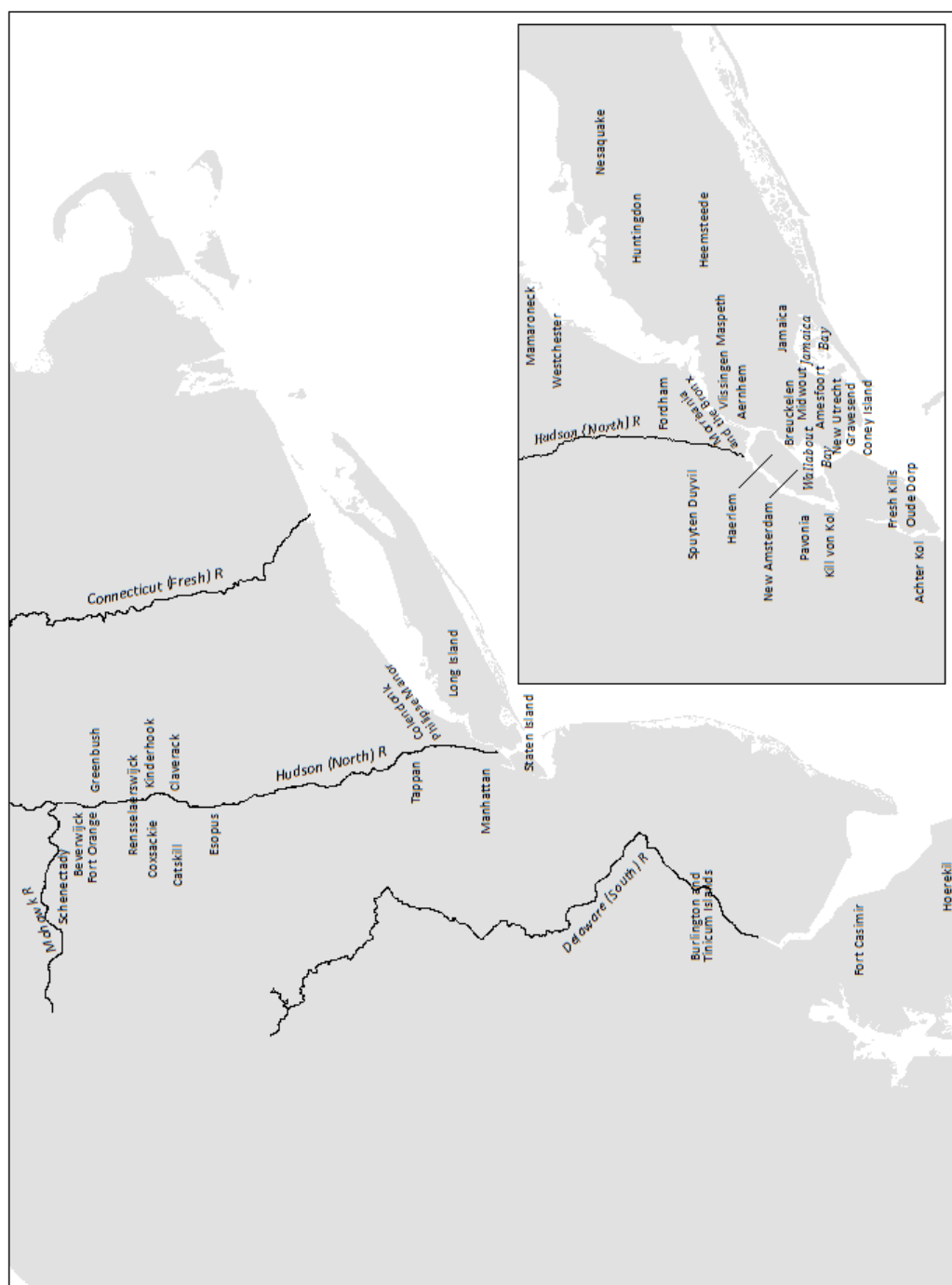


Figure 1-4. Commonly referenced sites in New Netherland (cartography by C. Hanchett).

Settlement

WIC's first trading voyage in 1623 was followed the next year by landing settlers and livestock to more officially stake claim to the area. These were discharged at various points between the Connecticut and Delaware Rivers, including on *Noten* (Nutten, Governor's) Island in New York Bay and upriver at Fort Orange, which replaced Fort Nassau. Three months later, in March, thirty Walloon families arrived and within a year five ships had arrived with colonists, livestock, and provisions for agriculture, defense, and trade (Jacobs, 2005; Venema, 2010). In 1625 orders were given to consolidate all the previously settled colonists and relocation to Manhattan took place the following year after its purchase from the Lenni Lenape (Bachman, 1970; Jacobs, 2005).

Immigration to New Netherland was generally slow after these initial efforts because there were few motivations for people to leave the economically booming and religiously tolerant Dutch Republic. Two years after their arrival the Walloons also returned to Europe, and that year three of WIC's nine farms on Manhattan were vacant; even a decade later five of the six remaining farms were vacant and none had livestock.⁷ However, in 1628 a group of WIC members in favor of active settlement and ending the fur-trade monopoly succeeded in passing the Charter of Freedoms and Exemptions to permit land grants to members with the ability to settle at least fifty people above the age of fifteen within four years (redrafted in 1629; reissued 1640) (Venema, 2010). These patroonships were allowed to run along a coast or river for four miles or along both sides of a river for two miles, extending as far inland as the patroon was able to oversee. Patroonships were more manorial than feudal with the patroon having limited

⁷ Gehring (1990); Jacobs (2005); van Laer et al. (1974a, "Statement regarding van Twiller's disposal of animals belonging to the farms on Manhattan Island"), Venema (2010).

jurisdiction in civil matters and tenants protected by WIC (Kim, 1978). The company retained Manhattan for itself as well as the fur-trade monopoly but patroons were permitted to trade within the colony if they paid a duty on each pelt. Unregulated trade was also permitted outside New Netherland (Folkerts, 1997; Jacobs, 2005; Kim, 1978; Venema, 2010).

Five patroons requested a total of nine patroonships, two of which were within the study area: Michiel Pauw's Pavonia on what became mainland New Jersey across from Manhattan and *Rensselaerswijck* on both sides of the Hudson River in the vicinity of Fort Orange. Kiliaen van Rensselaer, primary stakeholder of *Rensselaerswijck*, was chief among the proponents for agricultural settlement and believed one issue facing WIC was its allowance of "poor beggars" to settle in the colony. A decade after starting his patroonship he wrote that the governing of such "a loose mass of people" was inefficient and could be avoided by allowing the wealthy to settle and manage large tracts of land (van Laer, 1908, May 12, 1639, pg. 428.). Along with Fort Orange, *Rensselaerswijck* proved to be the driving force behind settlement on the upper Hudson River and remained operational for two centuries. In contrast, all other patroonships failed within a decade of their start. *Rensselaerswijck*'s success was due in large part to van Rensselaer's own experiences and interests in farming and his vision that the colony would become a granary for *patria* and WIC's Brazil colony. The failure of other patroonships was primarily caused by the inability to settle the requisite number of people and destruction by Native Americans (Bachman, 1970; Folkerts, 1993; Venema, 2010).

In 1650 the *schout* (sheriff) of *Rensselaerswijck*, Adriaen van der Donck, complained to WIC about the mismanagement of New Netherland and believed if the company had "applied to colonizing the country, and transporting cattle, the place might now be of considerable importance." Instead, he wrote, "self interest and private speculation" had retarded the colony's growth and New England had surpassed it in most arenas (O'Callaghan, 1856a, pg. 26). His report was officially rejected by WIC but together with changing economic conditions in Europe

may have motivated a policy shift because emigration to New Netherland subsequently increased. In 1656, for example, WIC began to offer free passage to “artisans and farmers who can show that they will be able to provide there for themselves, their wives, and their children” (Jacobs, 2005, pg. 75).

Diversity

Single men were the primary demographic group in New Netherland and arrived as laborers, merchants, tradesmen, farmers, and WIC soldiers and employees. Farmers with families comprised the majority of immigrants in later years. On multiple occasions, plans were made to send orphans from Amsterdam. Religiously motivated immigration was minimal and represented only by the 1643 settlement of an Anabaptist sect on western Long Island (after their eviction from Massachusetts) and post-1685 influx of Huguenots to several areas (following the revocation of the Edict of Nantes). Only about one-third of settlers came from the Dutch Republic while the majority was comprised of German, Scandinavian, French, and English.⁸ Slaves brought directly from Africa were also numerous. Farmers, however, tended to originate in the northeastern interior of the Dutch Republic (Jacobs, 2005).

English settlers formed the second-largest group in New Netherland as a result of direct and inter-colony immigration. The lower Connecticut River valley was predominantly English after the mid-1630s despite WIC’s 1623 construction of Fort Good Hope at what is now Hartford,

⁸ See Cohen (1992); Jacobs (2005); Venema (2003). In 1646, for example, Director Stuyvesant told Father Isaac Jogues that there were 400-500 men on Manhattan speaking 18 languages and practicing many religions including Calvinism, Catholicism, English Puritanism, Lutheranism, Anabaptism, and Mennonism (Snow et al., 1996). Visitor Daniel Denton noted in 1670 that New York City was mainly comprised of English and Dutch residents and 26 years later it was reported that the population of New York City was half Dutch, a quarter French Protestant, and a quarter English (O’Callaghan, 1854a, “Representation of Messrs. Brooke and Nicoll to the Board of Trade,” August 26, 1696; Royster, 2006). When the Scottish physician Alexander Coventry arrived in New York City in 1785 he heard French, German, Dutch, Scots, Irish, and English (Coventry, 1978, September 11, 1785). Ethnic diversity also common on Mohawk River, where in 1776 Joseph Bloomfield remarked that “it is not uncommon here to hear the different English Scotch, Dutch & Indian Languages talked at one time”—in a single day he heard English, German, Dutch, French, and six Iroquoian languages (Snow et al., 1996, pg. 5). A quarter of a century later the Massachusetts Reverend John Taylor described hearing English, Dutch, Irish, and Scots in the Mohawk Valley (Munsell, 1855, “Journal of Rev. John Taylor”).

Connecticut (O'Callaghan, 1856a). The boundary with Connecticut was only formalized with the 1650 Treaty of Westminster and large portions of Long Island and what became Westchester County were already English-settled. Some English villages on western Long Island even operated under their own magistrates, but WIC was wary of intolerance for shows of force and in 1648 recommended that only "mild measures" be taken against English self-government within the colony.⁹ Two years later the *Heeren XIX* likewise advised the seventh director, Pieter Stuyvesant, to deal with new immigrants cautiously, leniently, and accommodate them as best as he could.¹⁰

This *laissez-faire* policy was abandoned by 1653 because WIC realized granting favors to the English might "nourish serpents in our bosom who finally might devour our hearts."¹¹ This decision was not unfounded: during the ongoing Anglo-Dutch War the English planned to attack New Netherland with the support of New Englanders (Rink, 1986). At the same time, the Magistrates of the English village of Gravesend, Long Island reported that representatives of other Long Island towns had met to air grievances and there was an atmosphere of mutiny.¹² Within a few years harmony was restored on Long Island and Dutch and English towns continued to coexist but there was an increasing number of immigrants from New England and Northern Ireland after 1700. By the mid-eighteenth century the population of English settlements had surpassed the original five Dutch towns of *Breuckelen* (Brooklyn), *New Amersfoort* (Flatlands), *Vlacke Bos/Midwout* (Flatbush), *Aernhem/Boswijck* (Bushwick), and New Utrecht.¹³

9 Gehring (2000, "Letter from the directors general in Amsterdam to Petrus Stuyvesant," April 7, 1648, pg. 58); Gehring (2003, "Letter from the directors in Amsterdam to the Director General and Council," September 25, 1655).

10 Gehring (2000, "Letter from the directors at Amsterdam to Petrus Stuyvesant," July 24, 1650).

11 Gehring (2000, "Letter from the directors at Amsterdam to Petrus Stuyvesant and the council of New Netherland," November 4, 1653, pg. 229).

12 Gehring (2000, "Letter from the Magistrates of Gravsande to the Amsterdam chamber of the WIC," December 27, 1653).

13 Gehring (2003, "Letter from the directors to Stuyvesant," June 14, 1656); Hedrick (1933, citing Bickham 1747); Leeuwenberg & Patkus (2006); O'Callaghan (1854b, "Brigadier Hunter's answers to queries relating to New-York") Roth (2004); Weld (1807); Wheeler (2004).

Obstacles to Development

Settlement was inhibited by the early appropriation of choice tracts of land by a few individuals who either kept them vacant or prevented their purchase by anyone else. Among the worst offenders was the fifth New Netherland Director, Wouter van Twiller, who in the 1630s owned a tobacco plantation and two WIC farms on Manhattan, two islands in the East River and another in New York Bay, and property on the Delaware River.¹⁴ His tenure was generally a failure and complaints were made that Fort Amsterdam on Manhattan was “wholly and entirely dilapidated,” other structures were falling down, and the company’s farms were vacant and in disrepair.¹⁵ In 1638, for example, the only horses on the island were on van Twiller’s farm; most of the animals from other company-owned farms had been shipped upriver to Rensselaerswijck.¹⁶

In 1651 WIC directors instructed Director Stuyvesant to prevent any more granting of land until he determined the petitioner’s intent for settlement and cultivation; the *Heeren XIX* also wanted to limit the amount of land allotted to each colonist.¹⁷ The following year an ordinance was issued against land speculation because the “population, cultivation and planting of farms are delayed and retarded, because such lands have for long years lain, and do still remain wild and waste, without any considerable improvement and settlement.”¹⁸ Selling, purchasing, leasing, or occupying any lands without permission of WIC became illegal and many previous claims, sales, patents, and deeds were voided. Any current occupants of these lands would have to petition for a WIC patent and deed, leading to the issuance of many formal documents during the 1650s for lands already occupied for a decade. Later that year Stuyvesant was reprimanded for granting

14 van Laer et al. (1974a, “Return of property belonging to Wouter van Twiller,” March 22, 1639).

15 van Laer et al. (1974a, “Declaration of Jacob Stoffelsen and others as to the ruinous condition of Fort Amsterdam, the farms, mills, and other public property on the arrival of Director Kieft,” April 16, 1639).

16 O’Callaghan (1865, April 15, 1638 and 1639); van Laer (1908).

17 Gehring (2000, “Letter from the directors at Amsterdam to director general Petrus Stuyvesant,” March 21, 1651).

18 Gehring (1991, “Ordinance regulating the purchase of Indian lands and annulling various other grants,” July 1, 1652, pg. 29).

large tracts to speculators without the means to improve it and instructed to stop the practice.¹⁹ Speculation did not go unnoticed by small-holders in the colony and in 1650 the inhabitants of Gravesend agreed that no resident should sell their lot in the village until it was improved and built upon and that each farmer was to have only one lot.²⁰ In 1653 many Long Islanders wrote to the government with concerns about the uncertainty of their patents and the ramifications of allowing land sufficient for twenty families to be given to one person.²¹ In response, however, Stuyvesant and his Council noted that many Long Island towns contained more land than had been settled or improved and suggested that the complaint was rooted in Gravesend's unwillingness to pay property taxes (Gehring, 1983, December 13, 1653). Five years later Stuyvesant finally ordered a survey of Manhattan lots because so many were large and unimproved while others—planted as orchards or gardens—were unavailable for settlement. He announced that lots would be sold if landowners did not pay a tax or improve them by building (Fernow, 1976b, January 15, 1658).

Existing settlements were spread thinly and isolated homesteads were prone to Indian attack, and among Gravesend's concerns in 1653 was that scattered homesteads were difficult to defend and settlement should be consolidated. An early argument for consolidation was made in 1641 by David Pietersen de Vries, who felt that the sixth director, Willem Kieft, should not declare war on the Indians because WIC would not be able to mount a defense until more people lived in villages (de Vries, 1911; Murphy, 1835). In 1645 WIC believed settlers would be safer if they organized themselves “in the manner of villages, towns and hamlets, as the English are in the habit of doing, who thereby live more securely” (Cohen, 1992, pg. 70-71). A colony-wide proclamation was made in 1656 ordering consolidation of settlements because “in consequence of the dwelling of the outside people apart... as well on the flat lands as on various Hooks and

19 Gehring (2000, “Letter from the directors at Amsterdam to Director Stuyvesant,” December 13, 1652, pg. 188).

20 Gehring (2000, “Orders agreed upon by the inhabitants of Gravesend,” possibly 1650).

21 Gehring (1983, “The humble remonstrance and petition of the colonies and villages in this New Netherland Province,” 1653).

places, many and divers murders of men, slaying and destruction of cattle and burning of houses have been committed.”²² The order was reissued in 1660 because ongoing settlement of isolated farmsteads resulted in continued attacks (O’Callaghan, 1868, February 9, 1660). Disobedience was punishable by a yearly fine and the lack of company assistance in times of need (Fernow, 1976a, January 18, 1656). Settlement in the second half of the seventeenth-century included the establishment of population centers on Staten Island and in the mid-Hudson Valley, particularly in the *Esopus* after establishment of a garrison and palisaded village of *Wildwijck* (Kingston).²³

Adriana van Swieten (2001) believed that New Netherland’s development emphasized market towns, like those in the densely-populated and trade-oriented Netherlands, while New England resembled the rural and agrarian landscape of Britain. Likewise, Merwick (1980; 1990) differentiated between urban and rural settlement in the colony and drew a clear line between Dutch notions of city and country. It should be remembered, however, that New Netherland’s population prior to village consolidation was generally scattered with the exceptions of Beverwijck, New Amsterdam, and some Long Island towns. The organization of patroonships can also not be overlooked. Agricultural historian David Cohen (1992) therefore concluded that New Netherland’s towns, isolated farms, and tenanted manors ultimately resulted in a settlement pattern not unlike that of other colonies.

Surrender to the English

New Netherland was surrendered to the British in 1664 following an assertion by King Charles II that the area was first explored for the English and their claim superseded that of the

²² Fernow (1976b, January 19, 1656, pg. 17); Gehring (1995, “Ordinance concerning the formation of villages and prohibiting thatch roofs”); O’Callaghan (1868, “Ordinance of the Director General and Council of New Netherland for the formation of Villages, and prohibiting Straw Roofs and Wooden Chimneys,” January 18, 1656).

²³ Gehring (1981, March 15, 1660); Gehring (2003, “Journal of Petrus Stuyvesant’s visit to the *Esopus*,” May 28 to June 25, 1658, and “Agreement by the settlers of *Esopus* to form a village,” May 1658).

Dutch. With the exception of a brief Dutch re-conquest between 1674 and 1675 during the second Anglo-Dutch War, New Netherland became the Province of New York under the king's brother, the Duke of York and Albany. The province initially included the inhabited areas of New York, Delaware, Pennsylvania, and some Massachusetts islands. The English were more exacting than the Dutch in terms of formalized settlement and issued several orders promoting orderly development. In 1676, for example, it was ordered that all vacant, unfenced, and unimproved land was to be granted to those who would improve it and all "decayed Houses" sold unless their owners repaired them.²⁴ The following year Governor Edmund Andros advanced Stuyvesant's original effort by ordering a survey of all unsurveyed lands on Manhattan because the large, unimproved grants were still deemed a "publique detriment."²⁵ In the mid-1680s Governor Thomas Dongan issued orders for surveys of Long Island and areas on the Hudson River and authorized sheriffs to request proof of ownership and produce people with questionable land titles.²⁶ These efforts aided in the more efficient peopling of the former Dutch colony.

New Netherland as a Cultural Region

Although the Dutch colonial legacy in North America is often assumed to be restricted to toponyms, religious establishments, and urban settlement sites, New Netherland may be thought of as a distinct cultural region because the Dutch did not completely abandon their language, traditions, or farming practices after 1664 English takeover.²⁷ Hinshalwood (1981) and Meinig (1986), for example, argued that New Netherland should be considered a cultural region

24 Christoph & Christoph (1989, "Order about vacated lots," May 26, 1676).

25 Christoph & Christoph (1982, "An order concerning unimproved lan[d] on Mahatans Island," July 23, 1677).

26 Christoph & Christoph (1982, "Warrants to the several sheriffs to inquire by what titles inhabitants of their counties hold their possessions," April 16, 1684, April 19, 1684, May 11, 1684, and March 6, 1684/5, "Summons to inhabitants of the Bronx River area to show their titles for their lands," March 21, 1684/5, "Warrant for Philip Welles to lay out all unsurveyed land in Albany and Ulster counties, Haverstraw, Tappan, and Yonkers," April 16, 1684, April 19, 1684, May 11, 1684, and April 15, 1685, and June 4, 1685).

27 Goodfriend (1999); Hinshalwood (1981); Meinig (1986); Merwick (1990); Searle (2004); Shorto (2004); Venema (2003); Zelinsky (1955); Zelinsky (1961).

alongside New England, Pennsylvania, the Chesapeake/Virginia, and Carolina. Dutch occupation of the New York-New Jersey Harbor and Estuary watershed was not an “evanescent phenomenon” but this long-held supposition has resulted in the perpetuation of many misconceptions and misrepresentations about the Dutch colonial experience (Goodfriend, 1999, pg. 5). Specifically, the lack of accessible records created a false impression that the colony was only a profit-driven, capitalist enterprise with no real social structure or development (Venema, 1999). Cohen (1992, pg. 4) declared that the “single class of urban merchants fails to explain the Dutch-American experience beyond the demise of New Netherland” and Goodfriend (1995) and Folkerts (1997) argued that its history should be more balanced with inquiry into agricultural practices.

Even thirteen years after the takeover Governor Andros reported that the American colonies were as distinguishable as people from different nations. Within New York itself he attributed cultural separation in part to the relocation of many Dutch residents to isolated areas in the Hudson, Hackensack, Passaic, Ramapo, and Raritan valleys.²⁸ Cultural integrity was also promoted by continued use of the Dutch language, which was not replaced by English as the official language of court records until 1731. The Dutch Reformed Church also kept their Deacons’ Records in Dutch until 1790s (Venema, 1999). In the last two decades of the eighteenth century travelers in the Hudson Valley often met Dutch-speaking people who spoke English poorly or not at all; the Dutch at Schenectady in the Mohawk Valley also retained “their language and manners, especially their fondness for smoking tobacco” and a colloquial “Jersey Dutch” was spoken in some areas in New Jersey into the nineteenth century. As late as 1833 a tourist remarked that Dutch was commonly heard in the Hudson Valley (Stuart, 1833).

²⁸ Christoph & Christoph (1990, “Questions submitted to Sir Edmund Andros by the committee for Trade and Plantations, and his responses,” April 1677); Fabend (1996).

In 1800 a visitor to Albany commented that some residents were “still to the tenth and twentieth generation *Dutch* in person, dress, mind and manners.” The Dutch apparently kept to themselves because four turn-of-the-century visitors separately opined that they were “very sivel (but not like English),” “boorish, taciturn, disobliging,” and having “inherited all the coolness, reserve, and covetousness of their ancestors” were “attached to their own customs, and cherishing their national prejudices.”²⁹ Architecture also remained Dutch until the turn of the nineteenth century when it was gradually replaced by buildings in the New England-style.³⁰ At least one contemporary attributed this change to the Revolution, which “enlarged” the minds of the residents (Munsell, 1870, pg. 404).

Still, as late as 1835 it is clear that the landscape was different in parts of eastern New York. That year Henry Coleman wrote in the *Genesee Farmer* that he observed a stark change crossing from Massachusetts into Rensselaer County where there was

a change in the general appearance of things is seen as soon as you pass the line of the State. The barracks for hay and some of the barns covered with thatch; a different construction of their farm wagons; the general use of horse instead of oxen, and houses with low piazzas in front, the Dutch style of building, indicate a population of different habits and notions from those in New England. Many of the early settlers in this part of the country were Dutch, and through the New Englanders have become intermixed with them, some of the usages of their ancestors are retained.

New Netherland’s identity has been gradually revealed through an increasing body of sociocultural and economic research and this dissertation considers the possibility that settlers in the Dutch colony also developed a distinct environmental heritage.

²⁹ Coventry (1978, June 1, 1786, 106, June 13, 1786, and December 23, 1791); Halsey (1906); Harris (1988); Fabend (1996); Karlson & Crumpacker (1984, pg. 226); Munsell (1852, pg. 127); Scott (1983, November 17, 1674, pg. 3); Snow et al. (1996, pg. 2); Watson (1856, pg. 267).

³⁰ Munsell (1853, “The Duke de la Rochefoucault-Liancourt in Albany, 1795”); Munsell (1855, “Journal of Rev. John Taylor”); Munsell (1867, “John Lambert in Albany,” pg. 220, and “Diary of Rev. Samuel Chandler” – 1755, from Gloucester, MA going to Crown Point,” pg. 374); Watson (1856); Weld (1807).

Research Objectives and Significance

This research specifically asked: *How did Dutch colonists in New Netherland use and manage wetlands between 1630 and 1830? When were European forage species introduced to this region? and What colonial land-use legacies might be detectable in modern wetlands?*

Objectives

The project was designed to meet the following research objectives:

- 1) To explore colonial perception and valuation of wetlands in New Netherland by considering their description in historical records and use in the mixed-husbandry agricultural system;
- 2) To trace the transmission of European wetland reclamation techniques to the New World by comparing wetland management in New Netherland to known practices in New France and New England;
- 3) To evaluate Dutch assimilation into English culture and the timing of the capitalist ecological revolution by documenting the adoption of new forage species by Dutch farmers;
- 4) To tentatively identify vegetation legacies of colonial-era wetland agriculture in the Northeast.

Significance

Because northeastern wetlands share geologic origins and were controlled by colonists with similar agricultural traditions, this research has implications for three groups working in the study area and throughout the Northeast: conservationists actively managing wetlands, ecologists using hydric soils to reconstruct past environments, and environmental historians interpreting these landscapes for the public.

Importance for Wetland Management

Historian Dan Flores (1994) argued that his field would benefit from studies of place-based relationships between culture and ecology. Such “bioregionalism,” including identification of “geographic signatures,” has been suggested in the Northeast as an approach to integrating local knowledge with natural resource management (including wetland resources) (Foster & Lyman, 1994; Roman et al., 2000). The cultural distinction of New Netherland suggests that the area may itself be a bioregion (Dominy, 1994, pg. 82). Furthermore, by combining information on New Netherland with what is known for New France and New England, a larger bioregional synthesis of wetland management, temporary impacts, and legacy effects may be compiled. The results of studies from other locations with similar cultural and natural histories can also be used as modern analogs for wetlands in the study area and wider region that can inform conservation agendas.

Many European parks highlight the agricultural history of wetlands as integral to their current appearance, composition, and development of nearby settlements, and wetland succession trends in southeastern New York may likewise present opportunities to re-introduce historical agricultural practices for conservation of desired attributes. In particular, the majority of wetland acreage in the Hudson Valley is located on privately-owned farm land in rural areas and agricultural abandonment may have allowed establishment of woody vegetation at the expense of scrub-shrub and emergent wetland types; in the Hudson Valley and Coastal Lowland ecological zones, for example, over 60% of wetlands are forested (Gurwick, 1996; NYS DEC, 2009a). However, wetland acreage appears to be increasing in that area due to abandonment of drainage systems and construction of farm ponds (NYS DEC, 2009a; Vispo, personal communication, 2009). Management of extant and emerging wetlands to favor more open systems may benefit from application of historical techniques.

Value for Paleoecology and Historical Ecology

Ecologists use proxy records from Northeastern wetland sediments to reconstruct and forecast environmental, climatic, and sea-level changes and within the estimated bounds of early agricultural settlement in the Northeast over 20% of the sites chosen for paleoecological analyses were conducted on these materials.³¹ The use of wetlands in paleoecology has increased with the growing acknowledgement of their sensitivity in recording environmental change. Tidal marshes in the New York-New Jersey Harbor and Estuary provide especially lengthy stratigraphic records but their taphonomic history is incomplete because no attempt has been made to describe wetland management in these areas. Land-use information is especially important for Hudson River sites in the National Estuarine Research Reserve that are increasingly studied for changes in vegetation, fire, salinity, hydrology, and climate (e.g., Montalto et al., 2006; Pederson et al., 2005; Peteet et al., 2007). Historical ecologists use the same methods employed by paleoecologists to identify the causes, timing, frequency, and duration of disturbances in order to restore environments and recommend conservation strategies. Distinguishing between natural and anthropogenic processes is central to identifying environmental baseline conditions and determining the natural range of disturbance variability.

Future Directions for Environmental History and Education

Although wetlands are now on the national conservation agenda for their provision of ecosystem services and aesthetic appeal, they were frequently viewed as unhealthy, frightening, sinful, and marginal lands. Environmental historians tend to emphasize this twentieth-century shift from negative to positive perceptions and disregard the colonial period when wetlands were

31 Data from the Neotoma Paleoecology Database was accessed online April 4, 2012 at www.neotomadb.org. Due to the voluntary nature of data submission to Neotoma, however, this number may be low; for example, no Hudson River or New England marsh studies conducted within the past decade are included.

central to the Northeast's mixed-husbandry agricultural system. A new focus on pre-1800 wetland history would improve environmental education, which is characterized by:

- 1) Knowledge of ecological and social systems;
- 2) Consideration of social, economic, political, technological, cultural, historical, moral, and aesthetic aspects of environmental issues;
- 3) Acknowledgement of the role of feelings, values, attitudes, and perceptions in environmental issues; and
- 4) An emphasis on critical thinking and problem-solving skills for making action-oriented personal and public decisions (Disinger & Monroe, 1994).

Combining ecological and cultural aspects of wetlands will increase environmental literacy as defined by the North American Association for Environmental Education: a combination of *competencies* to identify, analyze, and evaluate environmental issues, *knowledge* of physical, biological, and sociopolitical systems, and *dispositions* to feel interested in environmental issues and a responsibility to act (NAAEE, 3013). The inclusion of historical wetland uses, management, perceptions, and values in environmental education may increase literacy in competent and knowledgeable students who are disinterested in ecology. The Hudson River Estuary Action Agenda, for example, currently emphasizes natural resource education and might benefit from a multi-disciplinary approach (HREAA, 2009).

Research Structure and Methods

Many environmental historians and historical ecologists have focused on the eastern United States because relatively thorough record-keeping accompanied the past five centuries of social and environmental change in that region (Whitney, 1994). A mixed-methods approach, however, was required to meet the objectives of this study because of the relatively incomplete nature of New York's colonial records as well as the general inconsistency of records for everyday practices like those associated with farming (Gates, 1972). Gaps in the historical record may

be filled with proxy records of environmental change to reconstruct landscape appearance and agricultural practices, including stratigraphic accumulations of plant fossils in wetland sediment protected from oxidation by anaerobic soils (Brooks et al., 2005; Pearsall, 2007; Swetnam et al., 1999). For the purposes of this research, colony-scale historical records were combined with proxy records of environmental change analyzed for three case-study sites.

Historical Records

Records from the pre-1664 era of Dutch control were of primary interest but early New York provincial documents were also emphasized because New Netherland continued to be a distinct cultural region after the English takeover. The eighteenth-century increase in immigration (primarily of British subjects) and changes in the types of records available necessitated the use of other types of information to document Dutch agricultural practices.

The main resources consulted for this dissertation are held by the New York State (NYS) Archives and Library, which house the largest collection of manuscripts related to Dutch colonial history in America. Documents related to the official business of the colonial governments of New Netherland and New York are held by the NYS Archives in the *New York Colonial Manuscripts Collection*. This collection is comprised primarily of executive and legislative records, judicial proceedings, legal papers, registers, and correspondence. The NYS Library collection, *Transcriptions of Records in Europe Relative to the Colonial History of the State*, was collected in the 1840s in the Dutch Republic, France, and Britain by John Romeyn Brodhead and published in eleven volumes as *Documents Related to the Colonial History of New York*. Most of these materials date to after 1630 because WIC records housed in the Dutch Republic were destroyed in the nineteenth century and no deeds or patents exist before 1638.

Translation of the bulk of the original Dutch colonial manuscripts was completed in the early 1820s by Adriaen van der Kemp but his interpretations were often incorrect, unreliable, and incomplete. Additional attempts were made to translate these works in the mid-nineteenth century by the Secretary-Archivist of New York State, Edmund Bailey O'Callaghan, who also assisted in the preparation of Brodhead's collection and published the four-volume *Documentary History of the State of New York*. In the 1880s New York State Librarian Berthold Fernow finished editing Brodhead's collection and translated additional material including seven volumes of *The Records of New Amsterdam from 1653-1674*. Archivist and librarian Arnold Johan Ferdinand van Laer was in the process of translating colonial manuscripts when the 1911 New York State Capitol fire destroyed forty volumes plus eighty of Brodhead's transcriptions. Van Laer's remaining translations were finally published 1973 with the assistance of the Holland Society and drew attention to the amount of previously inaccessible material available for historians. As a result, the Netherland Project (NNP) at the NYS Library was formed in 1974.

Under the guidance of director Charles Gehring and with financial and outreach support from the New Netherland Institute, the NNP has functioned as the primary organization for transcribing, translating, and publishing official seventeenth-century Dutch colonial documents. Access to Dutch materials was further facilitated in 2012 with the opening of The New Netherland Research Center at the NYS Library where records were centralized in a single room. The NNP has translated approximately 65% of the more than 12,000 pages of Dutch colonial documents from the *New York Colonial Manuscripts Collection*, now published in eighteen volumes first entitled *New York Historical Manuscripts: Dutch* and later renamed *New Netherland Documents Series*. The NNP also publishes translations of municipal and institutional records and has provided translations to include in the *New York Historical Manuscripts: English* that focuses on the period of British administration (renamed the *New York Historical Manuscripts Series*).

The NYS Archives *Applications for Land Grants 1642-1803* provided information on settlement trends through requests for land, surveys, patents, and maps. Material was also taken from other records by the aforementioned translators, the work of Joel Munsell and Jonathan Pearson on Albany, and additional works included on the NNP's bibliography of approximately 140 primary sources. Only some church records and those related to Caribbean holdings on this master bibliography were not consulted.

Among the most informative records were post-1680 land transactions because under the English system these records were open to the public (Dutch notaries were previously allowed to record and store them privately). Beginning in 1683, for example, property titles were required be kept in English and stored in the county clerk's office and/or provincial offices in New York City. After 1700, however, the bulk of land transactions in provincial records deal with large tracts of land sought by single landowners or groups of proprietors. These large grants were rarely accompanied by descriptions and most of the lands requested, granted, and patented between 1720 and 1740 were of large tracts in western Ulster and Orange counties and outside the study area (i.e., west of Schenectady and north/northwest of Albany). Furthermore, most areas north and west of Albany were not actively settled for several more decades (Watson, 1856). In the 1750s many requests were made for whatever unpatented lands remained in the already-settled regions of New York, but these also contained minimal description. An increase in military activity after the mid-eighteenth century further shifted the focus of provincial records away from detailed and local-scale accounts.

Landscape descriptions made by early explorers and travelers on the Hudson River were used to supplement eighteenth-century provincial records. Travelogues are common for the region because the Hudson River was a primary route to the interior of North America; even after the opening of the Erie Canal in 1825 travelers journeyed upriver to access the canal. Personal papers, legal documents, early naturalists' observations, and agricultural publications also

provided insights into eighteenth-century New York. Among the most important were the *Van Rensselaer Bowier Manuscripts* (1630-1643 patroonship records), *Peter Kalm's Travels in North America* (a Swedish botanist's 1748-1749 travel diary), the Alexander Coventry Diary (kept by a Claverack, Columbia County farmer from 1788-1831), and Jared Eliot's *Essays Upon Field Husbandry* (observations on New England farming between 1748 and 1762).

The NYS Library's collection of county and town histories was consulted because these nineteenth- and twentieth-century records were often written by local residents with first- or second-hand knowledge of local history. Some additional records were sought from local archives, libraries, and historical societies, but time constraints made it impossible to consult every source of information. For the same reason, although portions of Connecticut and New Jersey were also Dutch-settled, with the exception of two volumes of Delaware records only colony- and provincial-scale material in the NYS Library and Archives were evaluated.

Maps were also consulted when available in order to determine the historical location of wetlands and relation of settlement to them. After 1674, for example, there was an increase in orders for boundary-drawing in the New York Colony and maps became more common (e.g., within *Applications for Land Grants*). Although they post-date the time period of interest, early nineteenth century maps were also useful because many were made prior to large-scale wetland drainage and infilling. Chief among these maps are those found in the six-volume *Iconography of Manhattan Island 1498-1909* by I. N. Phelps Stokes.

Information on early-nineteenth-century wetland uses and management was derived from agricultural treatises and periodicals. Chief among the early publications were essays by John Armstrong (1819), Frederick Butler (1819), Samuel Deane (1822), and John Young (1822). The first several years of the earliest agricultural journals were also consulted, along with those widely circulated in New York, i.e., *The Agricultural Museum* (1810-1812), *The Plough Boy*

(1819-1823), *New England Farmer and Horticultural Journal* (1822-1825)³², and *The Cultivator* (1834-1840). Journals often contrasted new techniques with older, traditional, or lingering practices, described the importation history of seeds, the location of their planting, and how long they had been cultivated in a given area. Yet other entries served to explicitly remind farmers of traditional techniques; the *New England Farmer*, for example, included articles under the heading “Farmer’s and Gardener’s Remembrancer” for this purpose.

Because of the loss of original records resulting from adverse storage conditions, destruction of the Dutch West India Company’s records, the 1911 Capitol fire, and ongoing translation, this dissertation is necessarily based on incomplete information. However, the scope of the materials consulted make this research broader in temporal and spatial scale than other studies that have aimed to document land-use by a specific group. Because most of the records have been recently published, citations are reported by author and date of publication; the sole exception is *Applications for Land Grants*, which is cited as “ALG.” Throughout this dissertation it should be remembered that one morgen was roughly the equivalent of two acres, the Dutch used the Gregorian (“New Style”) calendar that was ten days ahead of the English Julian (“Old Style”) calendar, and that names ending in *ss*, *sen*, *sen*, and *sz*. were shortened forms of *son*. A *hook* or *hoek* was a point of land. Figure 1-3 shows the original toponyms of commonly referenced sites in New Netherland; synonyms are presented in Table 1-1.

³² Henceforth, *New England Farmer*.

Original Toponym	Synonyms	Decade of Settlement
Long Island		
Breuckelen*	Brooklyn	1630
Amersfoort*	Flatlands	1630
Heemstede	Hempstead	1640
Gravesande	Gravesend	1640
New Utrecht*		1640
Maspeth	Newtown, Middleburgh, Hastings	1640
Midwout*	Midwood, Flatbush	1640
Vlissingen	Flushing	1650
Aernhem*	Boswijck, Bushwick	1650
Rustdorp	Jamaica	1650
Nesaquake		1650
Huntington		1650
Westchester County		
the Bronx		1640
ColenDonck	Yonkers, Philipsburg Manor	1650
Oostdorp	Vreedlant, Westchester	1650
Fordham		1660
Morrisania		1680
Manhattan and Staten Island		
Nieuw Amsterdam	New Amsterdam, New York City	1620
Pavonia	Hoboken, Jersey City	1630
Spuyten Duyvil		1650
Nieuw Haarlem	Haarlem, Haerlem, Harlem	1650
Oude Dorp	Old Town	1660
Fresh Kills		1680
Hudson and Mohawk Rivers		
Fort Orange		1620
Rensselaerswijck		1630
Greenbush	Rensselaer, East Greenbush	1630
Beverwijck	Albany	1650
Esopus	Wiltwijck, Kingston	1650
Coxsackie		1660
Kinderhook		1660
Schenectady		1660
Claverack		1670
Catskill		1670
Tappan		1680
Delaware River		
Fort Casimir	New Amstel, New Castle	1650
Hoerekil	Whorekill, Lewes	1650

Table 1-1. Original toponyms, synonyms, and approximate dates of founding for New Netherland settlements (New Netherland Institute 2013; Versteeg & Shattuck, 2011).

* Denotes one of the original five Dutch towns on Long Island.

Proxy Records

Information on Manhattan wetlands as they appeared in the early seventeenth century was acquired from the Mannahatta and Welikia projects (Welikia, 2013). These projects were spearheaded by the Wildlife Conservation Society over the past two decades to document the pre-European landscape of the five boroughs using historical and proxy records. Original proxy record analysis was conducted in three wetlands to represent a range of types in the earliest-settled portions of the study area. Sediment cores were examined from a salt marsh on western Staten Island (Sawmill Creek Marsh on the Arthur Kill), a brackish marsh in the lower Hudson River (Piermont Marsh), and a freshwater palustrine wetland on a major tributary of the Hudson River (Kinderhook Creek, Columbia County).

The Sawmill Marsh is currently undergoing restoration and Piermont Marsh is protected as part of the National Estuarine Research Reserve. Sediment cores from both sites were analyzed for pollen, macrofossils, charcoal, and organic matter content in Dr. Dorothy Peteet's laboratory at Lamont-Doherty Earth Observatory. For the purposes of this dissertation these samples were evaluated for evidence of grazing by analyzing pre-prepared slides for fungal spores of species known to live on herbivore dung. Pollen, phytoliths, fungi, plant macrofossils, charcoal, and organic matter content were analyzed at the Kinderhook Creek site to identify shifts in vegetation assemblages, presence of livestock, and type of fire regime. Complete methods are presented in Chapter 6.

Wetland Terms and Types

Of particular interest in this research are wetlands traditionally known in English as *meadows* and what the French termed *prairies*. The *Dictionary of American English on*

Historical Principles (DAEHP) defined a *meadow* as “a level, grassy lowland, especially one which is moist or subject to inundation.” References to tidal marshes as *meadow* and *prairie* are abundant and Donahue (2004) asserted that the grasslands along seasonally flooded streams were also called *meadow*. The defining characteristic was the broad extent of grassy vegetation that created the same “grassy sea” on Massachusetts’ Sudbury River as Staten Island’s coastal “sea of grass” (Foster, 1999, pg. 52; Morris, 1898, pg. 354). After the turn of the nineteenth century when upland areas were cleared and sown with imported forage species, wetlands were no longer required for hay and pasture and *meadow* was used to refer to wet and dry grasslands.³³ In some cases, upland grasslands were called *artificial meadows* (*prairies artificielles*) to distinguish them from natural meadows. Likewise, introduced forage species were commonly termed *artificial grasses*.

Meadow existed as a soil type defined by the United States Department of Agriculture soil survey as late as 1929. Areas of *meadow* were identified more on the basis of “topographic condition” than vegetation or actual soil type, though in all instances they were wet and many were topped with muck or peat (Lewis & Kingsman, 1929, pg. 1596). Some existed in open areas with hydrophytes that could be used for pasture while others were originally covered with woody vegetation that had to be cleared prior to agricultural use. For example, in 1728 a farmer from Orange County planted grass in two cleared portions of meadows, one of which contained “hassocks” that he later cut down (likely tussock sedge) (Haley, 1989, pg. 13). In 1787 a farmer from eastern New York described several Hudson Valley farms as having meadows in various stages of clearance (“partly cleared,” “partly cleared, but grown up again with brush,” “cut down some brush in the low meadow”).³⁴ After several years of observing changes in meadows along the Sudbury River of eastern Massachusetts, in the late-nineteenth century Thoreau concluded

³³ Anderson (2004); Cronon (1983); Donahue (2004); Foster (1999); Hudson (1889); O’Callaghan (1856); Valencius (2002).

³⁴ Coventry (1978, August 12, 1787, pg. 167, October 6, 1787, pg. 170, November 28, 1787, pg. 181, and May 16, 1788, pg. 199).

that “human activity increases a natural tendency toward grass and herbs on these lowland sites; without this activity, the open grasslands would be qualitatively different and quantitatively less abundant” (Foster, 1999, pg. 51). He noted how *Salix* sppg. (willows), *Betula* sppg. (birches), and *Alnus* sppg. (alders) were prevented from spreading by aggressive mowing (Foster, 1999). Thoreau also noted that at least some of the Sudbury meadows were intentionally burned for management; Acadian marshes were also burned (Cunningham & Prince, 1976; Foster, 1999).

United States Fish and Wildlife Classification System

This dissertation uses the United States Fish and Wildlife wetland classification system of Cowardin and others (1979) currently used by the National Wetlands Inventory (NWI) because it privileges vegetation type unlike the hydrogeomorphic (HGM) classification system of Brinson (1993). The value-free HGM system considers only geomorphic setting, water source, and hydrodynamics and one early attempt to create a classification system based on these characteristics referred to vegetation as the “thin green fuzz that grows on top of and as a result of this hydrogeologic setting” (Hollands, 1987, pg. 37).³⁵ The USFW system is more appropriate for the purposes of this research because vegetation was the primary acknowledged wetland attribute prior to the mid-twentieth century. However, this research is pertinent to further development of the HGM system because natural and historical disturbances are needed to identify reference wetland profiles (Brinson, 1993, pg. 61).

The following USFWS categories represent the wetland types of interest in the study area, i.e., *meadows* and *prairies*. Characteristics were provided by Cowardin and others (1979) as well as historical and contemporary sources. Emergent wetlands are characterized by rooted,

³⁵ An early classification system for glaciated northeastern wetlands, similar to that of the HGM system, was based on three geologic factors, six hydrologic factors, and two topographic factors (O'Brien & Motts, 1980).

erect, herbaceous hydrophytes (typically perennials) and known colloquially as marshes, meadows, fens, prairie potholes, and sloughs. Woody vegetation in forested wetlands must be at least six meters in height and that of shrub/scrub wetlands less than six meters; forested wetlands are known as swamps, hammocks, heads, and bottoms and scrub-shrub wetlands as shrub swamps, shrub carrs, bogs, and pocosins.

Marine and Estuarine Intertidal Emergent Wetlands

Graminoid-dominated wetlands on the ocean or estuarine shore are zoned according to tidal action and are similar in northern Europe and northeastern North America. The intertidal zone of saltmarsh cordgrass (*Spartina alterniflora*) is at least partially submerged twice daily. The better-drained middle-marsh zone is characterized by saltmeadow cordgrass (or saltmarsh hay, *Spartina patens*) and saltgrass (*Distichlis spicata*), as well as forbs like sea lavender (or marsh rosemary, *Limonium* spp.), sea plantain (*Plantago maritima*), asters (*Aster* spp.), seaside goldenrod (*Solidago sempervirens*), saltbush (or orach, *Atriplex patula*), seablite (*Suaeda maritima*), and glasswort (or marsh samphire, *Salicornia* spp.). The highest marsh, dominated by blackgrass (*Juncus gerardii*), is overflowed only during spring tides. Beyond this zone are species tolerant of brackish water such as saltmarsh bulrush (*Scirpus robustus*), cattail (*Typha* spp.), and common reed (*Phragmites australis*). In some brackish tidal marshes chenopods (*Chenopodium* spp.), big cordgrass (*Spartina cynosuroides*), and clubrush (*Schoenoplectus* spp.) are also present.³⁶

³⁶ Bertness et al. (2002); Clark (1968); Cowardin et al. (1979); Ganong (1903); Pederson et al. (2005); Redfield (1972).

Marine and Estuarine Intertidal Scrub-shrub Wetlands

Broad-leaved deciduous scrub-shrub wetlands may occur at the interface between tidal marshes and uplands, characterized by marsh elder (*Iva frutescens*) and sea-myrtle (*Baccharis kalimifolia*).

Palustrine Emergent Wetlands

Palustrine emergent wetlands support graminoids like cattails, common reed, bulrushes (*Scirpus* spp.), sedges (*Carex* spp.), mannagrass (*Glyceria* spp.), slough grass (*Beckmannia syzigachne*), and whitetop (*Scolochloa festucacea*). Broad-leaved emergents include smartweeds (*Polygonum* spp.), dock (or sorrel, *Rumex* spp.), waterwillow (*Decodon verticillatus*), and introduced purple loosestrife (*Lythrum salicaria*). Tussock sedge (*Carex stricta*) is the most common sedge in these types of wetlands across the Northeast (Tiner, 1998).

Nineteenth-century meadows in New England contained a variety of sedges and grasses like reed canary grass (*Phalaris arundinacea*), fowl meadow grass (*Poa palustris* or *Glyceria striata*), blue joint (*Calamagrostis canadensis*), and red top (*Agrostis alba* or *gigantea*) (Donahue 2004). To this list Henry David Thoreau added *Carex scoparia* (broom sedge), *Carex echinata* (star sedge pickerelweed), pickerel weed (*Pondetaria*), water hemlock (*Cicuta maculata*), dogwood (*Osier* spp.), willow (*Salix* spp.), ferns (e.g. *Osmunda regalis*), sweet-gale (*Myrica* spp.), water pepper (*Polygonum hydropiperoides*), toadflax (*Thesium*), lysimachia (*Lysimachia* spp.), deer grass (or meadow beauty, *Rhexia* spp.), water parsnip (*Sium* spp.), wool grass (*Scirpus* spp.), and a “common large rush” that made “black-looking squads,” likely a species of *Juncus* (Foster, 1999, pg. 53). Clark (1968) and Ganong (1903) listed the following as present in freshwater areas behind tidal marshes in Acadia: sedges, horsetails, sweet gale, cotton grass

(*Eriophorum* spp.), rhodora (*Rhododendron canadense*), willow herb (*Epilobium* spp.), and cranberry and blueberry (*Vaccinium* spp.).

Palustrine Forested Wetlands

Forested wetlands in the study area are divided into broad-leaved deciduous, needle-leaved deciduous, needle-leaved evergreen, and dead. They may have a shrubby understory and herbaceous ground-cover and are typically called swamps. Within the Northeast, dominant broad-leaved deciduous trees are red maple (*Acer rubrum*), American elm (*Ulmus americana*), ash (*Fraxinus pennsylvanica* and *F. nigra*), black gum (*Nyssa sylvatica*), and swamp white oak (*Quercus bicolor*). Soils in these wetlands are generally mineral or highly decomposed organic. Tamarack (or larch, *Larix laricina*) is the only needle-leaved deciduous tree in the area and grows on organic soils. Atlantic white cedar (*Chamaecyparis thyoides*) is the sole representative of needle-leaved evergreens and grows on organic soil.

Palustrine Scrub-shrub Wetlands

Vegetation in scrub-shrub wetlands is less than six meters in height and can include young or stunted members of species comprising forested wetlands. Broad-leaved deciduous species also include alders, willows, buttonbush (*Cephalanthus occidentalis*), red osier dogwood (*Cornus stolonifera*), bog birch (*Betula pumila*). Thoreau recorded all of these on the Sudbury River with the exception of bog birch (Foster, 1999). Young or stunted tamarack is the sole representative of needle-leaved deciduous scrub-shrub wetlands in the Northeast. Broad-leaved evergreen species like Labrador tea (*Ledum groenlandicum*), bog rosemary (*Andromeda glaucophylla*), bog laurel (*Kalmia polifolia*), and leatherleaf (*Chamaedaphne calyculata*) grow primarily in acidic peat bogs. Farther north, as in some portions of New France, many palustrine forested and scrub-shrub wetlands are needle-leaved evergreen and include black spruce (*Picea*

mariana). Clark (1968) counted black spruce, tamarack, and white birch (or paper birch, *Betula papyrifera*) in the muskeg bogs of Acadia.

Colonial Dutch System

The Dutch did not have a singular umbrella term for *wetland* until after the 1971 Ramsar Convention, but there have been terms for each type (Wolff 1993). In the eighteenth century, the terms *moeras* and *veen* were equivalent to the English *marsh*, *mash*, *maash*, *march*, and *marish*—terms for low, wet ground (Sewel, 1735; Sewel, 1766).³⁷ *Swamp* was also used in Dutch at that time and synonymized with *haage*. However, within the colonial-era documents consulted for this research, only two terms were consistently used to reference wetlands: *vly* and *creupelbos*. These words are represented by a number of variants, including *valey*, *valei*, *vly*, *vley*, *vlaai*, *vlaie*, *vlei*, *fly*, *ffly*, *flye* and *creupelbosch*, *kreupelbos*, *kreupelbosch*, *creupel*, *kreupel*, and *cripple*.³⁸ Respectively, these two categories encompassed all emergent wetland types (*meadows*) and forested/scrub-shrub wetland types (those with the potential to become *meadows*).

Vly

The *Dictionary of American Regional English* (DARE) describes *vly* as exclusive to New York and meaning “A Swamp or marshy pond.” Plotting the location of toponyms containing *vly* or *fly* confirms that these terms are most common in the Dutch-settled Northeast (Figure 1-5).

³⁷ The Dictionary of American Regional English (DARE) lists *mash*, *maash*, and *march* as variants of *marsh*, and the Dictionary of American English on Historical Principles (DAEHP) defined *marsh* and *marish* as “A piece or tract of low-lying, watery land.” However, from the eighteenth through nineteenth centuries, *march* meant a border, boundary, or landmark (Wright, 1903).

³⁸ The shortening of *valley* to *vly*, etc. is an example of ellipsis or telescoping, where some internal sounds are omitted. Conversely, shorter terms for *creupelbos* and its variants are simple abbreviations. Variants of *vly* like *vlei*, *vley*, *vlaie*, and *fly*, and of *creupel* like *kreupel*, *creuple*, and *cripple* are phonetic renderings.

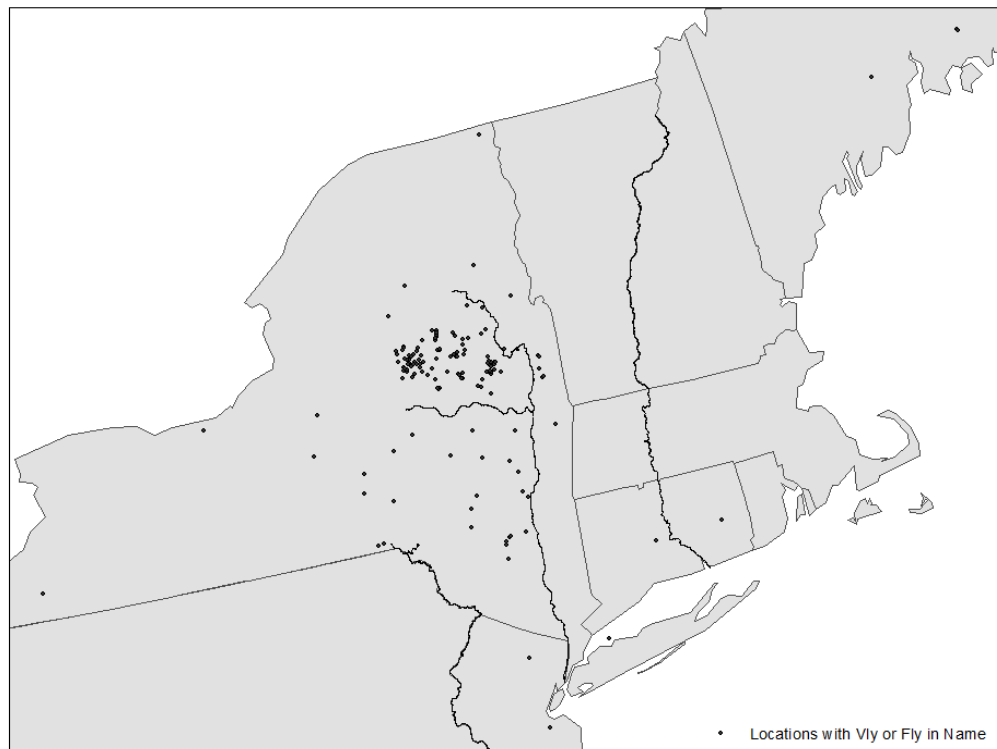


Figure 1-5. Location of toponyms containing *vly* or *fly* (data from the Geographic Names Information System, cartography by C. Hanchett).

The DAEHP also defines *vly* as “A swamp or marsh.” Van Laer defined *vly* as “a flat or salt meadow” but sometimes translated it as *marsh* and in at least one volume chose to leave *vly* and its variants untranslated. Another translator, J. Murphy, described *vly* as “a contraction of the word *valleye*—a valley” and Gehring also explained this to be the case (Murphy, 1835, pg. 114; Gehring, personal communication, 2009). “Wetlands and marshes (*broeck-landen en Valleyen*)” were explicitly described by Adriaen van der Donck in his 1655 *Description of New Netherland* as being

salt, fresh, or brackish – some so big that one cannot see across them. They can be used for pasture (*Weyden*) or haymaking (*Hoyen*) only, because they tend to flood at spring tide if situated near the coast. They resemble the mud flats and river meadows of the Dutch Republic and could be drained with the aid of levees and plowed. Marshlands are also found inland, far from the rivers, and they are always fresh and good for haymaking, provided they are not too clumpy or too wet. These defects can be overcome with little trouble if one makes the effort by

breaking up the clods when frozen in winter and drawing off the water in spring at a suitable opportunity.³⁹

Another description of these wetland types comes from the 1679 travels of Jaspar Danckaertss and Peter Sluyter, two Dutch travelers searching for a location to settle a Labadist community in America. The original Dutch text explicitly equates *valey* to *schorr*, a term still in use for tidal salt marshes in Europe (also spelled *schor* and *schorre*). Near Jamaica Bay, Long Island, they saw

a large piece of low flat land which is overflowed at every tide, like the *schorr* (marsh) with us, miry and muddy at the bottom, and which produces a species of hard salt grass or reed grass. Such a place they call *valey* and mow it for hay, which cattle would rather eat than fresh hay or grass. It is so hard that they cannot mow it with a common scythe, like ours, but must have the English scythe for the purpose... This meadow (*schorr*), like all the others, is well provided with good creeks which are navigable and very serviceable for fisheries.⁴⁰

Although the Dutch terms *beemde* and *weyde/weide* also mean *meadow*, many translators have chosen to translate *vly* and its variants to *marsh* or *meadow*:

1650: “the meadow (*valey*) behind Broer Cornelis’ farm”⁴¹

1671: “marsh (*vley*) was also included in it”⁴²

1681: “Lands and meadows” (*landeryen* and *vlyen*)⁴³

168?: “a parcel of meadow land (*vlye Lants*)”⁴⁴

1682: “a certain meadow (*vlye Lants*)”⁴⁵

39 Goedhuys et al. (2008, pg. 18-19); italics added after comparison with original Dutch text.

40 Murphy (1867, pg. 130-131); italics included in published translation.

41 van Laer (1922).

42 van Laer (1932b, “To Richard van Rensselaer,” possibly 1671, pg. 440).

43 van Laer (1932a, March 26, 1681, pg. 96).

44 Pearson & van Laer (1916, “Contract of sale between Anthony van Schaick and Sybrant van Schaick and Pieter Schuyler for land at Half Moon,” March 3, 168?, pg. 108).

45 Pearson & van Laer (1916, “Deed from Anthony van Schaick to Sybrant van Schaick and Pieter Schuyler for a piece of meadow land at Half Moon,” August 24, 1682, pg. 167).

1682: “the woodland and meadow (*vly*) lying northwards”⁴⁶

1682: “to the marsh (*vly*) by the point”⁴⁷

1683: “arable land and marsh (*vley*) specified in said Powel’s patent”⁴⁸

1685: “the marsh (*vley*) on the west shore” and “between the land the marsh (*vley*)”⁴⁹

Some original English documents synonymized *vly* with *marsh*, *mash*, or *meadow*:

1645: “head of a fflye or marsh”⁵⁰

1664: “ffly Lands or Meadowes”⁵¹

1665: “Parcell of Meadow Ground (called ye ffly Lands)”⁵²

1669 or 1670: “said Valley or Meadow Ground”⁵³

1671: “Meadow or Valley did belong to their land”⁵⁴

1672: “a piece of Salt Marsh or Valley.”⁵⁵

1673: “land & Meadow or Vly”⁵⁶

1676: “a certaine valley of land” or “Maddow”⁵⁷

1686: “vleys or marshes lying thereabouts”⁵⁸

46 Pearson & van Laer (1916, “Deed from Mohawk sachems to Claes van Boeckhoven for a piece of woodland at Canastagioene (Niskayuna),” March 4, 1681/2, pg. 152).

47 Pearson & van Laer (1916, “Deed from Johannes Clute, nephew and heir of the late Capt. Johannes Clute, to Jan van Loon for one-third of a tract of land opposite Claverack,” February 2, 1681/2, pg. 255).

48 Pearson & van Laer (1916, “Deed from Jannetje Powell, widow of Thomas Powell, to Andries Hansen Scherp and Jurian Collier for land at Kinderhook,” November 15, 1683, pg. 201).

49 Pearson & van Laer (1916, “Articles of agreement between Pieter Schuyler, Jan Jansen Bleecker, Dirck Wessels, Johannes Wendel, Robert Livingston, David Schuyler and Cornelis van Dyck for the division of the arable land of Saratoga,” April 15, 1685, pg. 348).

50 O’Callaghan (1868, “Charter Granted by the Director and council of New Netherland to the Town of Gravesend, Long Island,” December 19, 1645, pg. 54).

51 Paltsits (1910b, March 6, 1664, pg. 481).

52 Paltsits (1910b, “Gravesend and New Utrecht – Land Controversy,” March 3, 1664/5, pg. 513).

53 Stokes (1998, pg. 120).

54 Fernow (1881, “Council Minute. Purchase of land in Westchester County,” October 30, 1671, pg. 460).

55 Paltsits (1910b, “Maspeth Kills – Confirmation of Land to Hendrick Jansen,” May 20, 1672, pg. 667).

56 Paltsits (1910b, July 12, 1673, pg. 628).

57 ALG (Vol. I, “Description of the meadow land assigned to the foregoing by Ro: Ryder, deputy surveyor,” October 7, 1676).

58 ALG (Vol. II, “Petition of Phillip Schuyler, for a license to purchase a certain piece of wood land, lying upon ye west side of a creek or kill that runs in Hudson’s river, being on ye east side thereof, there commonly known by ye name of Roeloff Johnson’s kill, which said land is called by ye Indians Quasighkook, and contains, with the vleys or marshes lying thereabouts, about 200 acres,” April 1, 1686).

1686: “ffly or meadow ground, upon the great Binwater”⁵⁹

1686: “two pieces of ffly or meadow ground”⁶⁰

1686: “ye Vly or mash...att Kinderhook” and “S^d Vley or mash”⁶¹

1687: “the half or moiety off that vley or mash”⁶²

1687: “the Creek or kill y^t comes out of the Vley or mash”⁶³

Using the Mohawk River bottoms as their exemplar, Danckaertss and Sluyter distinguished between meadows and flats by observing that

Their cultivated lands are not what they call in that country *valleyen*, but large flats (*vlakten*), between the hills, on the margin, or along the side of the rivers, brooks or creeks, very flat and level, without a single tree or bush upon them, of a black sandy soil which is four and sometimes five or six feet deep, but sometimes less, which can hardly be exhausted. They cultivate it year after year, without manure, for many years. It yields large crops of wheat...⁶⁴

A majority of translations synonymized *vlakten*, *vlakhte*, and *vlakhte* with *flat*, but on occasion *vly* and its variants were used:

1640: “a large flat (*Valaye*) of about two or three hundred morgens of clay soil”⁶⁵

1640: “a flat (*Valaye*) there...where hay can be raised for two hundred head of cattle”⁶⁶

1683: “the flat (*valey*) which the lessee has now in use”⁶⁷

59 ALG (Vol. II, “Description of a survey of a ffly or meadow ground, upon the great Binwater, lying to the northeast of Kingstown, in the county of Ulster, containing about 38 acres, laid out for Henry Clayson and Yochum Englebert van Nauman, by Phillip Welles, surveyor,” April 9, 1686).

60 ALG (Vol. II, “Description of a survey of two pieces of ffly or meadow ground, containing in all 89 acres, lying to the north of Kingstowne, in ye county of Ulster, laid out at the request of Wm. Demyre, by Leonard Beckwith,” December 9, 1686).

61 Pearson & van Laer (1916, “Deed from Jannetje Powell to Jan Martensen for a vly or marsh at Kinderhook on the north side of Jan Martensen’s farm,” October 25, 1686, pg. 319-320).

62 Pearson & van Laer (1916, “Deed from Jan Martensen and his wife to Gerrit Teunissen for one-half of the marsh on the north side of Jan Martensen’s farm at Kinderhook,” February 14, 1686/7, pg. 330).

63 Pearson & van Laer (1916, “Deed from Annetje Lievens to Roelof Gerritsen for two parcels of land and an island south of the Half Moon,” February 4, 1686/7, pg. 336).

64 Murphy (1867, pg. 315); unparenthesized italics included in published translation, parenthesized italics found in the original Dutch journal at the Brooklyn Historical Society.

65 Jameson (1909, “From the ‘Korte Historiae ende Journaels Aenteyckeninge,” by David Pietersz. de Vries, 1633-1643,” pg. 206).

66 Jameson (1909, “From the ‘Korte Historiae ende Journaels Aenteyckeninge,” by David Pietersz. de Vries, 1633-1643,” pg. 209).

Occasionally, *vly* or its variants were also translated as *swamp*, *morass*, or *swale*, and some original English documents also equated the two:

165?: “a small tract of land or common swamp (valley contracted *Vly*)”⁶⁸

1677: “morass or valley”⁶⁹

1678: “a piece of land with a swale (*vley*)”⁷⁰

1684: “into which extends a certain swamp (*vlye*)”⁷¹

1686: “small valley or swamp of land”⁷²

1686: “valley or swamp”⁷³

The most common terms for a forested or scrub-shrub wetland, however, were *creupelbos* and its variants.

Creupelbos

DARE identified *Cripple* as common to eastern New York, eastern Pennsylvania, and New Jersey, meaning “Low swampy ground usually covered with trees or underbrush.” DAEHP likewise defined *Cripple* as “A swamp or low-lying tract of land overgrown with trees or shrubs.” Van der Linde defined *creupelbos* and its variants as “thick or dense growth by brushwood, shrubs, bushes, and/or small trees, in short a thicket” (van der Linde 1983, pg. 236). The term

67 Pearson & van Laer (1918, July 12, 1683, pg. 559).

68 Munsell (1853, pg. 89); in the next sentence, however, van der Kemp translated *vly* as *valley*.

69 O’Callaghan (1866, April 14, 1677).

70 van Laer (1935, “To Richard van Rensselaer,” June 1678, pg. 28).

71 Pearson & van Laer (1916, “Deed from Robert Sanders to Pieter Pietersen van Woggelum for a piece of woodland to the south of Piskawen kill,” December 19, 1684, pg. 150); original term found in footnote.

72 ALG (Vol. II, “Description of a survey of a certain tract of land, by the round out kill, within the limits of Kingstown, within the county of Ulster, and known by the name of ye Plain Field, together with swamp land, amount in all to 144 acres, laid out for Thomas Chambers, by Phillip Welles, surveyor,” April 27, 1686).

73 ALG (Vol. II, “Description of a survey of 54 acres of swamp, lying within the limits of Kingstown, in the county of Ulster; likewise about 7 acres of land, lying in ye valley, to the eastward of the southeast gate, in Kingstown, laid out for John Tyson, by Phillip Welles, surveyor,” May 4, 1686).

was commonly translated literally as *cripple bush*, which van Laer described as “a track covered with scrub; a jungle or thicket.” He also defined *creupelbosch* as a thicket on low, marshy ground.⁷⁴ Gehring routinely translates this term, and its variants, as *thicket*; in one original document the word is equated to “marshy place” (Gehring, 1981, pg. 186; Gehring, personal communication, 2013). Some *creupelbos* were not perennially wet, however, because in 1660 Augustine Herrman traveled through some “dry thickets” in the Delaware region.⁷⁵ In 1655 Adriaen van der Donck explained that

There would be many more freshwater marshes (*versche valleyen*) but for the land’s natural condition favoring the growth of trees and the wide dispersal of seed by birds and wind, so that the dampest and wettest areas also become wooded. These are known as thickets (*kreupel-bosschen*) and are so densely overgrown with trees and brushwood of every kind, mostly of small size in between the bigger specimens, that it is a marvel to behold.⁷⁶

Most translators of Dutch colonial documents have translated *creupelbos* and its variants as *swamp* or *thicket*:

1680: “along the great kill within the thicket (*d’Creupelboss*)”⁷⁷

1683: “the riverside to a thicket (*Kreupel Boss*)”⁷⁸

1683: “into the woods to a thicket (*Creupel Boss*)”⁷⁹

1685: “oak tree in the cripple bush (*Creupel Boss*) which is marked No. 1”⁸⁰

⁷⁴ Pearson & van Laer (1916, “Deed from Annetje Lievens to Roelof Gerritsen for two parcels of aland and an island south of the Half Moon,” February 4, 1686/7, pg. 337); van Laer et al. (1974b, “Contract of sale of a parcel of land on the East River on Manhattan Island from Govert Loockermans and associates to William Coulter,” September 15, 1646); van Laer et al. (1974a, “Contract of sale between Thomas Beeche (Bescher) and Cornelis Lambertsen Cool of a plantation on Long Island, adjoining Gouwanus,” May 17, 1639).

⁷⁵ Gehring (1981, October 1, 1660, pg. 211).

⁷⁶ Goedhuys et al. (2008, pg. 18-19); italics added after comparison with original Dutch text.

⁷⁷ Pearson & van Laer (1916, “Deed from Andries Hansen Huygh to Andries Jacobsen Gardenier for land at Kinderhook,” December 13, 1680, pg. 98).

⁷⁸ Pearson & van Laer (1916, “Contract of sale between certain Mahikan Indians and Robert Livingston for a tract of land on both sides of Roelof Jansens kill,” July 29, 1683, pg. 189).

⁷⁹ Pearson & van Laer (1916, “Deed from certain Mahikan Indians to Robert Livingston for a tract of land on both sides of Roelof Jansens kill described in preceding contract of sale,” July 18, 1683, pg. 191).

⁸⁰ Pearson & van Laer (1916, “Articles of agreement between Pieter Schuyler, Jan Jansen Bleecker, Dirck Wessels, Johannes Wendel, Robert Livingston, David Schuyler and Cornelis van Dyck for the division of the arable land of Saratoga,” April 15, 1685, pg. 347).

n.d.: “next the great swamp (*Kreupel Boss*)”⁸¹

A wetland on lower Manhattan was called a *Creuplebush* on a 1690 English-language map and *Swamp* in two others from 1730. Additional English documents equated the term with *swamp*:

1687: “East side of y^e Swamp or Creupelboss”⁸²

1687: “the north Side of ye Creupelboss or Swamp”⁸³

1687: “East side of ye Swamp or Creupelboss”⁸⁴

n.d.: “by the swampe or Creuple lyeing by the River”⁸⁵

n.d.: “standing by a small Swampe or Creuple”⁸⁶

n.d.: “standing betweene two small swamps or Creupter”⁸⁷

In some cases, however, the original word was *swamp* or *moras/moeras*:

1643: “the plantation of Old Jan by the swamp (*moras*)”⁸⁸

1652: “thicket or swamp”⁸⁹

1671: “to which belongs a certain swamp or meadow (*Swamp ofte valeije*)”⁹⁰

1673: “the adjoining meadow and swamp (*Valey en Swamp*)”⁹¹

81 Pearson & van Laer (1916, “Deed from Capt. Johannes Clute to Wyntje Harmens, daughter of Harmen Thomassen Hun for a piece of land upon the Murderer’s Kill,” pg. 120).

82 Pearson & van Laer (1916, “Deed from Annetje Lievens, widow of Goosen Gerritsen van Schaick, to Harmen Lieverse for land at the Half Moon,” February 4, 1686/7, pg. 341).

83 Pearson & van Laer (1916, “Deed from Annetje Lievens to Roelof Gerritsen for two parcels of aland and an island south of the Half Moon,” February 4, 1686/7, pg. 337).

84 Pearson & van Laer (1916, “Deed from Annetje Lievens, widow of Goosen Gerritsen van Schaick, to Harmen Lieverse for land at the Half Moon,” February 4, 1686/7, pg. 341).

85 O’Callaghan (1877, “A patent for Peter Cock,” pg. 550).

86 O’Callaghan (1877, “A Patent for Lawrence Cock, Erick Cock, Michael Nellson, Otto Ernest Cock, Gower Ramboe, and Peter Neilson,” pg. 551).

87 O’Callaghan (1877, “A Patent for Peter Thomason,” pg. 552).

88 O’Callaghan (1865, November 19, 1643 and November 26, 1643) and van Laer et al. (1974b, “Declaration of Claes van Elslandt and others that they saw the woman residing on Old Jan’s plantation drive the Company’s cattle into the swamp,” November 1643, pg. 127).

89 van Laer (1920, January 22, 1652, pg. 51).

90 Paltsits (1910b, pg. 619).

Inconsistency and Ambiguity

Inconsistency lies not only in translation but also in the original terms. A large wetland on lower Manhattan, for example, was described in 1643 as a *moras* and *cripplebush*, in 1647 as a *creupelbos*, and in 1730 as being “covered with Breaks and bushes and small trees.”⁹² This obvious scrub-shrub wetland was also described in 1679 as a *valy* and in later English-language documents as *swamp*, *meadow*, and *marsh*.⁹³ In a series of English-language documents from the early 1670s, a “swamp or Marish ground not esteemed meadowe” at Fordham was also described as “the ffreshest Boggy meadow” and “Swamp or Bagg of Meadow.”⁹⁴ In a series of 1675 mixed-language court minutes, the terms *valley*, *meadow*, *marsh*, *morash*, and *flye* all appear.

In later years, however, some English documents differentiated between types of wetlands. In 1687, for example, the English surveyor-general laid out land including “valleys meadows and swamps” in Ulster County and in 1702 Thomas Stillwell asked for a survey of “vacant Marish Boggy Meddow & Beach” on Staten Island.⁹⁵ In 1736 two men were granted land on the Mohawk River with ownership of all the “pastures, meadows, marshes, swamps” within the tract.⁹⁶ Many Royal or gubernatorial land grants also distinguished between wetland types within a semi-standard list of resources included in those grants, e.g., “all Lands, Sayles, Rivers, Creeks, Harbours, Mineral (Royall Mines excepted), Quarries, Woods, Meadows,

91 Paltsits (1910b, pg. 622).

92 Gehring (1980, “Patent to Tonis Nysen,” April 3, 1647); Gehring (personal communication, 2013); O’Callaghan (1854b, “Petition of Captain Anthony Rutger to the King,” December 1730, pg. 915, and “Affidavit in support of Captain Rutger’ petition,” December 21, 1730, pg. 917).

93 Murphy (1867); O’Callaghan (1854a, “Report of the Board of Trade on the Affairs of the Province of New-York,” October 19, 1698); O’Callaghan (1854b, October 26, 1700, “Answer of the agent of New-York to a memorial against the act vacating certain grants of land); O’Callaghan (1866, March 1, 1694 and December 24, 1702, pg. 304); Stokes (1998, pg. 99).

94 Christoph & Christoph (1982, “An order concerning the meadowe in dispute betweene John Archer of Fordham and William Betts and George Tippet,” July 7, 1670 and “An order to restrayne Betts and Tippet from doeing trespass upon the land belonging to John Archer of Fordham,” August 16, 1672, pg. 504); Paltsits (1910a, September 18, 1667, pg. 196). In Middle English *bagge* meant bag, sack, purse, or case, but also a “sac-like or pouch-shaped part” of a person or animal’s body (Kurath & Kuhn, 1957). From the eighteenth century onward, *bag* was synonymous with bog (Wright, 1903). Either meaning may be appropriate, as *baggy* might indicate the shape or type of wetland. *Bagg* also seems to be an old Dutch word for peatland, with *bagger* meaning “to dredge” (Wolff, 1993).

95 ALG (Vol. II, “Description of a survey of 410 acres of land, in the [] by the Indian name of Chauwaugung, in the county of Ulster, laid out for Thomas Loyde, by Philip Welles, surveyor,” January 20, 1687 and Vol. III, “Petition of Thomas Stillwell, praying that a warrant of survey may be issued to lay out a piece of beach, marsh and boggy meadow, lying near ye old town on ye south side of Staten Island,” April 13, 1702).

96 ALG (Vol. XII, “Draft of a patent, to John Lyndesay and Philip Livingston, for the patent last above described,” June 21, 1736).

Pastures, Marshes, Waters, Lakes, Fishings, Hunting, Hawkeing and Fowleing” or “all ye Lands, soyle, meadows, fresh and salt pastures, Comons, woodlands, Marshes, Ryvers, Ryvolettes, streames Creeks waters Lakes.”⁹⁷

Wetland classification today remains somewhat ambiguous, at least within the USFWS system where only 30% of a wetland’s area needs to be covered with woody vegetation to be termed forested or scrub-shrub. Despite the unavoidable ambiguity related to translation, especially of terms which have no exact synonym, for the purposes of this research it was assumed that records involving *valley*, *vly*, and their variants—along with *meadow*, *marsh*, *marish*—indicate emergent wetlands. *Creupelbos* and its variants, together with *swamp*, *morass*, and *thicket*, were presumed to be forested or scrub-shrub wetlands.

Dissertation Structure

This dissertation opens with an overview of wetland perceptions, uses, and management techniques in Europe and North America to provide context for those phenomena in New Netherland. Assuming that the primary value of wetlands in these areas stemmed from their utility in providing livestock fodder, Chapter 2 ends with an examination of the importance of agriculture and livestock in the trade-centered economy of New Netherland. Chapter 3 delves into the agricultural uses of wetlands in the Dutch colony in order to make generalizations across the larger northeastern region. Because records pertaining to tidal marshes are more abundant than those for palustrine wetlands, Chapter 4 more fully explores the uses of a floodplain wetland in Columbia County, New York by analyzing paleoecological records for evidence of vegetation change, burning, and grazing. Chapter 5 compares settlement patterns in the study area with

⁹⁷ Fernow (1881, “Patent for the Land at the Neversinck, N. J.,” April 8, 1665, pg. 396 and “Indian Deed for Staten-Island to Governor Lovelace,” April 13, 1670, pg. 455).

wetlands occurrence to determine if population centers in New Netherland correlated as closely with these landscape features as they did in New France and New England. Chapter 6 considers wetland management techniques in New Netherland in comparison to other northeastern settlement areas and identifies early triggers for devaluation. In particular, irrigation, burning, infilling, drainage, and diking are explored. The dissertation concludes by further investigating devaluation and management in the early nineteenth century in relation to the introduction of European forage species and emergence of the American agricultural press. Northeast-wide generalizations are made regarding use, management, devaluation, and the short-term and legacy effects of those phenomena.

Chapter 2

Wetland Uses and New Netherland Agriculture

Colonial-era wetland use in North America was understandably linked to European practices centered on procurement of food and fiber. Fishing and grazing are known from Europe's North and Wadden seas as early as the Neolithic Period and native marsh plants were frequently harvested for livestock fodder and bedding, thatch, and other fibers. Pasture may have been the most common use of marine and estuarine intertidal emergent wetlands at the global scale and is still practiced in parts of Europe (Gedan et al., 2009). The value and uses of wetlands in northwestern Europe, where most of North America's early settlers originated, were made explicit by residents of the eastern English Fenlands when protesting planned reclamation in the first half of the seventeenth century: cattle and sheep grazing, fishing, fowling, provision of thatch and peat, and salt-making (Darby, 1940; Thirsk, 1957). Many of these farmers owned little upland and based their livelihoods on animal husbandry within these wetlands, which was facilitated by a twelfth-century drainage system that maintained an adequate water table (Darby, 1940).

Romney Marsh on the southeastern coast of England was also used as pasture during the seventeenth century, primarily for sheep to supply nearby woolen manufactures and had been partially drained over the previous century (Hipkin, 2000). To the west, a marsh at Bridgwater was likewise "long celebrated for its good beef and fat oxen."⁹⁸ Marshes of western France on the Gulf of Poitou were similarly modified and used, and reclamation efforts also faced opposition from local residents (Hatvany, 2003; Morera, 2010). Wetland reclamation has been ongoing in the Dutch Republic since the eleventh century and areas that became too wet from

⁹⁸ 1810, October 10. Extract from Lord Somerville's Essay on Sheep. *The Agricultural Museum*, 1, 119.

subsidence used as grasslands before windmills were introduced for deeper drainage in the seventeenth century (Verhoeven & Setter, 2010). Peat harvesting was a primary use of wetlands in the Low Countries during the Middle Ages until subsidence caused widespread flooding (Morera, 2010; van Dam, 2001). Hay was also harvested from Fennoscandian wetlands primarily after 1600; over half of the winter fodder collected in western Finland, for example, came from wet meadows (Vasari & Väänänen, 1986).

North American Wetland Uses

Fish, shellfish, birds, and vegetation were all consumed by North American indigenous peoples and tribes living near sizeable wetlands were also known to use them for refuge during times of conflict (Prince, 1997; Siry, 1984; Valencius, 2002; Vileisis, 1997). In fact, in the nineteenth century some swampy areas became known for their communities of dispossessed Native Americans and escaped slaves (Valencius, 2002). In parts of the Tennessee, Ohio, and Mississippi river basins, marsh elder and *Phalaris* sppg. (maygrass) were cultivated by Native Americans; *Vaccinium* sppg. (cranberries) and *Zizania aquatica* (wild rice) were also important foodstuffs (Prince, 1997; Sebold, 1992). Some Midwestern groups planted “ridged gardens” on or near flooded land or created raised fields, a tradition not unlike others in Mesoamerica, the Middle East, and Asia (Prince, 1997; Sluyter, 1994). Other wetland plants had uses as food, fiber, dyes, and medicines; Table 2-1 lists plants and their uses by Native Americans and colonists noted by Peter Kalm in 1749 (Benson, 1937).

Plant	Common Name	Part	Use
<i>Sagittaria</i>	Arrowhead; <i>Katniss</i> (Native Americans and Swedes)	Root	Food for people, cattle, and hogs
<i>Arum virginicum</i> (now <i>Peltandra virginica</i>)	Virginia wake-robin; <i>taw-him</i> , <i>tuckáh</i> (Native American); <i>taw-ho</i> (Native American and Swedes)	root	Food for people and hogs; starchy and tastes like potato; must be cooked or is poisonous
<i>Orontium aquaticum</i>	Golden club; <i>taw-kim</i> or <i>tackvim</i> (Native American); <i>taw-kee</i> (Native American and Swedes)	Leaves and seeds	Food for cattle, deer, and hogs (leaves); food for people (seeds); seeds dried then boiled, taste like peas
<i>Dirca palustris</i>	Leatherwood	Bark	Ropes, baskets, etc.
<i>Cupressus thyoides</i>	White cedar, white juniper; <i>hvitá cedern</i> (Swedes)	Wood	Decay-resistant fences, posts, canoes, hoops, houses, shingles, etc.
<i>Myrica gale</i>	Gale; <i>poivrier</i> or <i>poivrié</i> (French Canadians)		Yellow wool dye
<i>Zizania aquatica</i>	Water taregrass, Indian rice; <i>folle avoine</i> (French Canadians)	Seeds	Food for people; prepared like groats, tastes like rice
<i>Scirpus palustris altissima</i>	Rushes	Leaves, stems	mats
<i>Typha latifolia</i>	Cattail	Leaves and seeds	Cushions for horse collars, chair seats, bed-stuffing

Table 2-1. Wetland plants and their uses as listed by Peter Kalm in 1749 (Benson, 1937).

European Settlers

North American indigenous agriculture, however, did not involve domesticated animals and the seventeenth-century arrival of mixed-husbandry colonial farming would have marked a significant change in the perceptions and uses of wetlands. In the early eighteenth century, for example, the marshes on the Chesapeake Bay were described as “a convenient support for... flocks and herds” and even Virginia’s Dismal Swamp had value as pasture. That forested wetland was described in 1807 as abounding

with cane reeds, and with long rich grass, upon which cattle feed with great avidity, and become fat in a very short space of time; the canes, indeed, are considered to be the very best green food that can be given to them. The people who live on the borders of the Swamp drive all their cattle into it to feed (Siry, 1984, quoting Beverly, pg. 23).

So many cattle had been lost while grazing that “large herds of wild cattle” were found in the interior (Weld 1807, pg. 179, 180). Wetlands continued to be used for pasture well into the eighteenth century and some grades of tobacco were also planted on wetland soils (Siry, 1984). Following the Revolution, George Washington generally remarked that in Virginia “No more cattle is raised than can be supported by lowland meadows, swamps, &c., and the tops and blades of Indian corn” (though in the fall of 1749 a tourist was also told rice straw was excellent and palatable food for cattle in Carolina) (Benson, 1937; Hedrick, 1933, pg. 74). Wet prairies and bogs of the upper Midwest were similarly used for seasonal grazing into the nineteenth century (Prince, 1997) and Nesbit’s (1885) treatise on North American tidal marshes mentioned that Gulf Coast wetlands were used as pasture. In Texas these wetlands were more valued than uplands for winter pasture.

Although livestock was grazed on wetlands in these southerly regions, the need for hay was minimal because livestock were able to pasture outside year-round. In 1788, for example, a Virginian visiting the Hudson Valley explained that he preferred the south to the north in part because “there is no winter to provide for there; no hay to cut and cure, no firewood to get” (Coventry, 1978, February 17, 1788, pg. 193). In 1819 the southern advantage in animal husbandry was explained by the President of the Agricultural Society of the Genesee (western New York) as the availability of free or cheap food, saying

they cost almost nothing – a bell upon the master of the herd, and a little salt occasionally. The rest of their sustenance is gained from the woods and wild herbage. In this way mean cattle can be produced so cheap as to undersell us... (Hopkins, 1820, pg. 364).

As late as 1836 a Virginian reported that farmers there usually did not keep more livestock than could be kept overwinter on “the offal of the grain crops” and that few people had considered growing crops specifically to feed livestock (Morton, 1836, August, pg. 79). Livestock in some

areas of Pennsylvania were also left to pasture outside year-round though their diet was supplemented in winter (Fletcher, 1950). Some marshes were used for hay and pasture in Virginia and Maryland into the late-nineteenth century but the natural availability of pasture in the south was probably the reason why farmers in parts of North Carolina were not creating meadows even in the 1750s (Gehrke, 1935; Nesbit, 1885).

Peter Kalm (Benson, 1937, pg. 180-181) went so far as to attribute the distribution of annual and perennial grasses to grazing, saying that

farther to the north, as in Canada, there is a sufficient quantity of perennial grasses; so wisely has the Creator regulated everything. The cool parts of the earth naturally bring forth a more durable grass, because the inhabitants need more hay to feed their cattle with, on account of the length of the winter. The southern provinces again have less perennial grass, as the cattle may feed in the fields all winter.

Indeed, farmers in Québec needed to keep their cattle “at home” five months each year; in 1790 the first synthesis of New England agriculture noted that “there are not more than two months in a year, in which farmers are not either preparing, and laying up fodder for their flock, or else dealing it out to them”; foddering extended from early November to late-May (Benson, 1937; Deane, 1822, pg. 149). As a result, most early settlements in colonial New England and New France were founded near intertidal emergent wetlands (Butzer, 2002; Hatvany, 2003; Russell, 1976; Whitney, 1994). Other uses for northeastern wetland vegetation included livestock bedding, food (e.g., fish, fowl, and cranberries), seaweed as insulation and fertilizer, muck for manure, and peat for fuel. Species of *Spartina* from tidal marshes were used to make rope, chair seats, bricks, house insulation, and mulch.⁹⁹

French Acadians may have been the most wetland-focused colonial group and with the exception of fishermen settled almost exclusively near intertidal wetlands on the Bay of Fundy (Butzer, 2002; Hornsby, 2005). Cunningham and Prince (1976, pg. 8) mused that the “marshes

⁹⁹ Cunningham (1976); Carman et al. (1934); Nesbit (1885); L’Hommedieu (1791); Russell (1976); Siry (1984).

must have appeared magnificent” to these colonists because “Grass on the higher lands and around the edges was immediately available to cattle and could be harvested for winter use” and because wild rice and waterfowl were abundant. Owing to the availability of salt marsh hay, Acadians on the Chignecto marshes specialized in beef production and export to Louisbourg and New Brunswick lumber camps (Cunningham & Prince, 1976; MacNeil, 1989). Following the Acadian deportation of 1755, New England and Yorkshire English immigrants were even allocated approximately 50 acres of marshland and 200 acres of upland (Cunningham & Prince, 1976).

The French-settled St. Lawrence Estuary was also heavily oriented toward intertidal emergent wetlands owing to the proximity of the inhospitable Canadian Shield (Hatvany, 2003). Hay was harvested in July and August along the shores and islands north of Québec City by the second decade of the seventeenth century and the cattle grazed on these “salty pastures” were prized for their flavor (it should be noted, however, that milk from cows pastured on some New England marshes had a “peculiar flavor”—Nesbit [1885]) (Benson, 1937, pg. 477; Hatvany, 2003). In 1759 people were seen collecting hay at low tide on a St. Lawrence island near Québec and as late as 1822 wet meadow hay was mown near Montréal.¹⁰⁰ Settlers on Prince Edward Island were likewise “wedded to the marshes,” according to an 1803 settler (Hatvany, 2003, citing Lord Selkirk). Salt marsh hay was used as house insulation in Acadia, a type of rush was soaked in tallow for use as a candle, and another was used to cane chairs (Cunningham & Prince, 1976).

The coasts of Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, Long Island, and New Jersey are also known to have supported variations on a wetland-based agricultural system. In 1634, for example, it was said that the wetlands around Massachusetts’

¹⁰⁰ 1822, September 24. Agricultural report for August. *The Plough Boy*, IV, 136; Fernow (1877, August 1759, “Operations of the Army under M. de Montcalm before Québec”).

Shawmut Peninsula provided plenty of hay for cattle; salt hay was harvested on the Great Marsh at Newburyport, Massachusetts as late as the 1970s (Baron & Bridges, 1983; Hatvany, 2003, citing Wood; Smith et al., 1989). Islands and peninsulas ringed with wetlands were also used as pasture (Bidwell & Falconer, 1926). Meadows in colonial New England were both held privately and in common because their management required cooperation (Anderson, 2004; Donahue, 2004; Valencius, 2002).

Palustrine emergent wetlands were also highly valued in New England. Within a few decades of settlement, increased immigration and the demand for livestock caused residents to form new towns or annex areas with additional wetlands; in the Connecticut River Valley, the towns of Northfield, Greenfield, Deerfield, Hatfield, Springfield, Suffield, Enfield, Wethersfield, Longmeadow, Hampton, Hartford, Wethersfield, Windsor, and Northampton were all formed in this way (*field* indicates a grassy area, and *hamp* is an English term for flat, low pastureland near a river) (Anderson, 2004; Cohen, 1992; Whitney, 1994). Near Boston, Concord and Sudbury were formed on the Concord River, Medfield on the Charles River, Ipswich on the Ipswich River, Duxbury on Duxbury Bay, and Dedham on the Neponset River. Similar settlements formed on the Mystic and Nashua rivers (Anderson, 2004; Munsell, 1870; Steinberg, 1991). Unlike Sudbury, where there was so much available meadow in the 1650s that cattle from other towns were brought to overwinter there, the town of Whately, Massachusetts was initially denied a new town charter because it was believed the new location did not contain sufficient meadow (Steinberg, 1991; Vileisis, 1997).

Some of the earliest specialized, export-oriented agriculture (raising “fat cattle”) in the Northeast was enabled by the abundance of meadows along the Connecticut River in Massachusetts; upland farmers would pasture oxen and cattle in the summer, which valley farmers would purchase in autumn and fatten over the winter (Garrison, 1987). If the Great Meadow at Concord is reflective of how these wetlands were used in colonial New England,

individual farmers owned parcels but managed the meadow jointly by enclosing it and establishing and maintaining rights-of-way for access (Donahue, 2004). Thoreau noted that hay taken from the Great Meadow was not worth very much at market and that sedges, bulrushes, cattails, and arrowhead (*Sagittaria* spp.) were generally unpalatable (Donahue, 2004; Foster, 1999). “Pipes” (horsetails, *Equisetum* spp.), however, were favored by cattle. Figure 2-1 shows Concord’s Great Meadow in springtime during the first quarter of the twentieth century.



Figure 2-1. “Great Meadows in Spring,” 1900-1920, H. W. Gleason (The Walden Woods Project, 2013).

The value of palustrine emergent wetlands in New England can also be seen in mid- to late-nineteenth-century petitions against the construction of dams. In 1861 several residents of towns along the Concord and Sudbury Rivers gave testimony as to how their meadows had been devalued since the 1828 construction of a downstream dam (Hudson, 1886). Their descriptions show that increased inundation caused soils to become too soft for grazing or taking wagons on and that palatable grasses like “blue grass” and “red top” had been replaced by sedges and other

“water grasses” that were useful only as livestock bedding.¹⁰¹ Their meadow lots had yielded one to one-and-a-half tons of native hay per acre until the 1820s, making it worth upward of \$80 an acre, but the price per acre had declined to \$10 or less per acre by 1860. The farmers were not compensated.

Similar conflicts between meadow owners and mill operators had previously occurred and mill acts were passed throughout New England to protect upstream property owners from flooding caused by downstream dams (Steinberg, 1991). In the emerging industrial economy of New England, however, these acts gradually became ineffective as the idea of public benefits offered by mills gradually won out over private property rights. In 1749, for example, wetland owners near Medfield and Medway, Massachusetts unsuccessfully sued a Natick mill owner for flooding their property by building a dam. Fifty years later other residents near the Charles River incorporated in order to sue mill owners but their efforts also failed.

Wetland Uses in New Netherland

The uses of wetlands in New Netherland were not unlike those for New England and New France. Wetlands were valued for their provision of waterfowl, the hunting of which was sometimes done by purchasing fowling rights (Goedhuys et al., 2008). In the late 1780s a “marshy, springy piece of low clay ground,” called the Salt Lick or Clay Lick, near Kinderhook, Columbia County was used as a hunting ground for pigeons attracted to the minerals there (Coventry, 1978, August 19, 1787, pg. 167). Yet others had use in fishing, like the tidal marsh on Jamaica Bay that was described in 1679 as “well provided with good creeks which are navigable and very serviceable for fisheries” (Murphy, 1867, pg. 131). Evidence also exists for leasing and

¹⁰¹ Blue joint was one of the most-valued and red top was the widest-cultivated in America in the eighteenth century. Hudon (1886, pg. 635); Kerr (1964); Prince (1997); Stoddart (1886); Tiner (1998).

owning beaches and other seaside lands for fishing. In 1669, for example, the Kip brothers were granted “some low flats or broken pieces of Land att Canarise” on Jamaica Bay for building huts and stages to cure and dry fish.¹⁰²

Wetlands were used as places of refuge by Native Americans and European settlers alike in New Netherland, though references are few. In 1634 Harmen Meynderts van den Bogaert traveled west along the Mohawk River and came upon some Indians who ran to hide “behind a thicket,” presumably a *creupelbos* (Snow et al., 1996, pg. 2). Nearly four decades later a traveler heard that when the Native Americans fought they hid their women and children on islands “or in some thick swamp” (Royster, 2006, pg. 14). Likewise, in 1643 Kiliaen van Rensselaer ordered that his patroonship’s church and merchants be situated on the east side of the Hudson River across from Fort Orange “at the place on the river where inland the swamp is deepest and so may serve as defence in times of need” (van Laer, 1908, June 3, 1643, pg. 619).

Native Americans and Europeans alike used wetland plants like rushes and willows to make baskets.¹⁰³ Other vegetation could be used as clothing, as illustrated by a 1634 observation that some Mohawk Indians wore a type of armor made with “thin reeds and cord woven together” (Snow et al., 1996, pg. 4). Some tribes used “cane reed” to make blow-guns for hunting squirrels (Weld, 1807). Perhaps most interestingly, a game called *Seneca* was played by Native Americans in the Hudson Valley. In the late 1620s Isaack de Rasieres described the game as

played with some round rushes, similar to the Spanish feather-grass, which they understand how to shuffle and deal as though they were playing cards; and they win from each other all that they possess, even to the lappet with which they cover their private parts, and so they separate from each other quite naked.¹⁰⁴

Adriaen van der Donck also mentioned this game in his 1655 statement to WIC (Goedhuys et al., 2008).

¹⁰² Christoph & Christoph (1980, “License to Isaac, Jacob, and Hendrick Kip, Jr., to land and dry fish at Canarsie,” March 29, 1669).

¹⁰³ Jameson (1909, “Letter of Isaack de Rasieres to Samuel Blommaert,” pg. 106); Morris (1898).

¹⁰⁴ Jameson (1909, “Letter of Isaack de Rasieres to Samuel Blommaert,” pg. 106).

Wetlands with flowing creeks were useful for mills in New Netherland, many of which operated on the tide. In 1656 James Hubbard had a mill “standing in the meadow” near Gravesend and a decade later Abraham Jansen was given permission by the commissioners of Boswijck to erect a gristmill on the nearby Mespathkil as long as he compensated the meadow owners for the “soil and water” and paid taxes and royalties.¹⁰⁵ A few years later a stream running through a large tidal marsh was dammed to support a gristmill along the East River in what is now Harlem (Hill & Waring, 1899). A dam and grist mill were also on one of the marsh creeks of Jamaica Bay in 1679 and a grist mill was located on a creek of “particularly fine salt meadows” near Woodbridge, New Jersey that same year (Murphy, 1867, pg. 169). In 1686 Phillip Welles laid out two parcels of land for himself on Staten Island, one being a “stream of water with liberty make a dam and build a mill”—he also acquired the adjacent 40 acres of meadow and 56 of upland.¹⁰⁶

Other property transactions were similarly aimed at water access and not necessarily the adjacent land. Formal commodification of New England waterways began in the late-eighteenth century with the development of the Waltham-Lowell mill complex in eastern Massachusetts, but riparian rights prevailed until waterway control became central to the Market Revolution (Steinberg, 1991).¹⁰⁷ In contrast, the Dutch were buying and selling water rights immediately upon arrival in the New World. The 1646 sale of the *Gojers kil* (Muitzeskill Creek) to Jacob Janssen Flodder did not include any land except a small lot some distance away to grow and store one season of oats (Gehring & Venema, 2009). He built a mill that was referred to some time later by the patroon’s widow, Maria van Rensselaer, when she wrote to her brother-in-law that

105 Fernow (1883, “Report of the commissioners on the boundaries between Gravesend and Anthony Jansen and order of Council,” July 19, 1656, pg. 361, “Council Minutes,” February 1, 1664, pg. 541, and “Council Minutes,” February 7, 1664).

106 ALG (Vol. II, “Description of a survey of a tract of land containing 360 acres lying on the northeast side of Staten Island beginning by the water side against Cunstable’s hook, and bounded on the north by the Kill van Cull, likewise a stream of water with liberty to make a dam and build a mill with the ground adjacent to the said stream, containing 56 acres and 40 acres of meadow, laid out for Phillip Welles, by Phillip Welles, surveyor,” February 10, 1686).

107 Historian Ben Cronin has also asserted that “The shift in what might be called ‘water regimes’ was a crucial location of what Charles Sellers has called the Market Revolution” (from an abstract of his February 2013 talk at the Massachusetts Historical Society, “To clear the herring brook”: Fluvial Control, Common Rights, and Commercial Development in Plymouth County, Massachusetts, 1660-1860.”)

The value of the mill, like that of all other mills, must be judged not according to the structure, which amounts to little, but according to the water rights, which likewise belong to the jurisdiction of the colony, on account of which such a mill, which stands so close to the village and which must grind the grain of all the inhabitants, is of no small value.¹⁰⁸

Thus, although the water rights belonged to Rensselaerswijck, they were transferrable. In 1649, for example, Evert Pels and Willem Fredericks Bout bought sawmills on that same creek and leased the waterpower (Dunn, 2002a). Other Rensselaerswijck examples include Brant van Slichtenhorst's late-1640s purchase of the *Paponicack kil* and Andries Wederwax's late-eighteenth century ownership of a stream corridor in West Sand Lake (Figure 2-2) (Venema, 2003). Chapter 5 describes the acquisition of a tidal creek on a Hudson River marsh in an effort to control trade.

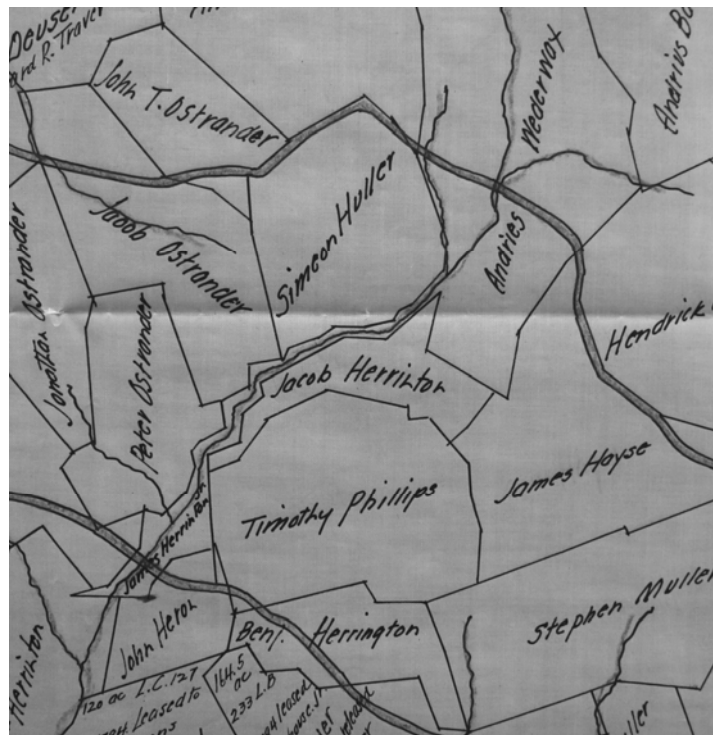


Figure 2-2. Detail of “Map of that part of the Manor of Rensselaerswijck which is called Green Bush: surveyed into farms in the fall of 1788 and spring of 1789, and laid down to scale of 20 chains to an inch,” John E. Van Alen / R. Schermerhorn Jr. (New York Public Library).

¹⁰⁸ van Laer (1935, “From Richard van Rensselaer,” May 1684).

The 1740s and 1750s saw the introduction of patenting “water lots” or riverbottom land between high and low tides, often in places described as *meadow*, but the objective was trade rather than agriculture. The first mention of “water lots” was in 1741 and referred to Peter Schuyler’s wharf in New York City.¹⁰⁹ In 1750 Staats Long Morris requested land on both shores of the Hudson River, including 100 acres of meadow south of the Esopus Creek and 12 acres of flats at Nutten Hook that were still unpatented and belonged to the Crown. He likely aimed to either build his own wharves or profit from selling the property to someone who would; however, two men quickly protested against any grant of land between high and low water works on the eastern shore in this vicinity.¹¹⁰

In 1752 John Chambers and his partners asked for a patent on riverbottom land below high water mark 600’ into the Hudson River adjacent to their New Windsor (Ulster County) lots. They aimed to make wharves because the river was too shallow in that area to bring boats directly to shore.¹¹¹ For the same reason Thomas Ellison also asked for a patent on riverbottom adjacent to his 2,000-acres in Ulster County that year, similarly extending from the high water mark to 600’ into the river.¹¹² These adjacent water lots were referred to as “soil under the water” and Ellison asked that Chambers’s group not be granted any more until he was consulted; another neighbor asked the same thing of Ellison.¹¹³ Nearly forty years later Moses Cantine asked for a grant of 20 acres of land under the Hudson River adjacent to his farm at Kingston and from the attached map it appears that his farm encompassed upland and meadow at what is now Kingston Point (Figure 2-3).¹¹⁴ The meadow has since been in-filled.

109 ALG (Vol. XIII, “Petition of Peter Schuyler, in behalf of himself and others, proprietors of the wharf and water lots lying in the city of New York, extend west side of Rodman’s slip and the east side of Connter’s keys slip, setting forth that they have carried their wharf further into the river than heretofore, and praying a patent to make the same a lawful key or wharf,” 1741).

110 ALG (Vol. XIV, entry 79, September 14, 1750, entry 87, October 17, 1750, and entry 85a, September 24, 1750).

111 ALG (Vol. XIV, entry 170, July 13, 1752).

112 ALG (Vol. XV, entry 5, August 10, 1752).

113 ALG (Vol. XV, entry 45, April 16, 1753 and entry 47, April 27, 1753).

114 ALG (Vol. XLIX, entry 140, October 16, 1790 and October 20, 1790).



Figure 2-3. "Map and description of survey of the lots prayed for in the preceding petition (Kingston, Ulster Co.)," 1790 (ALG, Vol. XV).

In 1793 Richard Cantillon's water lots in the Hudson River adjacent to his estate in Dutchess County were described and shown as "flats" on a survey; these were presumably mudflats exposed at low tide.¹¹⁵ In 1794 three brothers were each granted a water lot at Poughkeepsie that are clearly shown as "flats" on the map of their survey (Figure 2-4).¹¹⁶ That decade Thomas Frothingham was similarly granted the right to "lands covered with water for the purpose of Erecting a Wharf" on the Hudson River; this grant was countered by a petition from residents of Claverack for permission to continue using the area as a common fishing ground (Breugel, 1994).



Figure 2-4. "Map of said water lot," i.e., "Return of a survey for Matthew, Peter, and Jacob van Benschoten of a water lot at Poughkeepsie, Dutchess County," 1794 (ALG, Vol. XV).

115 ALG (Vol. LVI, entry 63, April 19, 1793).

116 ALG (Vol. LVII, entry 39, January 10, 1794).

New Netherland settlers also used wetland vegetation for building and roofing. Forested and scrub-shrub wetlands provided timber when the soil was dry or frozen and rot-resistant trees, like *Cupressus* sppg. (cypress) and *Chamaecyparis thyoides* (Atlantic white cedar), were particularly attractive materials for shingles, fence posts, barrel staves, and crates. Hardwoods like red maple and oak had other uses.¹¹⁷ Farmers along New York's Wallkill River in the region known as the Drowned Lands owned tracts of an Atlantic white cedar wetland into the early nineteenth century; farmers in Concord, Massachusetts also owned parcels of a cedar swamp (Donahue, 2004; Karlin, 1997). Trees from wetlands may have also provided the raw materials necessary to produce potash for the manufacture of soap and/or glass. In 1662 near Fort Orange, for example, a "potash-burner" went to look at a "thicket or cripple bush which may serve his purpose."¹¹⁸ Even herbaceous vegetation was utilized in building, at least by Native Americans. For example, Pierre Esprit Radisson saw an Indian "cabban which was made of rushes" during his early 1650s journey between Québec and Fort Orange (Snow et al., 1996, pg. 17). In 1678 a visitor observed corn drying in "Cribs made of reed" but the maker and owner are unknown (O'Callaghan, 1860, pg. 36).

As they did elsewhere, European settlers in New Netherland used native wetland vegetation for thatching.¹¹⁹ In some areas it may have been saltmarsh cordgrass, the "tall, rank grass" of the lower marsh which in English was known as "thatch," though common reed has long been used in Britain as a more durable alternative to straw and was often planted for that purpose.¹²⁰ The material was typically referred to as *riet* (reed) but in the 1640s two roofs were called *rietdack* or *riet ghedeckt*, which simply translate as "thatched roof," not necessarily "reed

117 Benson (1937); Carroll (1973); Donahue (2004); Herman (1992); Karlin (1997); Silver (1990); Vileisis (1997); Weld (1807).

118 van Laer (1932b, "From Nicholas Bayard," May 1662, pg. 294).

119 Christoph & Christoph (1980, "An order to make restitution to M[] Blanchan for the reed taken from []"), Gedan et al. (2009); Versteeg et al. (1976a, "Extraordinary Session, Thursday, May 28, 1665," May 28, 1665, and October 13, 1665).

120 Deane (1822, pg. 266); Graves (1822); Hay & Farb (1966); Kiviat & Hamilton (2001); Nesbit (1885).

roof.”¹²¹ *Riet* could have referred to many types of grasses, because the Dutch along the Neversink River (in far southwestern Orange County) called the tall, coarse grass of the river flats “reet grass” (Ruttenber & Clark, 1881). Furthermore, in Cohen’s (1992) analysis of Dutch-American farms, barley, rye, and wheat straw were listed as thatching material. “Straw” was also mentioned at least twice in the late-seventeenth century (van Laer, 1932a).

That thatch did sometimes originate in wetlands is confirmed by Dane Jacob Elderts bringing “thatch from Bronck’s meadow” to his home at Harlem in February 1663 (Riker, 1904, pg. 197). In 1686 two men sought to purchase a home lot on the *Nessequack* (Nissequogue) River, Long Island, with “seven acres and a half of sunken meadow and five acres of creeck thatch” and the following year added several islands of “Drowned meadows and creek thatch.”¹²² Other references to reed-cutting may also refer to thatch, e.g., “reed cutters demanded 30 stivers for mowing the marsh” to thatch Stuyvesant’s barn on his Esopus property in 1658. In 1670 Cornelis van Nes cut reed on Herman Vedder’s land at Niskayuna, which lying less than one kilometer from the Mohawk River, was probably bordered by extensive wetlands.¹²³

Walter Dickinson and Barnard Hodge both claimed rights to “a tract of Land Called Mullberry Swamp” on the Delaware.¹²⁴ Mulberries may have been an important wetland foodstuff because in 1785 Alexander Coventry of Claverack lamented that he had “cut a great many mulberry trees, being ignorant of their kind and value.” Two days later he attempted to

121 Colenbrander (1911); Murphy (1835); van Laer et al. (1974b, “Declaration of Cornelis Cornelissen and other soldiers regarding the destruction of Jochem Pietersen Kuyter’s house by the Indians,” March 9, 1644).

122 ALG (Vol. II, “Petition of David Scudder and Robt. Arther, in relation to the purchase of a home lot, which was Wm. Brotherton’s, with four score and ten acres adjoining to it and seven acres and a half of sunken meadow and five acres of creeck thatch, bordering on Nessequack river,” March 11, 1686 and “Petition of Robert Arthur and Daniel Scudder, of Smithston, in the county of Suffolk, a grant of several islands in the Drowned meadows and creek thatch, in Niesequaugh river,” January 13, 1687). The “sunken meadow” may refer to vegetated flats that were flooded at high tide, but able to be grazed at low tide. Similar meadows existed in the Hudson River at Esopus—the “Sunken fly” at the mouth of the Rondout Creek were vegetated tidal flats now called Esopus Meadows, a nature preserve that was once grazed by cattle.

123 Gehring (2003, “Letter from Sergeant Andries Louwerensen to Petrus Stuyvesant,” September 28, 1658, pg. 201); Fernow (1881, “Letter from Sergeant Andries Louwrens at Esopus to Director Stuyvesant: the bridge swept away; failure of the oats crop; Stuyvesant’s farm,” September 28, 1658); van Laer (1926, October 27, 1670).

124 Gehring (1977, “Papers from the Whorekill and St. Jones courts relating to a difference between Walter Dickinson and Barnard Hodges,” pg. 330); Fernow (1877, “Minute of a verdict for plaintiff at a court held at horekil, in the case of Walter Dickinson, plaintiff, agst. Bernard Hodges, defendant, in relation to the title to a tract of land called Mulberry Swamp, on St. Jones Creek,” June 18, 1670).

replant the stems.¹²⁵ In 1802 a comment was also made by a nearby resident of Kinderhook that when wood became scarce the peat of a large “bog” south of town would provide “excellent fuel” if allowed to dry (Warden, 1802). Three years later an attempt was made to harvest peat from the bottom of a drained pond on lower Manhattan in an area with wetlands that were long-used used for ice-skating (Hill & Waring 1899; O’Callaghan, 1860). A few nineteenth-century references to peat are known, but the early—and primary—uses of northeastern wetlands were in mixed-husbandry agriculture. In order to determine if wetlands in New Netherland were used for hay and pasture to the extent of New France and New England, the state of agriculture in the Dutch colony must first be established.

Agriculture in New Netherland

WIC made routine efforts to supply its colony with settlers, livestock, and farm implements despite its focus on the fur trade. In 1625, for example, a shipment of people, stallions, mares, bulls, cows, hogs, and sheep were sent over.¹²⁶ In August 1636 Director van Twiller reported to the *Heeren XIX* that the crops had done well that year and if agriculture were promoted they would have enough of everything except salt, oil, and vinegar (van Laer 1919, August 14, 1636.). In 1641 David Pietersen de Vries, patroon of *Vriessendael* (now Edgewater, New Jersey) generally felt that if more people were settled in the colony as farmers the wealth generated would surpass that of peltries; to him, the colonists were in want of nothing but “men to do the work” (Murphy 1835, pg. 157).

WIC made some effort to provide formal outlets for agricultural produce and in 1641 two fairs were established in New Amsterdam (cattle on October 15th and hogs on November 1st) and

¹²⁵ Coventry (1978, November 10, 1785 and November 12, 1785).

¹²⁶ Jameson (1909, “Wassenaer’s Historisch Verhael”).

in 1658 two cattle fairs were established in New Amsterdam (lean cattle in May and fat cattle in late October through November).¹²⁷ In 1656 Saturdays were declared market days in New Amsterdam to avoid spoilage of goods when “people from the country bring various wares, such as meat, bacon, butter, cheese, turnips, roots, straw, and other products of the farm to this City for sale.”¹²⁸

In the early 1660s some prominent residents believed the colony could provide grain for the Dutch Republic and in 1679 it was indeed reported that “New Netherland is a country overflowing with grain” and that liquor was abundant as a result.¹²⁹ The London-based Board of Trade received a report at the turn of the eighteenth century saying the chief product of New York was corn and some wheat was produced for export.¹³⁰ Cohen (1992) believed that the agricultural products of New Netherland were not unlike those of New England and was produced through a combination of Dutch, English, and Native American methods. The only methods unique to the area related to the use of the Dutch plow, scythe, and wagon, although these implements performed the same duties as their equivalents in other cultures.

Agricultural output, however, was decidedly lacking in the first half of the seventeenth century. In 1650 Adriaen van der Donck wrote the first of his monographs for the WIC concerning the state of New Netherland and suggested that the WIC wasted money and effort on expensive ventures that did not return sufficient benefits for the investments—it should instead focus on settlement and sending livestock (O’Callaghan, 1856b). In 1652 WIC asked Director Stuyvesant to

take great care for cultivation of every kind of produce of the soil and foodstuffs necessary for the maintenance of the people; also, to issue strict orders

¹²⁷ O’Callaghan (1865, September 30, 1641); O’Callaghan (1868).

¹²⁸ Fernow (1976a, September 12, 1656, pg. 23); Gehring (1991, “Ordinance establishing a weekly market at New Amsterdam,” September 13, 1656).

¹²⁹ Fernow (1907, February 20, 1664, pg. 187); Murphy (1867, pg. 354).

¹³⁰ O’Callaghan (1854a, “Representation of Messrs. Brooke and Nicoll to the Board of Trade,” August 26, 1696).

concerning the disorderly and untimely slaughter of every kind of livestock, so that the people coming over may find proper necessities.¹³¹

The following year the company was actively “engaged in considering means which could or might tend to the promotion of agriculture and the profit of the general inhabitants” of New Netherland.¹³² They recognized that “the growth and prosperity of yonder state depend[ed] principally upon the population and the cultivation of the soil.”¹³³ WIC instructed Stuyvesant to start breeding cattle “most earnestly,” stop slaughtering young cattle, import livestock from the West Indies, and feed salt to the sheep to reduce mortality.¹³⁴ The following year the *Heeren XIX* ordered him to take a census of animals and maintain a register to track of numbers and promote breeding.¹³⁵

However, the company did not see a reason to change their policies in New Netherland because colonists had long been settling there and should be left to “enjoy the freedoms granted to them in the year 1630” (meaning, those of the Charter of Freedoms and Exemptions).¹³⁶ By 1655, however, WIC was no longer convinced of New Netherland’s promise in agriculture because they believed the “inhabitants there show very little industry or diligence in agricultural pursuits.”¹³⁷ The 1650s and 1660s were marked by repeated periods of scarcity where, among other restrictions, the malting of grains and use of white flour for sweet breads were forbidden.¹³⁸ Scarcity was caused in part by the second Anglo-Dutch War that saw trade conflicts between Britain and the Dutch Republic both in Europe and America. In the spring of 1662 there was “little or no food for sale” in the Esopus even though that area was one of the primary wheat-

131 Gehring (2000, “Letter from the directors in Amsterdam to Petrus Stuyvesant,” April 4, 1652, pg. 153-154).

132 Gehring (2000, “Letter from the directors in Amsterdam to Director Stuyvesant,” June 6, 1653).

133 Gehring (2003, “Untitled letter to Director General (Stuyvesant) and his Council, from secretary of WIC,” 1654, pg. 15).

134 Fernow (1883, “Letter from the Directors to Stuyvesant: European News: Regulations for granting lands: Rensselaerswijck: Increase of cattle to be encouraged: slave trade to N. N. etc. etc.,” June 6, 1653, pg. 208).

135 Gehring (2003, “Letter from the directors in Amsterdam to Director General and Council,” May 18, 1654).

136 Gehring (2000, “Provisional plan for the colonization of New Netherland and Caribbean possessions”).

137 Gehring (2003, “Letter from the directors at Amsterdam to Petrus Stuyvesant,” May 26, 1655, pg. 58).

138 Fernow (1976c, October 21, 1661); Gehring (1990, “Ordinary Session,” February 11, 1653, March 17, 1654, and May 30, 1656); Gehring (2000, “Letter from the directors at Amsterdam to Petrus Stuyvesant and the council of New Netherland,” November 4, 1653).

producing areas in the colony.¹³⁹ In the 1670s a decrease in domestic production caused another period of scarcity that resulted in trade restrictions, particularly of wheat and flour although corn was eventually added to the list.¹⁴⁰ Trade had become so “slack” in late 1674 that several men requested land at *Katskil* (Catskill) for farming in order to support themselves.¹⁴¹ Prices were also raised by the governor to reduce demand (Christoph & Christoph 1982).

In 1656 WIC allowed a small tax on houses, plantations, and farms to go toward relieving the “suffering and impoverished people” but primarily to reduce the colony’s debt.¹⁴² Director Stuyvesant reported difficulties collecting this and other newly imposed taxes on land and cattle because the people were poor and recent Indian attacks had left them even poorer.¹⁴³ For example, the town of *Vlissing* (Flushing) reported that it could pay only some peas and wheat because of “the great hinderance and damage which wee haue and doe sustaine in our estates besides the daily feare of our liues by reason of the insufferable Insolency of the Indians.”¹⁴⁴ The town of Hempstead reported something similar; that they had just made peace with the Indians that year but ultimately agreed to pay wheat.¹⁴⁵

Farms were of two types in New Netherland, *bouweries* and plantations. The former category included farms engaged in mixed-husbandry and the latter produced a single crop for export (Cohen, 1992). Tobacco was an early emphasis for plantation owners, so much so that in 1653 the Director and Council attempted to stave off a grain shortage by ordering tobacco farmers to plant “as many hills of maize, or as much land with pease or other hard grain for bread,

139 Versteeg et al. (1976a, “Ordinary session,” April 18, 1662, pg. 31).

140 Christoph & Christoph (1980, “An order strictly prohibiting the exportation of wheate out of this province, for one yeare,” March 9, 1670); Christoph & Christoph (1982, “A prohibition for exportacion of wheat” and September 5, 1675); Scott (1983, November 17, 1674); van Laer (1928, February 12, 1675/6, pg. 71); van Laer (1932b, “To Richard van Rensselaer,” possibly 1671).

141 Christoph & Christoph (1976, “Petition of Juriaen Theunissz, Harman van Gansevoort and Gerrit Theunissz for permission to purchase a tract of land at Catskill from the Indians. Translation,” December 17, 1674).

142 Gehring (2003, “Letter from the directors to the Director General and Council,” December 19, 1656, pg. 85).

143 Gehring (2003, “Letter from the directors to Stuyvesant,” June 14, 1656).

144 Gehring (2003, “Letter from the town clerk of Flushing to Stuyvesant,” July 29, 1656, pg. 98).

145 Gehring (2003, “Letter from the town of Hempstead to Petrus Stuyvesant” and “Letter from the town of Hempstead to Petrus Stuyvesant,” July 25, 1657).

as they plant hills or fields with tobacco.”¹⁴⁶ David Pietersen de Vries traveled to Virginia in 1641 and observed their tobacco planting and believed the same thing should be done in New Netherland because the same plant grew in both locations, and that once the land was exhausted from tobacco it could grow wheat and flax (Murphy, 1835). *Sapokanikan* (now Greenwich Village) was the site of several tobacco plantations after 1630, including that of Director van Twiller. Tobacco was the chief crop of northern Manhattan until at least 1650 and in 1639 Jonas Bronck, a Swede from Copenhagen, leased a tobacco and corn plantation on the “flat land of Manhattan” to Pieter Andriessen and Lourens Duyts. In that same area the Walloon families of de Forest and la Montagne planted tobacco in the early 1640s.¹⁴⁷ Land adjacent to *Bestevaer’s cripplebush* (Beeckman’s Swamp, the lower east side) was a tobacco plantation in the 1640s.¹⁴⁸ Bronck also bought ca. 500 acres from the Indians on the mainland along the Harlem River and named it *Emmaus*, and ran it as a tobacco plantation until he leased it to Thomas Spicer in 1643.¹⁴⁹

There were several tobacco plantations on western Long Island in the 1630s: Native Americans had cleared and farmed parts of western Long Island, including tracts along *Merechkawick* (Wallabout Bay) that they used for corn and were later included in patents for Dutch farmers.¹⁵⁰ In the 1630s and 1640s several men were granted land in the Bay but they seemed to be interested only in tobacco farming.¹⁵¹ Just to the east Andries Hudde and Wolphert

146 Gehring (1991, “Ordinance to promote increased cultivation and planting of grain,” March 20, 1653, pg. 33).

147 Riker (1904); van Laer et al. (1974a, “Lease from Jonas Bronck to Pieter Andriessen and Lourens Duyts of a plantation opposite the flat land of Manhattan,” July 21, 1639 and “Return of property belonging to Wouter van Twiller,” March 22, 1639).

148 van Laer et al. (1974a, “Lease from Director Kieft to Thomas Broen and others of a tract of land on Manhattan Island, near Bestevaer’s cripplebush,” December 15, 1640).

149 Riker (1904); van Laer et al. (1974b, “Lease from Arent van Curler to Thomas Spicer of the farm of the late Jonas Bronck,” June 25, 1643).

150 Gehring (1980, “Patent to Fredrick Lubbersz,” May 27, 1640, “Patent to George Rapaelje,” June 17, 1643, “Patent to Pieter Cesar Italiaen,” June 17, 1643, “Patent to George Bacxter,” July 6, 1643, “Patent to Pieter Monfoort,” August 17, 1643, “Patent to Jan Eversz Bout,” July 6, 1645, “Patent to Herry Breser,” September 4, 1645, “Patent to Cornelis Dircksz,” December 12, 1645, “Patent to Peter Cornelisz,” February 8, 1646, “Patent to Huych Aertsen van Rossum,” February 22, 1646, and “Patent to Joris Dircksz,” March 23, 1646); van Laer et al. (1974a).

151 Gehring (1980, “Patent to Pieter Monfoort,” August 17, 1643, “Patent to George Rapaelje,” June 17, 1643, and “Patent to Pieter Cesar Italiaen,” June 17, 1643).

Gerritsz owned a 16-morgen tobacco plantation called *Achervelt* in the 1630s.¹⁵² Later that decade the Domine Everardus Bogardus leased a tobacco plantation to Richard Brudnill.¹⁵³ The lessees of the farm called *Rinnegackonck* were allowed to split the property into two or three tobacco plantations in 1651.¹⁵⁴ Tobacco was likely grown on Staten Island as well, because in 1640 Thomas Smith agreed to lease the land of David Pietersen de Vries for 150 pounds of tobacco per year for six years.¹⁵⁵ Tobacco was also grown north of Staten Island on the New Jersey side (Murphy, 1835).

Upriver, Kiliaen van Rensselaer's eye was likewise "fixed on tobacco planting by which [he could] support many people." He accordingly sought an experienced planter who was cultivating two morgens near Fort Orange by 1634.¹⁵⁶ In 1639 Jan Habsen obtained a lease for a grain and tobacco plantation southward on the Hudson River between two other plantations.¹⁵⁷ In 1680 Arnout Cornelissen Viele received a deed for land to grow tobacco on the east side of the Hudson River opposite what is now Newburgh (Orange County).¹⁵⁸

Stuyvesant was reminded in 1654 that he should not rely on any other colony to supply him with provisions and should promote agriculture, and in particular remind tobacco farmers that they were obligated to plant grain on a portion of their plantations.¹⁵⁹ Nevertheless, in an effort to increase trade, WIC petitioned the government of the Dutch Republic to repeal their tax

152 Gehring (1980, "Indian deed to Andries Hudde and Wolphert Gerritsz for land on Long Island," June 7, 1629, pg. 6).

153 van Laer et al. (1974a, "Lease from Everardus Bogardus to Richard Brudnill of a tobacco plantation and appurtenances," May 17, 1639).

154 van Laer et al. (1974c, "Lease from Remmert Jansen to Barent Jansen Bal of a farm on Long Island," August 31, 1651).

155 van Laer et al. (1974a, "Lease of the plantation of David Pietersen de Vries on Staten Island to Thomas Smith," January 7, 1640).

156 van Laer (1908, July 20, 1632, pg. 233 and "Account of the jurisdictions, management and condition of the territories named Rensselaerswijck," July 20, 1634).

157 van Laer et al. (1974a, "Lease from Volckert Evertsen and Gerrit Jansen to Willem Willemsen and Jan Habsen of the plantation on the North River occupied by Barent Dirksen," July 7, 1639).

158 Pearson & van Laer (1916, "Deed from the Indians to Arnout Cornelissen Viele for three flats on the east side of the Hudson River, opposite Danskamer," June 13, 1680).

159 Gehring (2003, "Untitled letter to Director General (Stuyvesant) and his Council, from secretary of WIC," 1654).

on tobacco grown in New Netherland and in 1656 expressed an interest in promoting tobacco cultivation in the colony in order to encourage commerce.¹⁶⁰

Farming the Flats

The chief farming loci in New Netherland were floodplain flats that were initially used by the Native Americans for growing corn and valued for growing wheat as in New England.¹⁶¹ However, despite being tidal over 150 miles upriver and subject to spring floods, the Hudson River has not developed extensive flats owing to its steep and often rocky shores. In 1640 David Pietersz de Vries observed that “The above-named river has nothing but mountains on both sides, little capable of sustaining a population, as there are only cliffs and stones along the river”—only toward Beverwijck/Albany where was the land low and fit for cultivation, the first sight of which was at *Beeren* (Castle) Island below the town where clayey soils were found in the open flats (*leeghe vlackte*).¹⁶² Fifteen years later, however, Adriaen van der Donck claimed there were “beautiful flats with meadows and pastures of great length and breadth, both in the river and along the water’s edge” (Goedhuys et al., 2008, pg. 18). Assuming van der Donck’s account was not exaggerated for propaganda, he may have been referring to the stretch of river near Rensselaerswijck where he worked as *schout*.

In 1630 Kiliaen van Rensselaer ordered his agent in New Netherland to acquire property in “places where there is flat and good land and the least underbrush and trees” and over time was able to secure hundreds—if not thousands—of acres of floodplain flats for his patroonship.

Two years later he wrote to his co-proprietor Johannes de Laet that an additional 200 morgens of

¹⁶⁰ Gehring (2000, “Letter from the directors in Amsterdam to Director Stuyvesant,” June 6, 1653); Gehring (2003, “Letter from the directors to Stuyvesant,” June 14, 1656).

¹⁶¹ Gehring (1980, “Patent to Fredrick Lubbersz,” May 27, 1640, “Patent to Jan Eversz Bout,” July 6, 1645, “Patent to Herry Breser,” September 4, 1645, “Patent to Cornelis Dircksz,” December 12, 1645, “Patent to Peter Cornelisz,” February 8, 1646, “Patent to Huych Aertsen van Rossum,” February 22, 1646, Patent to Joris Dircksz,” March 23, 1646); Jameson (1909, “Letter of Isaack de Rasieres to Samuel Blommaert”); Murphy (1853); Russell (1976).

¹⁶² Jameson (1909, “From the ‘Korte Historiae ende Journaels Aenteyckeninge,” by David Pietersz. De Vries, 1633-1643,” pg. 206).

land cleared or seeded by the Indians had been purchased along the Hudson.¹⁶³ A contemporary map of Rensselaerswijck shows *vlackland met weynick boomen* (flatland with few trees) along the Hudson River just south of Albany (Figure 2-5). The main settlement of Greenbush was a piney tract of land across from Fort Orange with Mahican-cleared fields along the river (Dunn, 2002a).



Figure 2-5. "Renselaerswijck [sic]: map." ca. 1632.¹⁶⁴ Near what is now Glenmont there was *vlackland met weynick boomen* (flatland with few trees), *verdrongen land* (drowned land) and a *riet valey* (reed meadow).

Several other notable flats existed in the vicinity of Rensselaerswijck and Beverwijck/Albany. The annually flooded land south of town, called *de vlackte* or *het plein*, was used for

¹⁶³ van Laer (1908, January 12, 1630 and June 27, 1632).

¹⁶⁴ NYSL Digital Collections, NYSL Scanned Publications Collection: Rensselaerswijck [sic]: mapg. Document ID 78665.

grazing and described as “a parcel of meadow ground pasture.”¹⁶⁵ In 1666 the new English governor Richard Nicolls planned to turn the flat into a commons and effectively create a typical English/New England village (Merwick, 1990). This land was deeded to the Reverend Godefridus Dellius in 1687 for use as a common pasture by the poor and three years later Lieutenant-Governor Jacob Leisler prohibited anyone from allowing their animals to graze on the Poor Meadow without special license.¹⁶⁶ In 1764 a visitor observed one cow per family grazing on the pastures.¹⁶⁷ In 1785 the City of Albany decided that the Church must divide the Pasture into lots “to promote the welfare of this city and the weal of the State” and by 1850 this area was platted out and filled with houses and factories.¹⁶⁸ Today, this area is known as the Pastures Neighborhood and is in large part covered with parking lots and highway ramps.

In the late 1600s pastures were also delineated on either side of the *Rutten Kill* by the City of Albany and individuals also had pasture lots east of town along the Hudson River.¹⁶⁹ Governor Dongan described another 15-acre pasture at Albany, previously owned by the van Rensselaers, as being subdivided and portions built on, though because of “the overflowing of the River” those structures washed away.¹⁷⁰ In 1764 a visitor observed that the extensive flat north of town (perhaps the same one) was divided into lots where corn was raised for slaves, horses, pigs, and poultry.¹⁷¹ Across the river, between the Wynant’s and Poesten Kills, was another area called *de Vlackte*. This was the first farm north of Albany on the eastern shore and was given by van Rensselaer to Thomas Chambers in 1646 (van Laer, 1908). An English traveler to Troy in 1811 described the area just north of this as being a “plain” (Munsell, 1870).

165 Munsell (1870, “Albany City in the year 1813”); O’Callaghan (1849b, “Copies of Diverse other orders issued by Leislars commissioners at Albany April & May 1690,” pg. 219).

166 O’Callaghan (1849b, “Copies of Diverse other orders issued by Leislars commissioners at Albany April & May 1690”); Pearson & van Laer (1916, “Deed from the Mayor, aldermen and commonalty of the city of Albany to the Rev. Godefridus Dellius for the pasture to the south of the city near the old fort,” November 1, 1687, pg. 333).

167 Munsell (1850, Description of Albany, and its Manners 1764).

168 In 1787 the City approved the Church’s plan for houselots there. Munsell (1867, “The City Records, 1787,” pg. 245).

169 Munsell (1870); Munsell (1871, “Diagrams of Lots in Beverwyk”).

170 O’Callaghan (1853, “Governor Dongan’s report on the State of the Province, including his answers to certain charges against him,” pg. 410).

171 Munsell (1850, Description of Albany, and its Manners 1764).

Not all flats originated as open fields, however, and in June 1643 the representative of Rensselaerswijck wrote to van Rensselaer that the best farm in the colony—*de vlackte*, the *Vlakte*, *vlaecten*, *vlackte*, Schuyler Flats, or the Great Flatt—still contained “hidden stumps and roots” so they were only able to plow 16-17 morgens that spring.¹⁷² This area was described by Peter Kalm in 1749 as flat and farmed, and two decades later as “rich Bottom on each side of the River is near Half a Mile broad consisting of a blac Mould very level & low, proper for the best Sort of Meadow, but here sown with Wheat and Peas both which look well” (Benson, 1937; Halsey, 1906, pg. 19).

The Mohawk River floodplain was also highly regarded for having fertile flats with black soil that extended west from Schenectady for nearly 100 miles.¹⁷³ In some areas the flats were described as meadow with “a thin grass, very short and poor” but in general they were “very rich & fertile & where the Dutch the Inhabitants of this fertile Country raise Vast Quantitys of Peas.”¹⁷⁴ The area near the confluence of the Hudson and Mohawk rivers was settled early on but no European settlements existed west on the Mohawk until Schenectady was formed in the 1660s at the approximately three-mile long *Schonowe*, or the *groote vlakte* (Great Flat), which even in 1800 was described as “rich and fertile flats.”¹⁷⁵ In 1798 a traveler to Schenectady called this flat a rich “interval” just slightly higher than the level of freshets and surrounded on three sides by a pine plain (Munsell, 1870).

Seven additional flats were purchased during the 1670s, some of which were initially used by the Mohawk Indians for corn but that ultimately produced peas and some oats, corn, and wheat.¹⁷⁶ Yet another *Groote Vlackte* was found west of Schenectady and beyond that others

172 Gehring (1980); van Laer (1908, “Inventory of animals in the colony sent over by Johan Baptist van Rensselaer,” 1651); van Laer (1927, pg. 27); van Laer (1932a, July 6, 1680); van Laer (1935, “Kiliaen van Rensselaer to Richard van Rensselaer,” May? 1687).

173 Coventry (1978, June 7, 1791 and November 7, 1791).

174 Coventry (1978, May 29, 1791); Snow et al. (1996, pg. 10).

175 Gehring & Venema (2009, “Grant of land on the Mohawk River to Arent van Corlaer,” July 27, 1661); Munsell (1852, pg. 124); van Laer (1932a, May 7, 1663).

176 Christoph & Christoph (1990, “Minutes relating to the petitions of Daniel Jansz, Jacobus Peek, and Isaac de Trieux for land along the Mohawk River near Schenectady. Translation,” October 22, 1677); Coventry (1978, May 24, 1791); Snow et al. (1996); van Laer (1937).

were also settled in the eighteenth century (Pearson, 1869). In 1791, farther west at Johnstown, the agricultural improver Elkanah Watson saw Mohawk River bottomlands “laid off in rich enclosures, highly cultivated, —principally by industrious Germans” (Snow et al., 1996, pg. 5). Fifty miles more, at what is now Herkimer, were the “exceedingly rich and fertile” German Flatts, “a delightful body of low lands, which look like the flats of Esopus” and inhabited primarily by Germans but also some Dutch and a few English.¹⁷⁷ In general, in the mid-eighteenth century riverbanks were known to be the “most fruitful Soil either for grain or pasture.”¹⁷⁸

One flat in the vicinity of the Mohawk River was at the mouth of the Schoharie Creek contained 1,000 acres “of low or meadow land lying at a place called *Tiononderoga*. This flat was included in the Albany City charter of 1686 despite being 35 miles to the west.”¹⁷⁹ At least 80 acres of this land was described in 1702 as a “flat or plain”¹⁸⁰ and in 1734 as “flatts or meadow ground, where wood nor brush was ever known to grow.”¹⁸¹ A 1791 visitor to Schoharie Creek was impressed by the “extensive Flat of beautiful land” there (Coventry, 1978, May 25, 1791, pg. 532). In 1719 the Common Council of Albany decided that the city must exercise their right to purchase that land from the Mohawks and five years later expressed a desire to obtain a license for the adjacent woodland, pay for the meadow, and patent the entire tract.¹⁸²

Albany representatives finally met with the Mohawks regarding purchase in 1730, at which time Indians were living there as well as a few independent settlers who had bought small parcels.¹⁸³ In 1733 the Mohawks sold ca. 1,200 acres of the “low or meadow land commonly

177 Coventry (1978, June 4, 1791); Snow et al. (1996, pg. 8, 10).

178 O’Callaghan (1855a, “George Clinton’s report on the Province of New-York,” May 23, 1749, pg. 508).

179 Munsell (1865, “State of the claim of the Corporation of Albany to the lands in Tryon County, called lower Mohawk Castle or Tiononderoga,” October 5, 1779, pg. 300).

180 ALG (Vol. III, “Petition of John Pieterston Mebie praying a patent for land lying on both sides of Tionderogoes creek,” November 30, 1702).

181 O’Callaghan (1855a, “Governor Cosby to the Lords of Trade,” December 7, 1734, pg. 25).

182 Munsell (1857, “City Records” – “Att a Comon Council held in the City hall of Albany the 14th day of March 1718/90,” pg. 294).

183 Munsell (1865, “State of the claim of the Corporation of Albany to the lands in Tryon County, called lower Mohawk Castle or Tiononderoga,” October 5, 1779), O’Callaghan (1855a, “Common Council of Albany to President Clarke,” May 18, 1736); Weise (1884).

called the Mohocks flats,” plus 2,000 acres of upland, on both sides of the creek.¹⁸⁴ This deed was invalidated and the following year the land was “vested in the Crown in Trust for the Mohocks Nation,” but some farmers were again active in the area by the 1780s.¹⁸⁵ The 1686 charter also allowed for the City’s acquisition of 500 acres of “low or meadow ground” at *Schahtecogue* (Schaghticoke), 20 miles to the northeast (Munsell, 1870, pg. 61).

In 1679 travelers compared the “tillable land” at Claverack to that of Schenectady, being “low, flat, and on the side of a creek” and wheat-producing (Murphy, 1867, pg. 322-323). They also described the flats at *Hysopus* (Esopus) as

more than three hours ride in length, very level, with a black soil which yields grain abundantly. They lie like those at *Schoon ecte* and *Claver rack*, between the hills along the creek, which sometimes overflows the land, and drowns and washes out much of the wheat (Murphy, 1867, pg. 324).

One resident believed the Esopus “could feed the whole of New Netherland.”¹⁸⁶ A portion of this extensive interval was called the Butterfields because they formed the foundation of thriving dairy farms; Governor Francis Lovelace himself requested a survey of the area in 1669 because he wanted to “improve [it] for a breeding ground” (Clearwater, 1907, pg. 51; Figure 2-6). In 1678 Native Americans deeded five large *vlaktens* on both sides of the nearby Catskill Creek, named *Wachachkeek*, *Wichguanachtikak*, *Pachquyak*, *Assiskowachkok*, and *Potick*.¹⁸⁷ These flats

184 O’Callaghan (1855a, “Deed conveying the Mohawk Flatts to the King,” November 4, 1733, pg. 15).

185 Munsell (1865, “State of the claim of the Corporation of Albany to the lands in Tryon County, called lower Mohawk Castle or Tiononderoga,” October 5, 1779 and “The City Records, 1780,” and “The City Records, 1781”); O’Callaghan (1855a, “Petition of Mohawk Warriors to Governor Clinton,” pg. 315, “Governor Cosby to the Lords of Trade,” December 7, 1734, pg. 25, and “At a council held at Fort George in the City of New York the 15th day of June 1753 PM,” June 15, 1753).

186 Gehring (2003, “Letter from Thomas Chambers to the director general and council,” May 2, 1658, pg. 168 and “Letter from Thomas Chambers to the council of New Netherland,” May 18, 1658, pg. 171); Versteeg & Shattuck (2011, “Some extracts from the additional writs, arrived with the letter of Director and Councillors, dated July 23, 1658. Read at the Meeting in September 1658.”).

187 Fernow (1881, “Abstracts of Indian deeds”); Pearson & van Laer (1916, “Deed from Catskill and Mahikan Indians to Capt. Sylvester Salisbury and Marten Gerritsen for five large flats at Catskill,” July 8, 1678, pg. 19).

were also called “Plains” described as “fine bottom land, adapted either for grain or grass, both of which yield great crops.”¹⁸⁸

The first Europeans in the area that became Cocksackie (*Koxhackien*, *Koixhackung*, *Koxhackung*, *Koxhaexy*) settled inland from the river where several creeks intersected. Part of the land was called the *Fonteyne Vlakte* (Fountain Flats).¹⁸⁹ A large number of artifacts found there indicate the area was first settled by the Mahicans. Flooding was the only risk to farmers on the Cocksackie flats that were described in 1662 as “cleared land... a short distance in the woods” and in 1786 as “a tract of good level land without stone, said to be a dark colored clay, extending a distance of about 5 miles North and South, and between one and two miles wide.”¹⁹⁰



Figure 2-6. Map of five 20- to 28-acre lots drawn in the Butterfields in 1676 (ALG, Vol. I).

188 Pearson & van Laer (1916, “Deed from the Indians to Jacob Lokermans for a piece of land on the Caters creek (Kaaterskill creek),” May 26, 1686, pg. 304); Coventry (1978, November 30, 1787, pg. 182).

189 Beecher (1991); van Laer (1932, April 7, 1685).

190 Coventry (1978, February 3, 1786, pg. 87 and November 30, 1787); Gehring & Venema (2009, “Indian patent for land to Pieter Bronck,” January 13, 1662, pg. 235).

Van Rensselaer described 210 morgens of cleared land on the west shore of the Hudson River, *Sanckhagag*, as “not only fat, clayey soil of itself but yearly enriched by the overflow of high water there when the ice breaks and jams.”¹⁹¹ Although appreciated for maintaining soil fertility, flooding was the greatest threat to riparian flats and loss of crops, livestock, and structures was expected every year during springtime melt. In the 1650s Secretary van Tienhoven described Rensselaerswijck as flooding every spring and Adriaen van der Donck commented that during flooding in there and at Catskill and the Esopus, “Sometimes a stand of corn here and there is washed away, though the silt left behind as good as manures the land.”¹⁹² In May 1666 when grain appraisers went to Director Stuyvesant’s Esopus farm, *Rhecoppenhoek*, they found much of the wheat and rye there had been uprooted by “high water” or “covered with sand” from the nearby Rondout Creek (Versteeg et al., 1976b, May 14, 1666). The month before, upriver at Rensselaerswijck, the patroon’s house washed away along with other buildings (Dunn, 2002b).

Jeremias van Rensselaer reported that after the 1668 ice floes, knee-deep sand was left on the *Hooge Bergh* farm on Papskanee Island and ice piled to the top of a barn; on occasion these freshets also deposited considerable amounts of wood, as was the case on Herman Bastiaensz’s island farm in 1670.¹⁹³ In the early 1670s at the *Kinderen Hoeck* (Kinderhook), which boasted four flats totaling ca. 120 morgens, “a great deal of wheat was carried away by the high water.”¹⁹⁴ Alexander Coventry described the Kinderhook area as having “some fine intervale farms along the creek,” one of which had “very extensive meadows” along the water that are still flooded

191 van Laer (1908, “Account of the jurisdictions, management and condition of the territories named Rensselaerswijck,” July 20, 1634, pg. 306-308).

192 O’Callaghan (1856a, “Information respecting land in New Netherland,” March 4, 1650, 367); Goedhuys et al. (2008, pg. 17).

193 van Laer (1932b, “To Jan Baptist van Rensselaer,” July 11/21, 1668); van Laer (1926, July 7, 1670).

194 Fernow (1881, “Abstracts of Indian deeds”); van Laer (1932b, “To Richard van Rensselaer,” possibly 1671, pg. 441).

today.¹⁹⁵ Large floods required the communal repair of fences, bridges, and roads on penalty of a fine (van Laer, 1928, May 7, 1680.).

Several other major flats were found some distance from water and were treeless as a result of Native American burning and farming. In the mid-1600s on northern Manhattan Island a number of colonists settled at the “flat,” “flats,” or “flatts” called *Muscoota*—the Harlem Plain.¹⁹⁶ In 1628 Isaack de Rasieres described the north end of Manhattan has having

good land in two places, where to farmers, each with four horses, would have enough to do without much clearing at first... On the east side there rises a large level field, of from 70 to 80 morgens of land, through which runs a very fine fresh stream; so that that land can be ploughed without much clearing.¹⁹⁷

Another extensive flat was a 400-tract called *Schorakin* owned by Jochem Pietersen Kuyter, who named it *Zengendal* (Vale of Blessing) though it later became known as Jochem Pietersen’s Flat (Figure 5-5; Riker, 1904). These grasslands were likely created and maintained by sub-decadal burning by the Lenape (Bean & Sanderson, 2008).

The Harlem Plain was the location of the first settlement on Manhattan Island north of New Amsterdam when the Walloon Henry de Forest was granted *Muscoota* in 1637. He intended to start a tobacco plantation but died before he began and the work was taken up by his friend and fellow émigré and brother-in-law Jean de la Montagne (Riker, 1904). La Montagne sold a portion of the plantation but kept a tract that he called *Vredendal* (Quiet Dale) and the flat continued to be called Montagne’s Flat and a tidal marsh to the south was called “Montagne’s hay marsh” (Figure 5-5).¹⁹⁸ Beginning in 1661 Montagne’s and Jochem Pietersen’s flats were resurveyed and divided into new lots of three to six morgens each to accommodate the influx of

195 Coventry (1978, August 9, 1788, pg. 204, and January 20, 1791); Courtens (personal communication, 2010).

196 Gehring (1980, “Indian deed to the West India Company for a tract of land, called Keskeskick, behind the kil which runs around Manhattan Island (Yonkers),” August 3, 1639, “Patent to Johannes la Montangie,” May 19, 1647, pg. 61 and “Patent to Cornelis van der Donck,” August 26, 1655, pg. 78).

197 Jameson (1909, “Letter of Isaack de Rasieres to Samuel Blommaert,” pg. 104).

198 Gehring (1980, “Patent to Pieter Jansz and Huych Aertsen,” March 11, 1647); Riker (1904).

new settlers, and a few years later following Indian trouble the village itself was palisaded (Riker, 1904).

Yet other flats were clear because of poor, dry soils. An extreme example is the Pine Bush between Schenectady and Albany, described as a “pitch-pine plain, nearly a perfect flat, chiefly covered with a forest” (Munsell, 1870, pg. 403). Another example is *Castuteeuw*¹⁹⁹ on western Long Island that was comprised of two or three plains or *vlackelandt* of about a square mile and became the towns of Amersfoort and Vlacke Bos/Midwout (Royster, 2006). The shallow soil in these areas formed from glacial outwash and were characterized by herbaceous, primarily perennial, vegetation surrounded by oak forest and pine forests; scattered trees and shrubs characteristic of open sites with poor, dry, and/or acidic soils were also found there (Harper, 1918; Weld, 1807). Van Wyck (1924) labeled these areas as “plains” in a map of the area and describes the one large and two small flats/prairies as treeless; a translation of Danckaerts and Sluyter’s 1679 description also called the area a “plain.” In 1629 the Indians deeded the westernmost flat to Andries Hudde and Wolphert Gerritsz and their 16-morgen tobacco plantation *Achervelt* is shown on Jan Vingboon’s 1639 map at *Kiskachauw*, though an inventory from the year before indicates it was surrounded by palisades (Figure 2-7).²⁰⁰ The central and eastern flats traded hands several times in the 1640s.

199 Also *Caskuteyie*, *Castetuen*, *Cashuteijie*, or *Keskateuw*. Gehring (1980, “Indian deed to Andries Hudde and Wolphert Gerritsz for land on Long Island,” June 7, 1629, pg. 6, “Indian deed to Jacobus van Corler for land on Long Island,” June 16, 1636, pg. 5, and “Indian deed to Wouter van Twiller for land on Long Island,” July 16, 1636, pg. 6); van Laer et al. (1974a).

200 Gehring (1980, “Indian deed to Andries Hudde and Wolphert Gerritsz for land on Long Island,” June 7, 1629, pg. 6, “Indian deed to Jacobus van Corler for land on Long Island,” June 16, 1636, pg. 5, “Indian deed to Wouter van Twiller for land on Long Island,” July 16, 1636, pg. 6); O’Callaghan (1865, June 16, 1630 and June 16, 1631, July 16, 1636 and July 22, 1638); van Laer et al. (1974a, “Deed for land on Long Island from Jacob van Curler to Wouter van Twiller,” July 2, 1638, “Bond of Andries Hudde to Rev. Everardus Bogardus with mortgage on property at Achtervelt, Long Island,” July 22, 1638, “Inventory of the farm called Achtervelt,” July 29, 1638, “Assignment by Andries Hudde to the West India Company of his half-interest in the live stock remaining with Wolphert Gerritsen,” August 5, 1639, “Release by Domine Everardus Bogardus of his claim on the property at Achtervelt conveyed by Andries Hudde to Wolphert Gerritsen,” August 6, 1639); van Laer et al. (1974b, “Lease from Andries Hudde to John Underhill of a house and plantation situated near Keskaechqueren, Long Island,” January 16, 1642, pg. 9).



Figure 2-7. Detail of "Manatvs gelegen op de Noort [sic] Riuiet," 1639 (Library of Congress).

Farming the Islands

Some of New Netherland's prime agricultural land was found on islands, which like many flats were also made fertile and flat by annual flooding. Castle Island, for example, was the location of the first Dutch fort in New Netherland but eventually became the site of the best farm in the upper Hudson Valley. Kiliaen van Rensselaer wanted to establish three 40-morgen farms on this island and called this region *Petanonck*. In 1634 he reported that 240 morgens of land had been cleared there for the farms named after his co-patroons: *Renselaers-Burch*, *Welys-Burch*, *Godijns-Burch*.²⁰¹ In the 1640s the island's farmer claimed to have grown wheat there for 12 years without ever leaving it fallow (Murphy, 1835). This island was identified twenty years later

201 van Laer (1908, April 23, 1634, pg. 286 and "Account of the jurisdictions, management and condition of the territories named Rensselaerswijck," July 20, 1634).

by Maria van Rensselaer as the most productive farm in the colony, which she refused to sell for some time (Marten Gerritsen ultimately owned it and the name changed to Marten Gerritsen's Island).²⁰² In 1749 Peter Kalm observed that this island was completely plowed and in 1785 James Coventry described it as "level, and fine rich loam, mostly in pasture, and is by far the most beautiful piece of ground, and the best land, I have seen in America. It is over-flowed every Spring, which keeps it fertile."²⁰³

Castle Island has since been connected to the western shore and is currently the site of the Port of Albany. Many other upper-Hudson River islands have also been consolidated with each other and/or the mainland, including the 18 islands south of Troy surveyed by James Frost in 1819.²⁰⁴ The river was dredged in many areas later in the nineteenth century and the spoils were deposited on marshes or in backwaters behind islands. Prior to the nineteenth century, however, these islands were highly valued farmland.

The first major undisturbed Late Woodland/early Historic Native American site east of the upper Hudson River was found on *Godyn's* (Kuyper) Island that is now part of Papskanee Island just southeast from Beverwijck/Albany (Lavin, 1997). The colony's second farm, *Semesseeck*, formed there in 1631 (Dunn, 2002a). *Paepsknee* (Papskanee) Island itself was described in 1684 as "one of the most important farms" and that it and a few others "must produce the revenue of the patroon."²⁰⁵ Papskanee was purchased from the Mahicans in 1637 by Kiliaen van Rensselaer and divided into three farms, one of which, the *Hooge Berg* (High Hill), was leased by Gysbert Cornelissen van Breuckelen from 1648 until 1679 when a fire destroyed his farm and probably took his life.²⁰⁶ In 1696 that farm was leased to Samuel Staets, whose

202 van Laer (1935, "From Richard van Rensselaer to Marten Gerritsen van Bergen," April 1683 and "From Richard van Rensselaer," May 1684).

203 Benson (1937); Coventry (1978, September 26, 1785, pg. 75).

204 Schodack Island and Papskanee Island are technically peninsulas. NYSA Field Books for Surveys by James Frost of New York State Lands (1811-1838, Volumes 31-34 (Nos. 1-4), "August [] 1819 Commenced the survey of the eastern shore of the River Hudson at the foot of Jacob Street, Troy, as directed by T. McCoun & G. Tibbets Esqrs. & under the direction of the surveyor general).

205 van Laer (1935, "From Richard van Rensselaer," May 1684, pg. 148).

206 van Laer (1935, "To Stephanus van Cortlandt," November? 1679); van Veghten (2010).

descendents still live in his original house. Another was rented to Volckert Jansz and Jan Thomasz who purchased it in 1658; in 1670 they complained that Jeremias van Rensselaer was plowing their shared pasture land but the following decade Jeremias' widow, Maria, wrote to her father that the two men had turned much of the pasture into arable land "contrary to their right."²⁰⁷ Janssen also purchased half of Constapel Island just to the south in 1663 from Andries Herbertson and Rut Jacobsen, who had grown wheat and rye there (Jeremias van Rensselaer purchased the other half).²⁰⁸ Several men inquired about purchasing Papskanee in the 1680s, including the third original farmer Martin Gerritsen van Bergen.²⁰⁹ Two small islands to the south of Papskanee were leased by Pieter Winne prior to 1680 when he decided to pursue milling.²¹⁰

Janssen and Thomassen also purchased *Apjen's* (Smack's) Island a few miles to the south in 1663, which was the northernmost of three islands that were joined by dredge spoils to create Schodack Island (Munsell, 1871, October 4, 1663). The Mahicans had a village on one or more of these islands into the eighteenth century (Huey, 1997). Janssen owned the river side of the island, Thomassen the mainland side, and the intervening *calverwey* (calf pasture) was held in common (Munsell, 1871, May 26, 1684). Their successors disputed title to the *calverwey* in 1684 but the court ruled that it should remain in common.²¹¹ Among the plaintiffs was Jacob Jansen Flodder, a miller on the nearby Muitzeskill Creek who had cultivated a small plot on the island in the 1640s and purchased land there in the 1650s.²¹² A tenant of Janssen and Thomassen was

207 van Laer (1926, June 23, 1670); van Laer (1935, "From Stephanus van Cortlandt," October? 1680, pg. 42); Venema (2003).

208 Gehring & Venema (2009, "Sale of half island by the administrators of the estate of Andries Herbetsen to Jeremias van Rensselaer," November 12, 1662, "Conditions for the sale of wheat by the administrators of the estate of Andries Herbetsen and Rut Jacobsen," 1663, "Sale of the half island of Andries Herbetsen and Rutger Jacobsen to Volckert Janssen," June 26, 1663 and "Sale of half an island by Adriaen van Ilpendam as administrator of Andries Herbetsen's Estate to Volckert Jansz.," November 11/21, 1665); Venema (2003).

209 van Laer (1935, "From Richard van Rensselaer to Marten Gerritsen van Bergen," April 1683 and "To Richard van Rensselaer," October 1683, and "From Richard van Rensselaer," May 1684).

210 van Laer (1935, "To Stephanus van Cortlandt," November? 1679).

211 van Laer (1932, May 6, 1684; May 26, 1684; July 1, 1684; February 3, 1684/5).

212 Gehring & Venema (2009, "Declaration about land at the Gojer's kil by Queskimiet, Aepie, Wickepe, Kleijn da Vidtie," May 14, 1664); Huey (1997); van Laer (1932a, May 6, 1684).

actively plowing and sowing this or another island the following year when he was stopped by the patrolman Jeremias van Rensselaer and his schout.²¹³

Volckert Janssen also owned the third island, *Schutter's* (Houghtaling) Island, in the 1670s and it was used for farming thereafter.²¹⁴ His son purchased the middle island in 1664 (Huey, 1997). One of these islands was the subject of van Rensselaer frustration twenty years later when Janssen's son was discovered creating his own farm although they were not permitted to make the island "more crowded than when they bought it" (Huey, 1997). These men raised animals, grain, and tobacco (Venema, 2003). Wheat was grown on Brecker's Island across from the Schuyler Flats farm before 1660 and hay and flax were also cultivated there by the Revolution; at that time it was described as being made fertile by regular flooding. Grain was also growing on *Greene* (Pine) Island at the confluence of the Mohawk and Hudson Rivers in the 1670s, including at least one field of oats.²¹⁵

Islands in the Delaware River were also valued. In 1679, *Koomenakimokonck* or *Matinakonk* (Burlington) Island on the Delaware had gardens, houses, and it was planted and described by Danckaertss and Sluyter as the best island in the river. The second best island was *Tynakonk* (Tinicum) Island, which was "covered with bushes, and inside somewhat marshy" and only cultivated in one area because otherwise it was "barren, scraggy and sandy, growing plenty of wild onions." It boasted only a few houses, a blockhouse, and a Lutheran church (Murphy, 1867, pg. 178). It was owned by a group of Swedes and Finns. When Peter Alrichs leased *Matiniconk* Island in 1668 the adjacent meadows were included as well as the nearby Jan Swarts Island, which was long-used "for releife of the Cattle whereupon they have always run."²¹⁶ In

213 Gehring & Venema (2009, "Conveyance of a piece of land by Wattawit and Pepewitsie to Volckert Janssen and Jan Tomassen," October 4, 1663, "Conveyance of a piece of land by Naspahan and Pasies to Volckert Janssen and Jan Tomassen," and "Complaint by Volckert Jansen and Jan Tomassen," May 15, 1664).

214 Gehring & Venema (2009, "Conveyance of Schutters Island by Volckert Jansz to Barent Pietersz," April 16, 1672); Huey (1997).

215 Grant (1903); van Laer (1927); van Laer (1928, June 6, 1676).

216 Gehring (1977, "Conditions under which Peter Alrichs will lease Matiniconck Island").

1703 Governor Nicolls granted Alrichs that and another island for an annual quitrent of four otter skins (Gehring, 1977, February 28, 1703).

Islands were still sought for farming in the mid-eighteenth century. In 1702, for example, William Lawrence asked for a patent for a three-acre island near his farm on the Hellgate that was “overflowed and under water every spring tyde.”²¹⁷ In 1741 John Schuyler requested and was granted a patent for the 11-acre Mase Island above Albany for the purpose of cultivation and improvement.²¹⁸ Thomas Lamb requested Magdalen and Shipsteen islands in the Hudson River in 1745, as well as the “sholes and swamps thereunto belonging,” but no improvement seems to have occurred because they still belonged to the Crown five years later.²¹⁹ North of Albany in 1749 Peter Kalm observed several islands, the larger of which “were cultivated and turned into grain fields and meadows” (Benson, 1937, pg. 350).

Types and Sources of Animals

Animals were raised on New Netherland farms along with crops like tobacco, vegetables, wheat, and other grains. The animals owned by Dutch colonists were the same as the English and included pigs, horses, cattle, goats, oxen, sheep and dogs (Williams, 1995). Oxen were used by some Dutch settlers in the mid-1600s but despite being less strong and more prone to breaking their harnesses horses were more popular.²²⁰ Horses were plentiful enough in 1653 that Director Stuyvesant requested a horse veterinarian; WIC could not locate one but sent medicines.²²¹ In

217 ALG (Vol. III, “Petition of William Lawrence, praying a patent for a small island, near to his abode on the Island Nassau, at the mouth of Little Hellgate, between Great and little Barren Islands, containing about 3 acres,” December 10, 1702).

218 ALG (Vol. XIII, “Petition of John Schuyler, praying a patent for a tract of land lying about 17 miles above the city of Albany, known by the name of Mase Island, containing about 11 acres,” October 6, 1741 and “Warrant for a patent to John Schuyler, confirming unto him a certain island in Hudson’s river, commonly called Mase island, containing about 11 acres, situate about 17 miles above Albany,” October 11, 1741).

219 ALG (Vol. XIV, entry 4, March 29, 1745 and entry 79, September 14, 1750).

220 Coventry (1978); *Genesee Farmer*, 5, 214-215; Goedhuys et al. (2008); O’Callaghan (1856a, “Information respecting land in New Netherland,” March 4, 1650).

221 Gehring (2000, “Letter from the directors in Amsterdam to Director Stuyvesant,” June 6, 1653); Gehring (2003, “Letter from the directors to the Director General and Council,” December 19, 1656).

1655 Adriaen van der Donck described some horses as coming from the Dutch Republic but otherwise they were English—English horses were smaller and not as suitable for farming but were good for riding, cheaper, and more available.

In the mid-1600s goats were common in New Netherland (including on the Delaware) because they were cheap, had high milk yields, bred quickly, and were hardier than sheep (Goedhuys et al., 2008). The numbers owned by any one person often exceeded 30.²²² There were more sheep in New England than New Netherland because weaving was promoted and the animals were not exported.²²³ The *Heeren XIX* was surprised to hear that there were so few sheep in the colony in the early 1650s but assumed it was due to a lack of guidelines on how to raise and slaughter them.²²⁴ In 1657 Director and Commander General of the Delaware Colony complained that their oxen were small and weak, only two cows were giving milk, and that their few pigs were “wild” (Gehring, 1981, May 8, 1657). The cattle at Fort Christina (then called Fort Altena, what is now Wilmington, Delaware) were also unsupervised because of low population and inadequate facilities (Gehring, 1981, 1657).

In 1655 the cattle in New Netherland were primarily of “the Holland breed”, though smaller because their hay was not as nutritious and heifers were bred sooner. Furthermore, they tended to become ill by “feeding on sweet pastures or sweet hay” (*verse gronden* and *verse hop*, meaning fresh pasture and hay)—this could be prevented, however, by feeding salty or brackish water and/or salt hay (Goedhuys et al., 2008, pg. 44). There were also some English cattle purchased from New Englanders, which van der Donck believed were cheaper and better able to stay outdoors through the winter although they did not grow very large or give as much milk (it did, however, have a higher fat-content). Peter Kalm noticed that although all the cattle in New

222 van Laer et al. (1974a, “Return of property belonging to Wouter van Twiller,” March 22, 1639 and “Receipt from Cornelis Dirksen Hooglandt to Wouter van Twiller for a number of goats,” July 24, 1638); van Laer et al. (1974c, “Contract of sale from Harry Breser to Cornelis de Potter of land and cattle on Long Island on the East River,” August 29, 1651).

223 Goedhuys et al. (2008); O’Callaghan (1856a, “Information respecting land in New Netherland,” March 4, 1650).

224 Gehring (2000, “Letter from the directors in Amsterdam to Petrus Stuyvesant,” April 4, 1652, p.153-154).

York and Québec were from Europe they “degenerate here and gradually become smaller” because of malnutrition (Benson, 1937, pg. 55). A 1681 mortgage on livestock described some heifers of Cornelis Teunissen van Vechten as “black with white heads, one black spotted, two red with white heads and one wholly red”—the editor’s note indicated the original text used the term *swarte blare*, which probably indicated *zwartblaar* or *zwartwitkop*, a breed from Groningen.²²⁵

Although many of the animals in New Netherland came directly from Europe, others came from New England, Virginia, and WIC’s Caribbean holdings on Curaçao, Bonaire, and Aruba. New England was a chief supplier of cattle because they had a greater number at lower prices than New Netherland.²²⁶ In 1653 WIC forbade trade with New England so “no more meat or bacon can be drawn from the north, but the following year this was protested because of the harm it would cause New Netherland on account of it procuring much of it’s stock from there because it was more cheaply had than at home.”²²⁷ In 1659 the *Heeren XIX* generally stated that “European goods reach New Netherland through New England and Virginia” (O’Callaghan, 1865, December 2, 1659). Over a century later this was also the case in the Mohawk Valley where many of the necessary products had been purchased from New England.²²⁸

Horses were imported from Curaçao and Aruba from the 1640s through the 1660s following a slow start at production because of snakebites and lack of water.²²⁹ Furthermore, even when horses on Curaçao and Aruba were “multiplying daily in great abundance,” the prices set for WIC horses exported from Curaçao were high enough to decrease demand. A decision was ultimately made to drop the price and allow interested parties to pick up horses themselves, rather than wait for delivery.²³⁰ Curaçao recognized that New Netherland needed horses for

225 Pearson & van Laer (1916, “Bond and mortgage of Cornelis Teunissen van Vechten to Andries Teller,” October 31, 1681, pg. 144).

226 Gehring (2003, “Letter from the directors in Amsterdam to Director General and Council,” November 23, 1654, 41); O’Callaghan (1856a, “Information respecting land in New Netherland,” March 4, 1650).

227 Gehring (2000, “Letter from the directors at Amsterdam to Petrus Stuyvesant and the council of New Netherland,” November 4, 1653, pg. 230).

228 O’Callaghan (1851, “Sir. Wm. Johnson to the Society for the Promotion of the Arts,” February 27, 1765).

229 Gehring & Schiltkamp (1987, June 8, 1655 and January 5, 1660).

230 Gehring & Schiltkamp (1987, March 11, 1658, pg. 117).

farming and generally traded them for provisions like grain, though in 1655 WIC thought it should begin trading horses for slaves in order to promote farming on the island itself.²³¹ Virginia and New England also bought horses from Curaçao, because in 1646 the *Heeren XIX* instructed the New Netherland Council to disallow that practice.²³² Isaack Allerton, however, was permitted to sell Curaçao or Aruba horses in Virginia in 1647 and 1655.

In 1652 WIC directors told Director Stuyvesant that the horses being exported from their West Indies holdings in such large numbers that they feared there would be nothing left “but a bunch of broken down animals,” so they forbade further export.²³³ Trade did not fully resume between Curaçao and New Netherland until 1657.²³⁴ An idea was even presented by WIC to open the islands to colonization by individual proprietors who might export wood, salt, and horses (and, of course, pay duties).²³⁵ WIC did permit Juan Dillian to form a colony on Curaçao, but instead of turning a profit, he exported dyewood and took horses from Aruba and Bonaire to sell on other islands.²³⁶

A seemingly large portion of New Netherland’s meat was obtained from New England, whose economy was described in 1680 as relying chiefly on fishing and animal husbandry for export (Murphy, 1867). In October 1647, for example, Stephen Goodyear of New Haven (Connecticut) wrote to Director Stuyvesant instructing him to retrieve his beef and pork that was to be paid for in West Indies salt.²³⁷ In 1652 Goodyear again acknowledged Director Stuyvesant’s request for pork and beef, this time with bread, malt, wheat, and peas to be paid for

231 Gehring & Schiltkamp (1987, June 8, 1655); van Laer et al. (1974a, “Invoice of the cargo shipped on board the ship Neptune for Curaçao,” November 28, 1640); Snow et al. (1996).

232 Gehring (2000, “Letter from the directors at Amsterdam to the council of New Netherland,” 1646).

233 Gehring (2000, “Letter from the directors at Amsterdam to Director Stuyvesant,” December 13, 1652, pg. 188).

234 Gehring (1995, “Clearance for Isaack Allerton to send a ship to Curaçao,” December 6, 1655); Gehring (2003, “Letter from the directors at Amsterdam to Petrus Stuyvesant,” September 15, 1657); O’Callaghan (1865, December 6, 1655); van Laer et al. (1974b, “Power of attorney from Willem de Key and Jan Claessen Smal to Isaack Allerton to sell in Virginia a shipment of horses from Curaçao,” June 5, 1647).

235 Gehring (2000, “Provisional plan for the colonization of New Netherland and Caribbean possessions”).

236 Gehring (2000, “Letter from the directors in Amsterdam to Director Stuyvesant,” June 6, 1653).

237 Gehring (2000, “Letter from deputy governor Goodyear of New Haven to Stuyvesant,” October 1647 and “Letter from deputy governor Goodyear to Petrus Stuyvesant,” November 22, 1647, pg. 24, and “Letter from the directors at Amsterdam to Petrus Stuyvesant,” January 27, 1649).

in beavers.²³⁸ New England continued to supply New Netherland with livestock over the next decade and at least two attempts were made to establish English trading posts within Dutch territory; in 1659 and 1662 two English envoys traveled from Hartford to Fort Orange to explain how they wanted to “supply the place with cattle” and set up a village east of Wappingers Kill in order to access the Hudson River. Their request was denied because WIC suspected they simply wanted to access the western fur trade (Gehring, 1990, July 25, 1659). In 1769 Richard Smith observed that Schenectady was “supplied altogether with Beef and Pork from New England” and some settlements in the upper Hudson Valley and along the Mohawk River were importing meat from New England well into the eighteenth century (Anderson, 2004; Donahue, 2004; Halsey, 1906, pg. 22). Although Virginia’s farmers were primarily subsistence and food was not in great supply, cattle were exported to New Netherland.²³⁹

The Dutch colony on the Delaware was also supplied with Virginia and New England livestock, though New Netherland was obligated to provide some to New Amstel and during the late-1650s and early 1660s the Delaware director repeatedly asked Director Stuyvesant for food, supplies, and livestock.²⁴⁰ The ability of the Dutch to supply their compatriots on the Delaware may have stemmed from their greater financial ability to procure supplies from elsewhere, but on at least one occasion Director Stuyvesant was able to procure oxen “at the great flats before Heemstede” that were driven overland to New Amstel.²⁴¹ New Netherland also sent horses to Virginia in 1655 and Canada in 1700.²⁴²

238 Gehring (2000, “Letter from Stephen Goodyear to Directors Stuyvesant,” July 19, 1652).

239 Murphy (1835); van Laer et al. (1974a, “Agreement of Tymen Jansen to accept cattle at the price paid in Virginia,” March 31, 1642).

240 Fernow (1877, “Jacob Alrichs to Director Stuyvesant: cattle purchased on the Great Plains at Hempstead for the city’s colony on the Delaware,” June 26, 1658); Gehring (1981, October 29, 1657, November 14, 1657, August 1658, and May 14, 1659); Murphy (1867).

241 Gehring (1981, May 17, 1658, June 26, 1658, and August 5, 1658); Fernow (1877, “Jacob Alrichs to Director Stuyvesant: cattle purchased on the Great Plains at Hempstead for the city’s colony on the Delaware,” June 26, 1658); Naylor (1994).

242 O’Callaghan (1866, March 14, 1700 and June 28, 1675); O’Callaghan (1865, May 25, 1662).

Ownership

Independent ownership of animals was common but much of New Netherland's livestock was rented "on shares" or "half the increase," where animals were leased in order to distribute risk and reduce expenses for both parties. The lessee would retain half the number of offspring at the end of a predetermined period and give the other half to the original owner; this arrangement may continue for several years but other agreements also ended with return of the original animals. Some contracts also included sharing of milk or butter while others required additional payment in the form of grain. Many specified which party was financially responsible in the event of animal death or injury. Leasing on halves was strictly enforced even when the owner requested the return of the animals; in 1661, for example, two cows were leased to Roelooft Swartwout on halves from Evert Prys and he was allowed to keep them until the end of the three-year contract even though Prys demanded their return.²⁴³ Other agreements were more flexible, as was the case between Jan Jacobsen and Hendrick Harmensen. In 1638 Jacobsen lent Harmensen cows on half the increase for six years, but the following year Jacobsen took three of those cows and gave them to Gysbert Rycken on a similar contract.²⁴⁴ A few months later Harmensen obtained a four-year lease for two cows on halves from Director Kieft plus 40 pounds of butter and milk every week.²⁴⁵ That same day, Aert Teunissen purchased a quarter interest in Jacobsen's cattle still the possession of Harmensen and a few months later purchased Jacobsen's entire interest.²⁴⁶

In 1650 Secretary van Tienhoven explained that WIC settled its first farmers by paying passage and providing a farm for six years along with a house, barn, tools, four horses, four cows, sheep, and pigs—aside from rent, the original number of animals plus half the increase in

243 Versteeg et al. (1976a, "First session," November 16, 1661).

244 van Laer et al. (1974a, "Contract of Jan Jacobsen from Vreeland to let Harmensen have six cows on halves," September 25, 1638 and "Contract between Gysbert Rycken and Jan Jacobsen from Vreeland respecting the use of a farm and the cattle thereon," March 31, 1639).

245 van Laer et al. (1974a, "Lease of cattle from Director Kieft to Hendrick Harmensen," June 18, 1639).

246 van Laer et al. (1974a, "Purchase by Aert Teunissen of Jan Jacobsen's claim to two cows in the possession of Hendrick Harmensen," June 18, 1639 and "Sale from Jan Jacobsen to Aert Teunissen of his interest in certain cows in the possession of Hendrick Harmensen," October 17, 1639).

offspring were to be returned to WIC at the end of the lease period for redistribution.²⁴⁷ In 1640 Claes Jansen leased three WIC horses that had just been brought the year before from the Dutch Republic and paid half the increase and 15 schepels of wheat per horse per year for six years.²⁴⁸ Kiliaen van Rensselaer also arranged for animals to be supplied on halves to farmers in Rensselaerswijck to compensate him for the pasture and hay they consumed.²⁴⁹

In 1649 Cornelis Melyn allowed two of his tenants on Staten Island to lease cows and goats on halves plus 20 pounds of butter per year per cow.²⁵⁰ In 1671, Thomas Chambers leased his Esopus farm *Wisquaemsickx* to Hendrick Albertsen and Adriaen Fransen, including livestock, which were leased on halves and the original number returned to Chambers in the end (Versteeg et al., 1976b, October 7, 1671). That same year Anna Brodheads leased her 20-morgen farm, implements, and livestock to Pieter Hillebratsen with the animals to be leased on halves and divided every three years; the agreement apparently fell through because the following year she made the same agreement with Adriaen Gerritsen, who was also to house and feed both his and her animals in her barn during the winter (Versteeg et al., 1976b, November 28, 1671 and August 19, 1672).

Leasing on halves also occurred in the Delaware settlements. In 1658, for example, the director there explained to the colony's proprietor (the City of Amsterdam) that some animals purchased from Virginia were leased on halves because none of the colonists wanted to assume the full risk with winter coming, lacking sufficient fodder, the risk of Indians killing them in the forest, and others becoming lost because they were "accustomed, for the most part, to run wild and hard to be managed."²⁵¹ In 1676 and 1677, Thomas Crompton made two separate lease agreements on the Delaware that included the lessor providing hogs, cows, or shoats on half the

247 O'Callaghan (1856a, "Information respecting land in New Netherland," March 4, 1650).

248 van Laer et al. (1974a, "Lease by Claes Jansen of three horses belonging to the Company," April 16, 1640).

249 van Laer (1908, "Redress of the abuses and faults in the colony of Rensselaerswijck," September 5, 1643).

250 van Laer et al. (1974c, "Lease of cattle from Jacob Loper, agent of Cornelis Melyn, to Hendrick Jansen from Utrecht," September 6, 1649 and "Lease of cattle from Jacob Loper, agent of Cornelis Melyn, to Jan Jansen from Langendyck.").

251 O'Callaghan (1858a, "Vice-Director Alrichs to the Commissioners of the Colonie on the Delaware River," October 10, 1658, pg. 54).

increase.²⁵² In both cases, half the offspring and the original animals were to be returned to Crompton at the end of the lease—in one case, half the pigs were to be slaughtered every two years (and the meat likely divided). Similarly, in 1679 another lease agreement between two men on the Delaware included the condition that no hogs were to be killed without mutual consent but that every two years their number would be divided between them.²⁵³

In order to aid the poor, the Dutch Reformed Church also leased animals on halves. In 1662 four cows were leased by the deacons of the Dutch Reformed Church of *Bruekelen*, where members of the parish assumed half the responsibility for their death while paying a certain amount of butter per year and returning half the offspring to the Church to “become the share of the poor.” One of the cows did not produce much milk and the decision was made to “fatten the aforesaid cow in the woods and sell it in the fall,” likely for slaughter (Van der Linde 1983, pg. 69, 209).

Stabling

In 1655 Adriaen van der Donck remarked that coastal farmers could keep animals outside year-round, at least during the day, but in winter they were stabled until March in more northern areas and in the highlands (Goeduyts et al., 2008). William Beeckman told Director Stuyvesant in 1662 that even the cows at New Amstel on the Delaware were “stabled during the cold months” (Gehring, 1981, November 27, 1662, pg. 313). In 1749, however, Peter Kalm said that around Philadelphia cattle were merely sheltered in winter under hay barracks and elsewhere they were outside year-round. He also noted that Albany cattle were stabled and fed hay from mid-November until March or April. He attributed the degeneration of cattle in the New World to “the

252 Gehring (1977, “Agreement between John Stevens and Thomas Crompton with affidavits relating thereto,” February 1676/1677 and “Articles of agreement made concluded and agreed upon betweenne Thomas Crumpton of the one party of Dorchester County planter and John Richardson of the other party of the same countey and province afore said planter this 18th day of August 1676”).

253 Gehring (1977, “Articles of agreemente made between John Steevens of the one party and Sammuell Stiles of the other party,” February 4, 1679).

cold winters, during which they are obliged to put their cattle into stables and give them but little food” (Benson, 1937, pg. 477). There are many instances of people taking in animals during the winter for a stabling fee or in exchange for another service.²⁵⁴

Early barns in New Netherland were often built as a combination house-barn with the dwelling section in front and a stable in the rear, a design traced by Cohen (1992) to the grain-producing eastern region of the Dutch Republic. In 1669 or 1670 a contract was made at Wiltwijck for a 60'×30' barn with a wood floor and “wolf’s roof” on both ends (four-foot overhanging gables).²⁵⁵ In 1642 Juriaen Hendrickson was contracted to build Director Kieft’s house-barn at the *Otterspoor* on northern Manhattan: 100'×50' with two side aisles, a chimney at each end, cellar, and attic.²⁵⁶ That year another house-barn was contracted for at the colony of *Achter Col*: 90'×24' with two side aisles, a truncated and hipped rear gable, and an attic.²⁵⁷ In 1648 Jan Damen contracted to have a house-barn built 60' long with 24' side-aisles, a bed in the front room, truncated rear gable, cellar, and attic.²⁵⁸ Attics were used to store grains like wheat, rye, and oats, as well as malt.²⁵⁹ In other cases they were used as sleeping quarters or for spinning and weaving.

The more common “new world Dutch Barn,” still standing in many areas, was designed later and built until the turn of the nineteenth century. These barns were approximately square, had eave-less roofs terminating at low side walls, an internal frame dividing the space into three aisles, and wide wagon entrances on the gable ends (Figure 2-8; Cohen, 1992; Fitchen, 2001). In contrast, English-style barns in North America are typically rectangular, tall with exterior

254 Versteeg et al. (1976a, “Ordinary session,” February 19/March 1, 1667); Versteeg et al. (1976b, “Ordinary session,” September 10, 1666, January 11, 1669/70, and August 19, 1672).

255 Houses also sometimes had a “wolf’s roof” (Versteeg et al., 1976b, August 21, 1673).

256 van Laer et al. (1974b, December 6, 1642, “Contract of Juriaen Hendricksen to build a house for Director Kieft at the Otterspoor”).

257 van Laer et al. (1974b, “Contract between Johannes Winckelman and Pieter Cornelissen and Abraham Clock for the erection of a farmhouse at Achter Col,” February 21, 1642).

258 van Laer et al. (1974c, “Contract of Juriaen Hendricksen to build a farmhouse for Jan Damen,” October 2, 1648).

259 van Laer et al. (1974c, “Inventory of the personal estate of Jan Jansen Damen,” July 6, 1651).

framing, and with openings on the long ends. Cohen (1992) believed this style of Dutch barn originated in the eastern provinces of the Dutch Republic.



Figure 2-8. The Frederick Ullman barn of Cherry Valley, New York (photo by C. Teale).

Livestock were often able to seek shelter underneath four- to eight-posted structures variably called a barrack, *schuerberch*, *schuer*, stack, rick, *hooiberg*, or *bergh*.²⁶⁰ These tall, open-walled structures had a movable roof supported by four, five, or six poles and a bottom platform some distance off the ground; some may have had enclosed space below (Figure 2-9).

²⁶⁰ Fernow (1883, "Inventory of the effects and goods at Achtervelt belonging to Andries Hudde and Wolphert Gerritsen," July 9, 1638); Gehring & Venema (2009, "Conditions for the auction of Pieter Bronck's log house, lot, and barrack barn," August 2, 1662, "Sale of half island by the administrators of the estate of Andries Herbertsen to Jeremias van Rensselaer," November 16, 1662, "Sale of a farm by Marten Cornelisz to Claes Fredericxsz and Cornelis Cornelisz Vielen," October 23, 1668, "Conveyance of a house, lot, barn, garden, and fruit trees by Frans Jansz Pruijn for Aque Cornelisz to Jan Labatie," January 7, 1668/9, "Conveyance of a house, barn, hay barrack, and buildings at Greenen Bosch by Jan Timmel to Theunis Dirricx," March 30, 1670, "Conveyance of a barn, hay barrack, garden, and some land at Schaenhechtede by Pieter Adriaensen to Helmer Otten," August 13, 1670, and "Conveyance of a cellar dwelling, hay barrack barn, and lot by Bastiaen de Winter to Jorisz Arisz, November 22, 1670); Versteeg et al. (1976b, September 27, 1644; October 24, 1644, December 19, 1675); van Laer et al. (1974b, "Lease from Johannes la Montagne to Bout Frances on the farm Vredendaal," June 14, 1643 and "Lease from Arent van Curler to Thomas Spicer of the farm of the late Jonas Bronck," June 25, 1643).

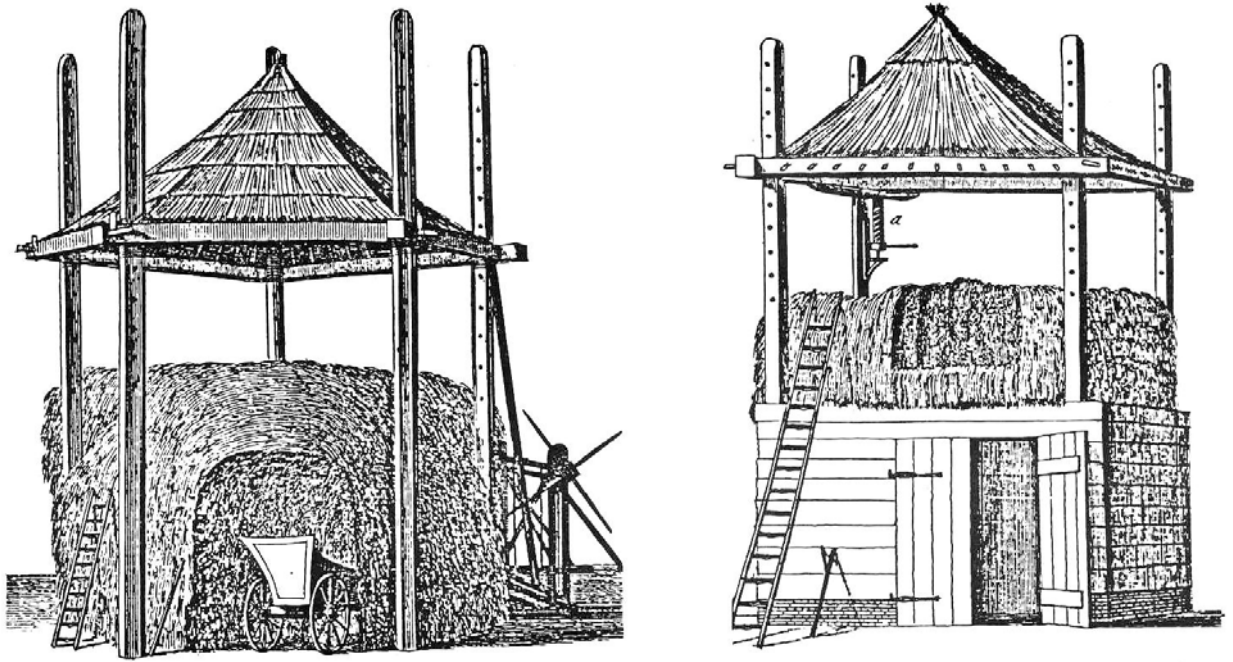


Figure 2-9. Barracks ca. 1810 (Blackburn & Dunn [1989], original publication in *Natuurlyke Historie van Holland* by J. Le Francq van Berkey in the Library of Congress).

Barracks were used to store hay and unthreshed grains. In Rensselaerswijck the patroon provided settlers with barracks to store fodder and together with barns were primarily located next to the river. After 1643, however, van Rensselaer issued instructions for barracks to be built where several farms were near each other and for crops to be combined therein.²⁶¹ In the 1630s Rensselaerswijck farms had 50'-tall four- and five-pole barracks.²⁶² In 1638 Andries Hudde and Wolphert Gerritsen owned both a 40'×18' barn and 40'-tall, five-post *bergh* on their Long Island plantation, *Achtervelt* (Figure 2-7, however, shows two barracks).²⁶³ A 1641 lease between Director Kieft and Hendrick Pietersen included a 50'×20' barn and four-post barrack to be built at WIC's expense.²⁶⁴ Surveyor General Cadwallader Colden had a barrack on his farm just west of

261 van Laer (1908, "Redress of the abuses and faults in the colony of Rensselaerswijck," February 12, 1642 and September 5, 1643).

262 Dunn (2002a); van Laer (1908, "Account of the jurisdictions, management and condition of the territories named Rensselaerswijck," July 20, 1634).

263 Fernow (1883, "Inventory of the effects and goods at Achtervelt belonging to Andries Hudde and Wolphert Gerritsen," July 9, 1638); van Laer et al. (1974a, "Inventory of the farm called Achtervelt," July 29, 1638).

264 van Laer et al. (1974a, "Lease from Director Kieft to Hendrick Pietersen of a piece of maize land on Manhattan Island," October 21, 1641).

Newburgh (now Orange County) that was used to store wheat in the 1730s and seems to have been of five poles (Haley, 1984). Figure 2-10 shows how Martin van Bergen's contemporaneous farm in Greene County may have looked, including two five-pole barracks.²⁶⁵



Figure 2-10. The van Bergen Overmantel, by John Heaton ca. 1728-1738. Note also the characteristic Dutch wagon, pantiled roof, and presence of Africans and Native Americans.

Barracks are unique to farms in continental Europe. The typically five-poled structures found in New Netherland were most similar to those of the provinces of Holland and Utrecht and in colonial America were indicative of Dutch and German farms in New York, New Jersey, and Pennsylvania (Benson, 1937; Blackburn & Dunn, 1989; Cohen, 1992). Kalm noticed these “haystacks with movable roofs” near Albany in 1749; in contrast, he described that the Swedes near Philadelphia stacked hay in thick, short cones and in Québec he noted “They have haystacks near most of their meadows, and on the wet ones they make use of conic haystacks” (Benson, 1937, pg. 332, 459). They were actively constructed in some portions of New York and New Jersey after the turn of the eighteenth century and are still in use in parts of the Dutch Republic (Blackburn & Dunn, 1989; Cohen, 1992). Barracks built at Kinderhook in the 1760s were still being used to store grain two decades later and at least one of three barracks on a Dutch farm in Cossackie contained wheat in 1787. In 1788 Alexander Coventry constructed his own barrack of pine and thatched with straw; before its construction he would leave hay stacked in the fields that were often damaged by roaming livestock (Coventry, 1978). An 1868 Albany publication

²⁶⁵ Cohen (1992); Blackburn & Dunn (1989); Gehring (1990, December 22, 1654); van Laer (1908, “Inventory of stock on farm No. 3, island of Manhattan,” January 1, 1632); Pohl (2002); van Laer (1926, October 27, 1670); van Laer et al. (1974c, “Inventory of the personal estate of Jan Jansen Damen,” July 6, 1651).

provided instruction on the “Construction of Hay Barracks” that were four-poled and roofed with thatch, shingles, or tin (Wheeler, 2005).

Conclusion

Agriculturally, the role of wetlands in Europe, New France, and New England was as provision of livestock fodder. New Netherland may not have emphasized agriculture or livestock husbandry to the extent of other colonies but farming and livestock were indispensable component of the economy and was advanced to some degree following the 1639 Charter of Freedoms and Exemptions. One of the patroons that took advantage of that charter, Kiliaen van Rensselaer, was an avid improver in the Dutch Republic and attempted to guide Rensselaerswijck in a progressive direction. Despite the small population of New Netherland and continued emphasis on trade, the acquisition and propagation of livestock were important in his patroonship. With that in mind, Chapter 3 aims to assess the role of wetlands in the colony’s agricultural pursuits.

Chapter 3

Hay and Pasture

Northeastern farmers, including those in New Netherland, were obliged to collect and store fodder for times when outdoor pasturing was impossible, a need that separated them from more southerly colonies. Fodder was differentiated between grains and chopped , the former being grains or chopped vegetation and the latter herbaceous vegetation. In 1658, for example, Jacob Jansen and Thomas Chambers could not provide oats for Director Stuyvesant’s horses but

agreed to supply them with “long fodder” over the winter.²⁶⁶ Two years later funds were needed to purchase “corn and long fodder or at least short fodder” for horses stabled in the Esopus.²⁶⁷ “Hay and other Long Feed” was also referenced in 1702 when a law was reissued in Albany against the keeping of fodder in houses because it was a fire hazard (Munsell, 1853, pg. 168). Some anecdotes indicate that vegetables were fed to livestock but evidence is scant.²⁶⁸

Short Fodder

Corn was used to fatten cattle and hogs in New England and New Netherland, as well as cornstalks and leaves that were cut and cured for winter fodder (Russell 1976). In 1650 Secretary van Tienhoven said both men and cattle were fed corn and beans.²⁶⁹ In 1679 two visitors to Maryland explained that livestock generally ran at large in the forests, except in winter when they were fed corn in the morning and evening (Murphy, 1867, pg. 217). In 1790 Alexander Coventry described a wealthy Dutch farmer near the Connecticut border as keeping his cattle “altogether on straw but allows each head 6 ears of Indian corn a day and this he gives at three different times.” Two years later, Coventry obtained some “stalks” for his horses and also fed them corn.²⁷⁰

Oats were the primary livestock feed in New England except in Scottish areas where it was also eaten by people (Russell, 1976). Farmers in Québec and on the Delaware also fed oats to their livestock; the French also fed barley (Benson, 1937; Gehring 1981, November 14, 1657). Oats were commonly fed to horses in New Netherland as well. In September 1658 Andries Louwerensen reported that although the oat crop was destroyed by worms that year in the Esopus

266 Fernow (1881, “Letter from Sergeant Andries Louwrens at Esopus to Director Stuyvesant: the bridge swept away; failure of the oats crop; Stuyvesant’s farm,” September 28, 1658).

267 Fernow (1881, “Answer o the Honorable Nicasius de Sille to the propositions of the Right Honble Director-General, written by himself,” February 12, 1660, pg. 139).

268 For example, cattle were fed “vegetables and a little fat, which is indispensably necessary for cattle in this country” (Munsell, 1850, Description of Albany, and its Manners 1764).

269 O’Callaghan (1856a, “Information respecting land in New Netherland,” March 4, 1650, pg. 366).

270 Coventry (1798, April 18, 1790, 471 and November 10, 1792).

the residents were still able to provide dry fodder to any horses Director Stuyvesant wanted them to overwinter.²⁷¹ Two years later Stuyvesant proposed that they protect their own horses from Indian attacks by establishing a stable with fodder and 25 schepels of oats per animal over the winter.²⁷² Nicasius de Sille concurred, adding that fodder should be either provided by WIC or “the country,” perhaps collected as far away as the “public meadows” on Long Island.²⁷³

Peas and oats were fed to animals on the Rensselaerswijck farm at Greenbush in the 1640s and oats generally in the vicinity for the next century and a half.²⁷⁴ In 1646 Father Isaac Jogues observed that settlers in Rensselaerswijck planted corn and oats “for their beer, and for the horses, of which they have a great many” (Snow et al., 1996, pg. 3). Ruttenber and Clark (1881) reported that in Orange County “coarse grains” were fed to cattle and hogs in the first half of the eighteenth century. Interestingly, Coventry also observed that a common practice among Dutch farmers near Claverack was to feed their horses wheat and rye even when their owners were eating only buttermilk and bran (Coventry 1978, August 21, 1786). Other brief anecdotes regarding livestock feeding include Kiliaen van Rensselaer’s 1632 instruction that his hogs’ diet be supplemented with “some meal in their drinking water” and any extra buttermilk could be given to the pigs.²⁷⁵ It must be noted, however, that because van Rensselaer never set foot in his colony it is unlikely that his instructions were always carried out. New England farmers fed some cattle “dried weeds, and leaves of trees” but Peter Kalm was surprised to see that deciduous tree leaves were not fed to cattle in Québec (Benson, 1937; Deane, 1822, pg. 149).

271 Gehring (2003, “Letter from Sergeant Andries Louwerensen to Petrus Stuyvesant,” September 28, 1658).

272 Fernow (1881, “Proposals of Director Stuyvesant respecting the measures to be adopted against the hostile Indians at the Esopus and answer of the Council to them,” February 9, 1660).

273 Fernow (1881, “Answer o the Honorable Nicasius de Sille to the propositions of the Right Honble Director-General, written by himself,” February 12, 1660, pg. 139).

274 Coventry (1978, November 6, 1790 and December 26, 1790); Dunn (2002a); van Laer (1922).

275 van Laer (1908, “List of animals in the colony of Rensselaerswijck,” June 27, 1632, 200 and July 20, 1632).

Long Fodder

Oat straw was called the “best fodder” for the winter in 1648 when Cornelis van Es of Rensselaerswijck was cited for threshing it “out of spite” and putting it on the manure pile of his rented farm “to the detriment of the next lessee and the patroon’s horses and cattle.” He was fined 25 guilders and ordered to compensate the patroon for the loss of the straw (van Laer, 1922, pg. 45). Wheat straw was fed to livestock but not the grain itself—doing so was a serious offense, as in 1667 when Thomas Quick was accused of feeding threshed wheat to someone’s horses on purpose “to cause trouble.”²⁷⁶ Rye straw was also fed to cattle, at least in the vicinity of New Castle on the Delaware in 1658 (Gehring 1981, March 18, 1658). In 1684 Jaques Vigoir contracted with Jan Cloet for 16 schepels of wheat plus six loads of straw “suitable for feeding cattle.”²⁷⁷ The wife of Reynier van der Coelen asked permission to thresh her grain in December 1671 in order to obtain the straw, because “the animals cannot live without fodder.” The straw may have been from wheat because the previous November her husband contracted with Aert Martensen Doorn to provide chaff, straw, and grain in exchange for the carting and storing of his wheat.²⁷⁸ Alexander Coventry noted that the Dutch still fed their milch cows wheat straw during the winter in the 1780s but in the spring of 1787 remarked that some oxen fed only on straw during the winter were “very poor” (Coventry, 1978, April 5, 1787). References to straw did not always include the type of grain, however, and in 1666 Director Stuyvesant leased one of his Esopus properties with the understanding that his tenant would “provide the horses and cattle with husks and straw up to the time that they can pasture outside” (Versteeg et al., 1976b, April 26, 1666).

276 Versteeg et al. (1976a, “Ordinary session,” December 3/13, 1667, pg. 380).

277 van Laer (1932a, November 17, 1684, pg. 487-488).

278 Versteeg et al. (1976b, November 5, 1670 and December 17, 1671, “Ordinary session”).

Wetland Hay

Despite the prevalence of straw, the most common “long fodder” was herbaceous wetland vegetation. References to hay-mowing sometimes typically described the crop as “grass” and provide no indication of the harvest location. In 1664, for example, Daniel Tourneur “cut grass” on *Baren* (Barren, Barent’s, Wards, Big Barn) Island in the East River, which was large enough to contain both wetlands and upland forests.²⁷⁹ Later that decade William Willett “caused some grasse to be mowed for his winter provision of Hay.”²⁸⁰ On occasion, however, the location was specified as a wetland and in other cases it is clear that the grass originated in a meadow. For example, in May 1661 representatives of Boswijck approached the Council to say they were in need of additional meadows, without which they didn’t know “where they could mow grass for hay.”²⁸¹ June 1669 a man from Fordham was forbidden to cut the “grasse upon the Meadow ground or Valley” within the bounds of Harlem and in July 1670 Jacques Guyon asked permission to “mowe some Grasse in the meadows neare him... for winter provision of Hay for his Cattle.”²⁸² George Wood and his neighbor were known to “mowe the swarth together” in a “boggy meadow” in Newtown or Gravesend.²⁸³

Lease agreements provide a window into the use of wetlands because they often specified privileges and limitations to land-use. A 1640s lease for land on the Mespath Kill, Long Island between Domine Everardus Bogardus and two men specified that “the valley (*valey*) shall be reserved to the domine, who shall mow thereon where he pleases, and the hay which the lessor does not need shall belong to the lessees.”²⁸⁴ In 1651 Evert Pels also leased land previously

279 Fernow (1976e, September 13/23, 1664, pg. 117).

280 Christoph & Christoph (1980, “An order for Wm. Willett to carry away hay at Cornells Neck,” September 8, 1668); Paltsits (1910a, September 8, 1668); Welikia (2013).

281 Fernow (1883, May 17, 1661, pg. 499-500).

282 Christoph & Christoph (1980, “An order forbidding the further proceedings of John Archer to cutt grasse, on the meadow belonging to Harlem,” June 3, 1669, 272); Morris (1900); Paltsits (1910a, “Estienne Gaigneau vs. Jacques Guyon, Attorney for Jean Collin, about land,” June 3, 1669 and July 4, 1670, pg. 494-495).

283 Christoph & Christoph (1989, “Proceedings of the court of sessions at Gravesent,” June 22, 1676, pg. 399).

284 van Laer et al. (1974b, “Lease of Domine’s hook from Rev. Everardus Bogardus to Robert Bello and Marck Menloff,” pg. 38).

belonging to Bogardus with “the use of the *valey* near Dominee’s hoeck, to cut hay.”²⁸⁵ WIC also leased some of its salt marsh just north of Corlaer’s Hook on Manhattan: in 1646 Gerrit Hendricksz was granted the 25-morgen Schout’s Farm along with “the use of the marsh as long as the Company permits” and in 1663 Leendert Aerden was granted the 39-morgen Blyvelt’s Bouwery with permission to “may mow the grass of the aforesaid marsh as the Company has no need of it.”²⁸⁶ Roelof Willemsen van Heerden leased a farm near Breuckelen that included a house, hayrick, garden, arable land, and woodland—although meadow was not part of the property, the lease included the right to “mow each year as much hay in the marsh (*valey*) near the farm as he needs for his cattle.”²⁸⁷

Other references derive from individual and village requests for ownership of wetlands, particularly as their need for fodder increased. In 1656 when Sara Joresy requested 20 morgens of land on *Wale bocht* (Wallabout Bay) along with sole use of its adjacent marsh she described the marsh as being used by neighbors for making hay despite their ownership of other marshland.²⁸⁸ In January 1661 the residents of Midwout said that they had been mowing a meadow near *Canarisse* on Jamaica Bay for years in order to “supply themselves with fodder for their cattle, which, praised be God, number now many heads.”²⁸⁹ Similarly, in June Breuckelen asked for more meadows on the *Waele Bocht* to supply their livestock “of which they have now, thanks be to God, a fair number.”²⁹⁰

Property disputes in the greater-Manhattan area also frequently mentioned the importance of wetlands in providing hay, including the long-term dispute over tidal marshes along the Harlem River and Spuyten Duyvil Creeks (detailed in Chapter 5). Adriaen van der Donck’s

285 van Laer et al. (1974c, “Lease from the agents of Anna Jans Bogardus to Evert Pels of a farm on the North River,” November 1, 1651).

286 Gehring (1980, “Patent to Gerrit Hendricksz,” December 6, 1646 and “Patent to Leendert Aerden,” July 17, 1663, pg. 35).

287 Pearson & Van Laer (1918, “Lease of a farm near Breuckelen, Long Island, from Frederick Lubbertsen to Roelof Willemsen van Heerden,” June 27, 1662, pg. 165).

288 The Council responded that she would be accommodated as everyone else. Fernow (1883, “Council Minutes,” April 4, 1656); Gehring (1995, “Petition of Sara Joresy for land on Long Island, n.d. and “Response to the foregoing petition”).

289 Fernow (1883, “Council Minute. Proceedings against Quakers at Jamaica, L.I. Land at Flatbush,” January 13, 1661, pg. 491).

290 Fernow (1883, “Council Minutes. Long Island land matters,” June 3, 1661, pg. 501).

desire to quickly move to his *Colendonck* estate and secure several morgens of marshland on the Spuyten Duyvel Creek was the result of wanting “an assurance for the aforesaid marshes, without which all of his and their hard-won and difficult work... because of lack of hay would be in vain, useless, and futile.”²⁹¹ His worry was not unfounded, because until the mid-1670s disputes continued over ownership of meadows in that area. In September 1668 Thomas Wandall complained to the constable of Westchester that he had leased a piece of meadow near *Spiting Divell* and mowed it “for his winter provision of hay” but was prevented from taking it away by George Tippet and Richard Betts because they also claimed the meadow.²⁹²

The following year Governor Lovelace again ordered Tippet and Betts to stop mowing because it seemed they were taking more than their share from the “meadow or valley” between them and their neighbor John Archer, whose tenants at Fordham would be made “destitute.”²⁹³ Following an August re-survey of the meadow the two men were ordered to stop disturbing Archer or anyone else at Fordham and not to cut grass there in the future; they were also ordered to return any hay they had cut and hauled away, but Archer was to pay them.²⁹⁴ The situation remained unresolved, however, because in August 1672 Betts was ordered to appear in front of the Court of Assizes after again mowing Archer’s Fordham meadow.²⁹⁵ Richard Betts also claimed the “ffreshest Boggy meadow” near Fordham and mowed it in August 1672; interestingly, other documents referred to this wetland as a swamp or “the swamp or Marish ground not esteemed meadowe.”²⁹⁶

291 Gehring (2000, “Petition of Adriaen van der Donck concerning land granted him at Saeghkil in 1645,” pg. 205).

292 Christoph & Christoph (1980, “A warrant for Georg Tippet and Richard Betts to deliver up Thomas Wandalls Hay,” September 3, 1668, 167); Paltsits (1910a, September 3, 1668).

293 Christoph & Christoph (1980, “Order forbidding the cutting of hay at Spiting Devill,” July 27, 1669); Paltsits (1910a, July 27, 1669, 211, and August 23, 1669).

294 Christoph & Christoph (1980, “An order forbidding the disturbance of Jno Archer in the enjoymnt of his land at Spiting Devill,” August 23, 1669); Paltsits (1910a, July 31, 1669).

295 Christoph & Christoph (1982, “A speciall warrant for hearing and tryall at the Generall Court of Assizes, in a difference depending between Jno. Archer, and Betts and Tippet,” August 23, 1672).

296 Christoph & Christoph (1982, “An order concerning the meadowe in dispute betweene John Archer of Fordham and William Betts and George Tippet,” July 7, 1670, “An order to retstrayne Betts and Tippet from doeing trespass upon the land belonging to John Archer of Fordham,” August 16, 1672, pg. 504); Paltsits (1910a, July 7, 1670, pg. 52, September 18, 1667, pg. 196, and September 24, 1671).

In September 1669 the source of John Archer's own newly cut hay was questioned, and six years later Johannes Vervelen's 1675 complaint to the Mayors Court originated with Archer having taken away four loads of hay to his "greate Impoverishment."²⁹⁷ Archer was also told in August 1677 told to stop cutting hay on a meadow also claimed by Harlem and in June he was again forbidden to cut the "grasse upon the Meadow ground or Valley" belonging to that village.²⁹⁸ At late as 1680 some Harlem residents also petitioned to stop Colonel Lewis Morris from mowing their meadows on Stone Island because they would also be made "Destitute" from lack of wintertime fodder.²⁹⁹ The Stone Island meadows had been hayed for several years and on September 2, 1666 Jan Teunissen and Philip Presto were arrested for bringing a canoe of hay from there to Harlem on the Sabbath (Riker, 1904).

Another dispute, along the *Nesauake* (Nissequogue) River of Long Island, took place in the early 1670s after several farmers were permitted to settle on Richard Smith's land that likely contained emergent estuarine intertidal wetlands as well as mudflats (NWI, 2013). In 1675 the farmers were found to be trespassing after five years of building, clearing, fencing, plowing, and planting; several of the petitioners had also mown hay in July that Smith's agent prevented them from hauling it away although it was "their whole provision of fodder for their Cattle" that winter.³⁰⁰ Smith complained that allowing them to have it would be "to his great Damage" and Governor Anthony Brockholls ordered that any "Grasse or Hay, Cutt, or mowen as aforesaid, bee

297 Christoph & Christoph (1982, "The articles of agreement whereby Johannes Vervelen is to operate a ferry between Spuyten Duyvel and Fordham," possibly 1660 and "An order for Willm Heyden and Sam: Drake of Eastchester to make inquiry in the matter between Jno Archer and the farmers etc.," September 11, 1669); Christoph & Christoph (1989, "Petition of Johannes Vervelen, complaining against John Archer," 1675, pg. 223); Scott (1983, August 17, 1675).

298 Christoph & Christoph (1980, "An order forbidding the further proceedings of John Archer to cutt grasse, on the meadow belonging to Harlem," June 3, 1669, pg. 272 and "A warrant to the constable of Westchester about some meadow ground claim'd by Harlem," August 16, 1677, pg. 153); Paltsits (1910a, August 16, 1667).

299 Christoph & Christoph (1991, "Petition of several residents of Harlem that Lewis Morris be restrained from cutting hay on Stony Island, with Colonel Morris's response," July 28, 1680, pg. 353).

300 Christoph & Christoph (1989, "Letter from Secretary Nicolls to Richard Smith, expressing the governor's views about some disputed hay," 1675 and "Petition from farmers on Richard Smith's land for equity," 1675).

made up, Stack't and secured, on, or by the said Meadowes" until the issue was finalized.³⁰¹ The farmers expressed a willingness to compensate Smith, and the governor agreed that they should remain in possession of the hay because Smith did not need it. Smith, however, charged them an exorbitant fee for keeping the hay (in one case 12 shillings per load when it was only worth three).³⁰²

Across Long Island Sound, *Anne Hooke's* (Rodman's) Neck (Westchester County) became the focus of a decade-long controversy in 1669. In September John Richbell complained that Thomas Pell "Doe unjustly detain and keep from him a certaine parcel of meadow Ground" on one of the necks of land at *Momoronock* (Mamaroneck, Westchester County). Pell refused to transfer property he sold to Richbell, who then asked the Court of Assizes to determine title; in 1671 the Council ordered surveyor Jacques Cortelyou to divide the neck in half.³⁰³ Although by then the neck was referred to as a "Mannor" owned by Pell's son, in September of that year men presumably acting for Richbell took away "severall parcels of hay made up in Stack upon his Land" and burned another."³⁰⁴ The disputed land was between Stoney Brook and Gravelly Brook ("C" and "G" on Figure 3-1).

301 Christoph & Christoph (1982, "An order to the officers of Huntington, concerning some land claimed by] Mr. Richard Smith of Nesaquack," July 9, 1675, pg. 48).

302 Christoph & Christoph (1989, "Petition by four residents of Huntington for equity in fees assessed by Richard Smith," 1676).

303 Christoph & Christoph (1983, "Thomas Pell to appear to answer complaint of John Richbell of Momoronock concerning title to certain meadows," September 13, 1669, pg. 95); Paltsits (1910a, January 18, 1671).

304 Christoph & Christoph (1980, "A speciall warrant for Jeremy Cannon, alias Dorman, James Mott, Roger Pedley to appeare at the Assizes to answer Mr. Pell in a case of trespass," September 22, 1671); Paltsits (1910b, September 22, 1671).

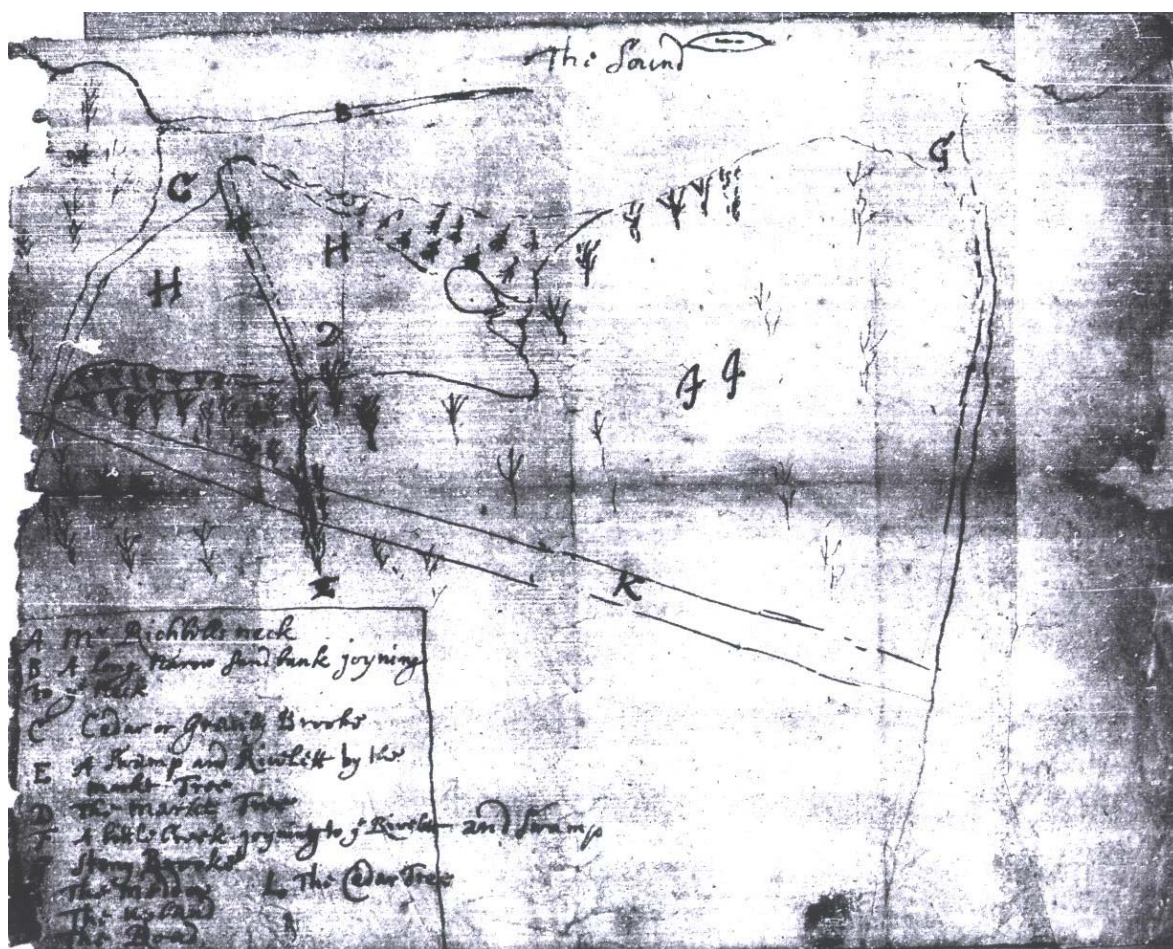


Figure 3-1. "Small Draught of land in difference between Mr. Pell and Mr. Richbell," 1666 (ALG, Vol. I).

Richbell was to be the aggressor a second time, when in August of 1680 he evicted his niece and her husband John Smith from land he gave them. Richbell notified them in June that they were not to mow the meadow and had to leave by October, though both parties agreed that Richbell would lay out his own share of meadow and land by the end of July "that hee might mow his owne and hee would not mow a Spier" belonging to Smith. Richbell did not lay out his portion by the agreed-upon date so Smith was obliged to "mow where hee Cann as he hath done ever since he Came to the place." With the constable's assistance but without a warrant or executive order, Richbell arrived while Smith was mowing and ordered him to stop. Upon Smith's return to "Cutt Some Grass upon the meadow aforesaid," Richbell and the constable

again threatened him—the constable hit him and overturned the hay-cart but still did not produce a warrant. The meadow was described as a marsh to be laid out for 18-25 families but it had not yet been divided because it “lyeth upon to the wilderness.” After division, Richbell gave the constable one lot and leased him another, leaving the Smith family with none.³⁰⁵

Records from Staten Island provide excellent information on the allocation of wetlands and include several references to their use. In 1760 Staten Island was described as low and consisting primarily of meadows, with “no other hay to be got, than such as commonly grows in swampy grounds” (Bayles, 1887, pg. 144). As late as the 1870s and 1880s some areas of Staten Island still had farms encompassing salt meadow “from which large quantities of salt grass [were] taken annually” (Clute, 1877, pg. 9). A seventeenth-century map of the Great Kills area clearly shows how close the first settlement of *Oude Dorp* (Old Town) was established to sources of *foin doux* (sweet hay), *foin sale* (salt hay), and *roseau* (reed) (Figure 3-2).³⁰⁶

305 Christoph & Christoph (1991, “Petition of John Smith of Mamaroneck, complaining of a forcible ejectment from his land,” August 23, 1680, pg. 364).

306 ALG (Vol. I, “French draught of part of Staten Island”).

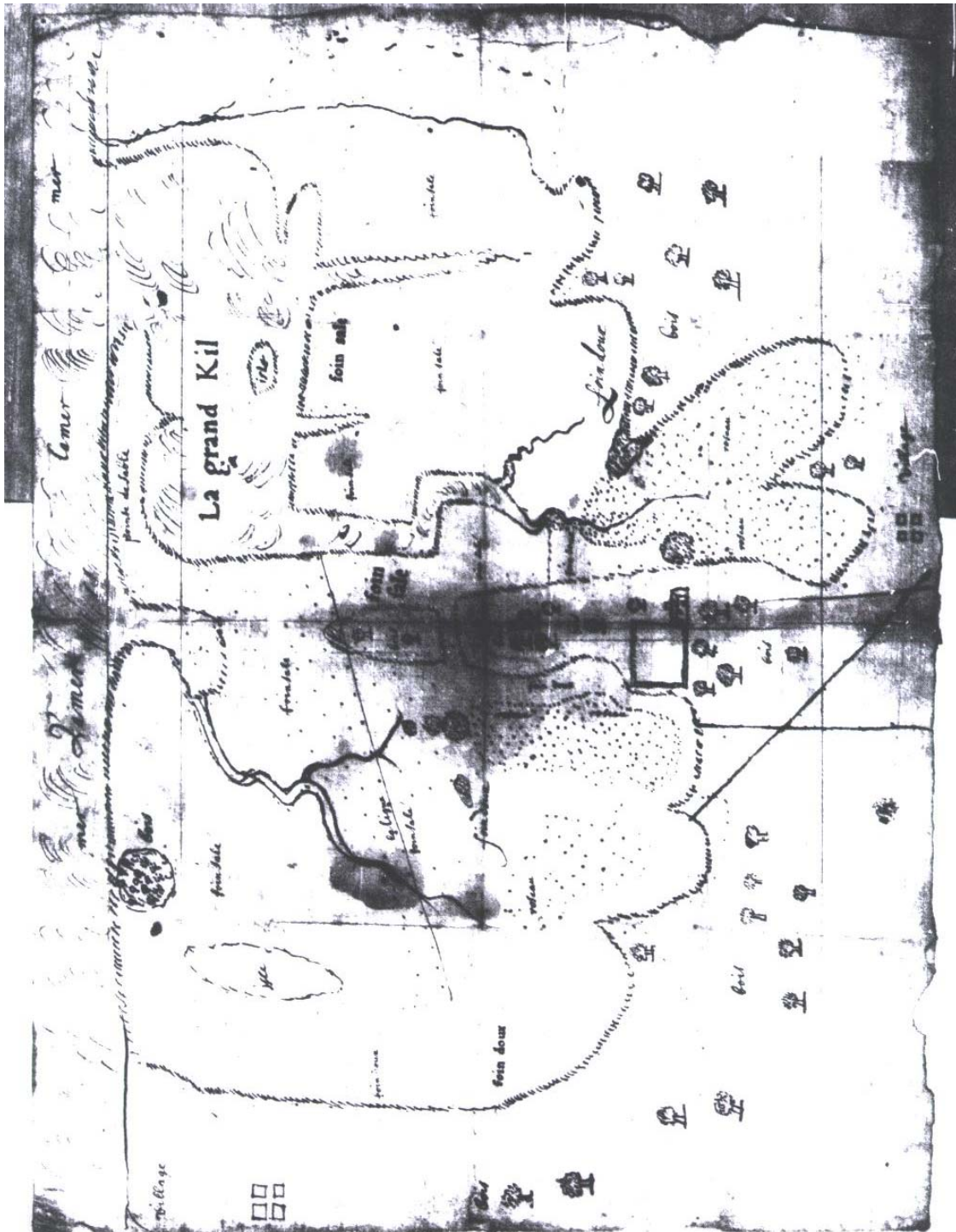


Figure 3-2. French draught of part of Staten Island," ca. 1676 (ALG, Vol. I).

Captain James Carteret of New Jersey, nephew of the first governor of that province, had “Cutt Grasse and made Hay” from a meadow along the Fresh Kills or Arthur Kill sometime before 1672 when this privilege was contested by the New York’s Governor Lovelace.³⁰⁷ When Carteret himself became governor of New Jersey he was again granted permission to use the meadow but issues continued to arise regarding the Carteret family’s rights on the island.³⁰⁸ A 1695 anecdote reveals the timing of harvest to be August; that month the surveyor August Graham reported being interrupted in his survey of salt and fresh meadow at Cedar Point in the Fresh Kills area because his compass was stolen after he set it “on a certain parcel of meadow (the grass whereof being cut downe).”³⁰⁹

Haying also occurred on wetlands in the Hudson Valley. In 1670, for example, Hendrick Meussen Vrooman leased a farm on the Hudson River just north of what is now Troy (Rensselaer County) that included “a piece of meadow Ground or Hooy valley” (*hooy* meaning “hay”).³¹⁰ Sixty-four years later the Scottish Surveyor-General of New York harvested ten wagon-loads of hay on his farm just west of Newburgh (now Orange County); the source was either his “meadow near the Bever Dam” or the “meadow where the Hassocks are cut off” (Haley, 1989, pg. 18). In April 1790 Alexander Coventry witnessed “some strange husbandry” on the van Rensselaer farm where

Standing on the barn floor was a wagon loaded with coarse swamp hay, which was very musty, off this his negro was feeding the work horses, having fed up his good hay in the Winter to the young cattle (Coventry 1978, April 17, 1790, pg. 467).

307 Fernow (1881, “Letter from ye Governor to Capt. James Carterett of New Jersey,” September 18, 1672).

308 Christoph & Christoph (1982, “A letter from Capt. Brockholls to Governor Carterett, giving him permission to use a meadow on Staten Island, without acknowledging Capt. Carterett’s eventual claim to it,” August 1682); Christoph (1996, “Petition. Elizabeth, widow of Philip Carteret, Esq., late governor of the province of East New Jersey, respecting some meadow land on Staten island granted to her husband’s use by the several English governors of the province of New York, but which is now claimed by one John Tunissen. Aug. 27, 1684”); Fernow (1881, “A letter from Capt. Brockholls to governor Carterett, giving him permission to use a meadow on Staten Island, without acknowledging Capt. Carterett’s eventual claim to it,” August 1682); O’Callaghan (1866, August 27, 1684).

309 ALG (Vol. II, “Statement of Aug: Graham, surveyor, in relation to his being interrupted in making a survey of 12 acres of salt, and 8 acres of fresh meadow, on Staten Island, for Arent Praell, pursuant to the Governor’s warrant,” August 8, 1695).

310 Pearson & van Laer (1918, “Lease from Robert Sanders to Hendrick Meussen Vrooman of a farm on the east side of the Hudson River called Stone Arabia,” May 3, 1670, pg. 370).

Coventry himself proved this to not be so “strange” when in October 1792 he hired men to mow two crops of marsh hay in the newly opened Military Tract of central New York and agreed with his neighbor to lease more of that marsh in the following years.³¹¹ Few records were found regarding hay in the Delaware region but in the spring of 1749 Peter Kalm observed some meadows of “cyperus grass or sedge” that “lay in marshes and valleys” there, which were mown once in May and again in late-August or early September (Benson, 1937, pg. 293).

Pasturing

Like their southern counterparts, northeastern farmers—including those in New Netherland—allowed their animals to graze on the stubble of harvested fields, enclosed them in fenced pastures, and allowed them to run “at large” during warmer months.

Grazing on the Aftermath

Cattle were sometimes permitted to graze on the stubble remaining in fields after the grain harvest. Grains were often grown by neighboring farms in the same area so that it could be enclosed within a communally maintained fence. One such fence surrounded land in Wiltwijck and was built/maintained by farmers in proportion to the amount of land they owned within, though any interior fences were individual responsibilities (Versteeg et al., 1976a). Cattle were allowed within the fenced common from mid-September to mid-October after which only draft horses and calves were permitted.³¹² Likewise, in 1671 when enough people had settled at the new Esopus villages of Hurley and Marbletown, draft horses and calves there were the only

311 Coventry (1798, March 14, 1792, pg. 660, October 5, 1792, pg. 695, October 9, 1792, October 16, 1792, and November 10, 1792).

312 Versteeg et al. (1976b, “Ordinary session,” January 10, 1671).

livestock allowed to pasture “on the arable” (Versteeg et al., 1976b, 1671). That same year across the river at Kinderhook it was decided that everyone must keep their farms fenced and not “drive cattle on the land” until after the 25th of September (van Laer, 1926, April 25, 1671).

In 1675 Wallerand DuMont leased four morgens of land to Hendrick Rycken for planting but reserved the right to use the land for pasture after the harvest (Versteeg et al., 1976b, November 11, 1675). Similarly, in a June 1677 property transaction for land on the Mohawk River, the buyer and seller agreed that “at harvest time, when the grain is in, the cattle... shall have free pasture on his, the buyer’s, land, and in the stubble, and his cattle in like manner upon her land.”³¹³ A decade later, a deed for nearby *Cohoos* (Cohoes) Island included the caveat that Anthony van Schaik’s cattle should be allowed to

freely feed upon y^e Stuble Land of y^e Said Roeloff Gerritse, and y^e Chatle of y^e Said Roeloff Gerritze his heirs and assigns owners of y^e above Recited Parcel of Land may likewise freely feed upon y^e Stuble Land of y^e Said Anthony van Schaik.³¹⁴

When haying ceased on Alexander Coventry’s farm in July 1786 his cows were put to pasture on a field that had produced clover and foxtail; however, the “excellent after-math” was destroyed by horses who broke into the meadow the following month. Cows and an ox were again fattening on the field in October and in the spring of 1789 some cattle were put on the field with the expectation that they would return to the homestead during the night.³¹⁵

Cleared and Fenced Pastures

Cleared and fenced pastures—held individually or in common—were not uncommon in New England or New Netherland, and as conflicts over plowing illustrated in the previous

³¹³ Munsell (1870, “Albany County Records,” June 26, 1677); Pearson (1869, pg. 157).

³¹⁴ Pearson & van Laer (1916, “Deed from Annetje Lievens to Roelof Gerritsen for two parcels of land and an island south of the Half Moon,” February 4, 1686/7, pg. 336).

³¹⁵ Coventry (1778, July 4, 1786, August 21, 1786, pg. 122, October 5, 1786, March 29, 1788, pg. 210, and April 10, 1789).

chapter, grazing land was not necessarily sub-optimal for cultivation. In 1639 Thomas Sanders leased a house and plantation to two farmers for seven years as long as they fenced and cleared it to be “fit for pasture.”³¹⁶ In 1673 the magistrates of Harlem ordered that the following year no crops would be planted on Jochem Pieter’s Flat after the grain harvest in order to allow cattle to pasture there; in 1675 it was decided that crops could be planted there every other year, alternating with the nearby van Keulen’s Hook, in order for pasture to be available in one or the other (Riker, 1904). Within a few years both flats were surrounded by a common fence five and a half feet tall and six rails high, and individual lots within the fence were marked.

Because so much injury was done to people and their livestock by the Native Americans it was decided in 1644 that a common, enclosed pasture should be made on Manhattan, and anyone wishing to keep their animals therein should meet to erect a fence.³¹⁷ The following decade several irregularly shaped lots were patented to Manhattan residents for space in the Sheep Pasture (roughly $90.5\text{m} \times 29\text{m} \times 90.5\text{m} \times 13.5\text{m}$ and $14\text{m} \times 19.5\text{m} \times 21\text{m} \times 19\text{m}$).³¹⁸ People with lots in the Sheep Pasture may have had land elsewhere; Jan and Pieter Monfoort, for example, had nearly 30 morgens each on Wallabout Bay in 1643 and a decade later also held patents for lots in the Sheep Pasture.³¹⁹ Others may have lived in the pasture: in 1656 Pieter Rudolf was granted a lot in the Sheep Pasture for a house and garden and the following year Nicolaes Bernard was granted the same.³²⁰ The first settlers of Schenectady in the mid-1600s were given five- to six-acre lots of pasture between the village and the Mohawk River and the village’s church-operated poor pasture was also adjacent to the village (Pearson, 1869). In

316 van Laer et al. (1974a, “Lease from Thomas Sanders to Isaac Abrahams and Casper Dirksen of a house and plantation formerly occupied by Evert Foppe,” August 3, 1639, pg. 207).

317 O’Callaghan (1868, “Ordinance of the Director and Council of New Netherland for the Construction of a public Inclosure on the Island of Manhattan,” March 31, 1644).

318 Gehring (1980, “Patent to Cornelis van Ruyven,” April 16, 1654, “Patent to Carel van Brugge,” May 22, 1654, “Patent to Cornelis van Tienhoven,” July 1645, “Patent to Nicasijs de Sille,” May 22, 1654, “Patent to Pieter Monfort,” June 28, 1654, “Patent to Isack Kip,” June 21, 1656, and “Patent to Jacob Kip,” June 21, 1656).

319 Gehring (1980, “Patent to Pieter Monfoort,” August 17, 1643, “Patent to Jan Monfoort,” December 1, 1643, “Patent to Pieter Monfort,” June 28, 1654, and “Patent to the heirs of Jan Monfort,” August 28, 1654).

320 Gehring (1980, “Patent to Pieter Rudolf,” May 18, 1656, “Patent to Nicolaes Bernard,” January 1657).

November 1657, Johanna de Hulter sold her pasture “as it stands in fence” to Jan Janse van Otterspoor (Pearson, 1869, pg. 8).

Calves sometimes had separate pastures, *calverwey* or *kalverwey*, such as the one discussed in the previous chapter on Papskanee Island; another, on nearby *Shotak* (Schodack) Island, was also off-limits to plowing and held in common.³²¹ In 1672 Tierck Claessen de Wit was deeded a house, lot, orchard, and “calves’ pasture” near Kingston.³²² Other small stock were sometimes kept in enclosures like hogpens (Rensselaerswijck) and goathouses/goatpens (lower Manhattan and *Varckens* [Hogs, Blackwell’s, Roosevelt, Welfare] Island).³²³

Many pastures were operated as commons and in 1670 Governor Lovelace reported that “the feed of Cattell is free in Commonage to all Townships.”³²⁴ In 1654 Andries de Vos’ request to fence some land near his Beverwijck lot as “pasture and meadow land” was denied because it was communal.³²⁵ In addition to Manhattan’s Sheep Pasture, in 1655 it was ordered that men must construct a second common fence for grazing cattle even if they had their own pasture elsewhere because this “Publick Enclosure” was to benefit everyone. Everyone with a share in the Commons had a special groundbrief and must help with its maintenance and in 1656 the Overseers of Fences brought a suit against several men with livestock within the fence in order to pay for its repair. At least some men with animals in the Common employed a herder to watch them, but even so, cattle sometimes escaped and damaged adjacent plow land.³²⁶

Commons existed to supplement privately owned land as shown by Obadiah Holmes’s 1678

321 van Laer (1932a, May 6, 1684, May 26, 1684, and July 1, 1684).

322 ALG (Vol. I, “Deed from Gov. Lovelace to Tierck Claessen de Wit, for a parcel of bush-land, together with a house, lot, orchard and calves’ pasture, lying near Kingston, in Esopus,” June 25, 1672).

323 Gehring & Venema (2009); van Laer et al. (1974a, “Deposition concerning the buildings erected in different places in New Netherland during Director van Twiller’s administration,” March 22, 1639); van Laer et al. (1974b, “Report of referees as to the value of improvements made on Varckens (Hogs) Island by Jan Claessen Alteras,” August 30, 1642).

324 O’Callaghan (1853, “Report on the State of the Province of New-York,” June 28, 1670, pg. 188).

325 van Laer (1920, January 20, 1654 and February 3, 1654).

326 Fernow (1976a, July 7, 1655), Fernow (1976b, May 1, 1656, May 9, 1656, and July 3, 1656).

statement that although he had improved his land “with fenc and Stake” for pasture and corn the size of his lot was “In Considerabl with out The help of the Comans.”³²⁷

By the end of the 1650s the new English village of Hempstead was described as the best town on Long Island because of the large numbers of cattle it was able to sustain on the Hempstead Plain.³²⁸ This large flat had similar origins to those of nearby *Castuteeuw*, two of which were also used as cattle pasture by the village of Midwout in the 1650s.³²⁹ These plains were used as commons into the nineteenth century (Naylor, 1994; Vanderbilt, 1882). The first European owners of the Hempstead Plain were Robert Fordham and John Carman, who purchased “the halfe moiety or equal part of the great plain” in 1643.³³⁰ The plain was held in common by town residents who employed herders to watch their cattle and sheep, which had become plentiful enough by the 1650s to supply settlers on the Delaware; the town also provided a significant amount of meat to American forces during the Revolution (Naylor, 1994; see the previous chapter for a discussion of New Amstel).

In 1670, visiting Englishman Daniel Denton noted that horse races were held annually on Hempstead Plain, which “grows very fine grass, that makes exceedingly good hay, and is very good pasture for sheep or other Cattel” (Royster, 2006, pg. 11). These races were initiated by Governor Richard Nicolls a few decades prior for both entertainment and the improvement of horses; in 1669 the prize was a silver crown or its equivalent in wheat.³³¹ The races were held on the portion known as Salisbury Plain that was known for pasture (Hedrick, 1933, citing Bickham, 1747). Other areas of the Hempstead Plain were mown, as illustrated by John Champion’s 1674

327 Christoph & Christoph (1991, “Petition of Obadiah Holmes for land on Staten Island,” September 10, 1678, pg. 8).

328 O’Callaghan (1856a, “Remonstrance of the Deputies from New Netherland,” July and October 1649).

329 Cohen (1992); Fernow (1883, “Council Minutes. Long Island matters,” March 30, 1662?, 512, “Council Minutes,” April 6, 1662, 512, and “Council Minutes,” April 13, 1662).

330 Fernow (1883, “Indian deed for land in Hempstead, L. I.,” November 13, 1643, pg. 530).

331 Christoph & Christoph (1980, “The Governors letter to the justices of the peace constable and overseers of Hempsteed concerning the horse race,” April 1, 1669).

grant of 20 acres of “plaine land ffor mowing land” at Lusum (now Jericho).³³² Of this “Brushy Plain,” Weld (1807, pg. 315) said “the Dutch farmers, who have made repeated trials of the soil, find that it will not produce wheat or any other grain, and, in short, nothing that is at all profitable except coarse grass.” Whitney (1994) hypothesized that these fields were dominated by the grass little bluestem (*Schizachyrium scoparium*). Yet other areas of the plain were used for penning or folding sheep and neat cattle, because in 1732 the Council made an unpopular decree forbidding this practice (renewed in 1740). The plains were “unenclosed, and used as pasture” into the eighteenth century and cooperatively managed into the nineteenth century.³³³

Pasturing on Necks and Islands

Livestock in New England were often kept on islands or necks of land (Anderson, 2004; Russell, 1976). Animals were safer in these natural “enclosures” and their owners were not obliged to build fences; at most, a single fence was required to separate a neck from the mainland. A *neck* was simply a peninsula or the land between two creeks as shown in Figure 3-3. Residents of Hempstead, for example, pastured their animals on Cow Neck on Long Island’s north shore that was separated from the mainland by a single fence and gate. The amount of fencing or gates maintained by each town resident determined how many animals they were able to pasture on the neck and was called the “gate-right” (Hedrick, 1933; Naylor, 1994). In 1658, for example, there were 60 “cooperators” maintaining 526 fence panels (Hedrick, 1933). Rockaway Neck was also managed in this way by 1650 (Naylor, 1994).

Islands were also used to pasture livestock but animals were sometimes able to swim between them and the mainland (Bidwell & Falconer, 1925; Williams, 1995). In the 1670s, for

332 ALG (Vol. I, “Conveyance from Robert Williams to John Champion of 40 acres of land lying in Lusum, near Oyster Bay, on Long Island”).

333 French (1860, pg. 547); Harper (1911); O’Callaghan (1855a, “Lieutenant-Governor Clarke to the Lords of Trade,” June 14, 1740); O’Callaghan (1866, September 26, 1732); Whitney (1994).

example, a complaint was made that cattle were swimming from farms on the western shore of the Hudson River above Albany to *Greene* (Pine) Island and damaging grain fields there (van Laer, 1928, June 6, 1676). In 1683 Stephanus van Cortlandt worried that if Castle Island was used as a pasture the animals might swim to the mainland and cause problems.³³⁴ Swine were also known to swim, and did so from mainland New Jersey to Staten Island in 1675.³³⁵

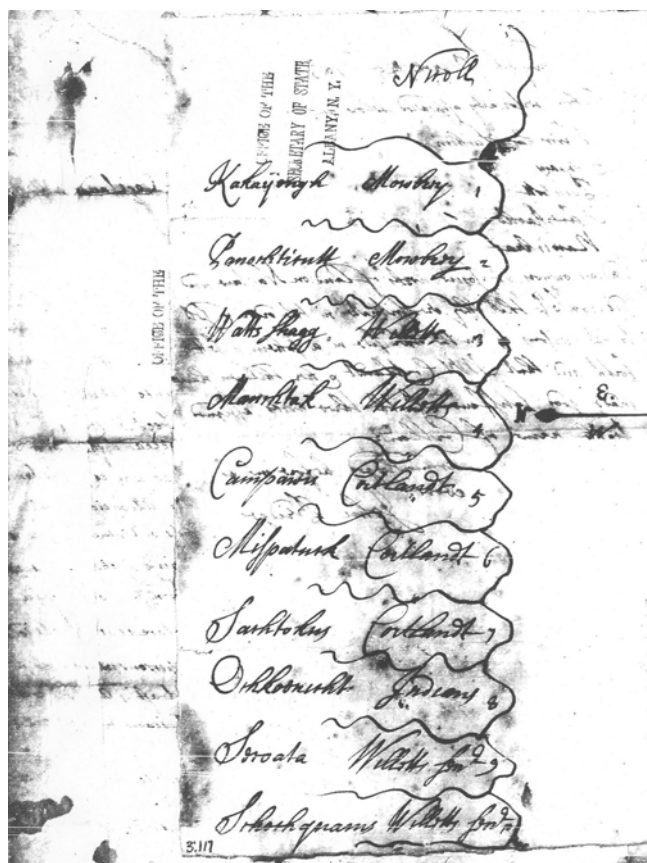


Figure 3-3. “Map included with the ‘Petition of widow Cortlandt and OloffCortlandt, her son, praying a patent for three necks of land, on the south side of Nassau Island, with Indian deed of the same to the petitioners above named,’ 1703 (ALG, Vol. III).

334 van Laer (1935, “From Stephanus van Cortlandt,” November 1683, “To Oloff Stevensen van Cortlandt,” November 1683, “To Stephanus van Cortlandt,” November 1683, “To Stephanus van Cortlandt,” December 1683, and “From Richard van Rensselaer,” September 1684).

335 Christoph & Christoph (1982, “Order to take up the swine on Staten Island of Governor Philip Carterett of New Jersey,” September 23, 1675).

Noten (Nuttan, Governor's) Island was the location of the first shipment of livestock in 1624 and used for grazing the governor's horses and cows thereafter.³³⁶ In 1630, Kiliaen van Rensselaer ordered that the land on the mainland near Fort Orange should be ploughed first while the islands there should "be kept for hay and as pasture" (van Laer, 1908, January 12, 1630, pg. 160). In the 1630s Director van Twiller purchased an island in the East River and set some animals loose on it with an overseer; hogs belonging to the village of Harlem were running loose on the island 35 years later (Fernow, 1976e, September 13/23, 1664, pg. 117; Riker, 1904). A nearby island was also granted to Harlem as a place to keep young livestock and harvest meadow hay, and calves were pastured there until 1669 when the island was purchased (Riker, 1904). In 1665 Captain Thomas Lawrence was given permission to buy the third island in the Hellgate in order to "Plant, or Feed Cattle upon the same."³³⁷ Not far away on Long Island the Deacons of the Dutch Reformed Church purchased a farm "for the benefit and profit of the poor," annexed a second parcel to it for support of any livestock, and in 1655 requested that *Huelicken* (Borger Jorissen, Luyster's) Island in Bowery Bay be granted as a place "to drive their hogs and livestock, etc."³³⁸

Staten Island was relatively uninhabited in the mid-1600s because of regular Indian attacks but was used as free range for horses until removal orders were made for any whose owner did not have land there.³³⁹ Cases dated November 1677 and April 1678 suggest that at least one man kept his horses on the island over the winter and in 1679 Danckaerts and Sluyter noted that the island was suitable for "pasturing horses and cattle, for being an island, none of

336 O'Callaghan (1854a, "Report of the Board of Trade on the Affairs of the Province of New-York," October 19, 1698).

337 Christoph & Christoph (1980, "License to Capt. Thomas Lawrence to purchase Round Island near Hellgate from the Indians," August 23, 1665).

338 Gehring (1995, "Petition of the deaconry for opening a road to the poor farm beyond the Hellegat, June 3, 1655, pg. 53).

339 Christoph & Christoph (1980, "An order empowering Captain Salisbury to make inquiry after all such horses cattle etc. as properly belong not to the inhabitants of Staten Island," February 15, 1668); Christoph & Christoph (1990, "Petition of Nicolaes de Meyer for a delay in removing his horses from Staten Island," November 6, 1677); O'Callaghan (1866, November 6, 1677).

them can get off.”³⁴⁰ *Coneynen* (Coney) Island on the south shore of Long Island was initially granted to Lady Deborah Moody in 1643, the first European female property owner in North America, “for purpose of pasture of village cattle and for hay fields” (Banta 1900, January 12, 1662, pg. 136). In 1645 the patentees of Gravesend were ordered to “put what cattle they shall thinke fitting to feed or grase vppon the affors^d Conyne Island.”³⁴¹ In September 1679 two visitors described it as a “low sandy island... grown over with bushes” that was uninhabited save for livestock that were “able to obtain there sufficient to eat the whole winter, and to shelter themselves from the cold in the thickets” (Murphy, 1867, pg. 118-119). Horses were allowed to run on the island because they could not escape.

Fencing

As Anderson (2004) and Cronon (1983) explained for New England and Virginia, free-ranging livestock was a problem for European settlers and Native Americans alike. The case was no different in New Netherland, where fences were created more to enclose crops than animals (Williams, 1995). In 1666, for example, Mattheu Blanchan defended the trespass of his cows onto another farm by explaining that people were expected to fence their own land because cattle running at-large could not be supervised. The plaintiffs countered as new arrivals in the colony they were unaware of this “rule.”³⁴² The general understanding by the late-1650s was that unfenced woodlands were also open for public wood-cutting and into the 1670s several farmers were permitted to take possession of land that had lain unfenced for some time.³⁴³

340 Christoph & Christoph (1990, “Order to ranger John Palmer to allow Nicholas de Meyer to remove horses from Staten Island,” April 8, 1678); Murphy (1867, pg. 141); O’Callaghan (1866, April 8, 1678).

341 O’Callaghan (1868, “Charter Granted by the Director and council of New Netherland to the Town of Gravesend, Long Island,” December 19, 1645, pg. 54).

342 Versteeg et al. (1976a, “Ordinary session,” May 18, 1666).

343 Christoph et al. (1991, “Letter from Michel Hainelle recommending a grant of land at Brooklyn to Wynant Pietersz,” September 1, 1678 and “Return of survey of Red Hook on Long Island,” September 10, 1678); Gehring (1991, “Ordinance concerning the fencing of private land, and authorizing the cutting of firewood on unfenced lands,” January 16, 1657); O’Callaghan (1858a, “At a Council in Fort Willem Hendrick,” May 26, 1674, pg. 716).

There are many direct observations that Dutch cattle roamed without supervision and entered Native American cornfields. As a result of these transgressions, in 1640 the Council declared that all Dutch farmers with land near Native American settlements must herd or fence their animals and otherwise prevent them from doing damage to Native American lands, on penalty of a fine. This was done out of fear that corn supplies would decrease as a result of damage and that Native Americans would be prompted to take revenge (Williams, 1995). In 1650, for example, the inhabitants of Gravesend agreed that they would enclose their lots “with post and raile in one Common fence” in order to exclude cattle and for the protection of the new village because “the peace with the Indians [was] new and rawe and there was still feares of theyre uprising to warre.” The fences, they said, were “a maine thing for the preservation of the fruits of the field and love amongst neighbors” and were to be inspected regularly with fines charged until repairs made.³⁴⁴ This decree, however, did not seem to have an impact because in 1667 Native Americans still complained that Dutch animals were ruining fields (Williams, 1995). The problem was exacerbated by attacks on livestock by Native American dogs. Rensselaerswijck also ordered fencing in 1640 and a colony-wide ordinance for fences, herders, and pounds was made in 1648.³⁴⁵ Land on the Delaware was ordered enclosed in the late 1650s and Schenectady ordered fences erected in 1668.³⁴⁶

Adriaen van der Donck felt farming in the colony was not as difficult as in the Dutch Republic “primarily because fencing and enclosing are not so costly, for instead of our ditches and canals, people there put up posts, pickets, or rails (Goedhuys, 2008, pg. 34). However, ditches may have been used in lieu of fencing in some areas. In December 1674, for example, a lot of meadow was disputed by George Wood and Josias Firman at Newtown or Gravesend—

344 Gehring (2000, “Orders agreed upon by the inhabitants of Gravesend,” possibly 1650, pg. 97).

345 Gehring (1991, “Ordinance against selling alcohol to the Indians; trespass; for the proper maintenance of fences; and establishing an animal pound,” July 1, 1647); Williams (1995); van Laer (1926, October 4, 1669, 108, and October 6, 1669); Versteeg et al. (1976b, “Ordinary session,” October 22, 1670, pg. 440).

346 Gehring (1981, “Minutes of the administration of Jean Paul Jacquet, vice-director of the South River,” February 23, 1656 and “Minutes of the administration of Jean Paul Jacquet, vice-director of the South River,” May 22, 1656 and November 27, 1656); van Laer (1926, September 3/13, 1668).

because the stakes and other marks had disappeared one of the first surveyors of the meadow was called to testify that when the lines were agreed upon “they ditched in their proporcions.”³⁴⁷ John Smith also testified that some years prior he was hired by Firman to dig a ditch between his lot and Wood’s. In June 1676 Wood also challenged the boundaries of a meadow lot belonging to Richard Fido and Smith again testified that they agreed on the boundary ditch he made. Abram Frost testified that he was one of a handful of men that had an interest in this “boggy meadow” and that town surveyors were asked to lay it out and “ditch it in.”³⁴⁸ In February 1675 four Dutch and French inhabitants of western Long Island requested “lands and water meadows situated between Bruckel and the Wallebockt” (Brooklyn and Wallabout Bay) because it was “time to have it trenched or enclosed in order to avoid the loss that these lands cause all the livestock in the spring.”³⁴⁹ The bounds of a Mohawk River lot described in an early 1687 deed included fences, ditches, and the river.³⁵⁰ The residents of Flatbush delineated their meadow lots with ditches but cooperatively maintained fences around the circumference and as late as 1787 a man at Catskill dug a 2’×2’ ditch “for a fence” (Coventry 1978, November 27, 1787, pg. 177; McLaughlin, 1981).

Fencing was a common obligation in farm leases in the seventeenth century and fencing requirements were made after cases of trespass were brought to court.³⁵¹ Fencing was related to the availability of labor and finances, however, and a shortage of either could postpone its

347 Christoph & Christoph (1989, “Rough draft of council minutes,” December 17, 1674).

348 Christoph & Christoph (1989, “Proceedings of the court of sessions at Gravesent, June 22, 1676, pg. 399 and “Order to the constable of Newtown to seize goods of Richard Fido,” October 27, 1676).

349 Christoph & Christoph (1989, “Letter from inhabitants of Brooklyn requesting a patent. Translation,” February 22, 1674/5).

350 Pearson & van Laer (1916, “Deed from Annetje Lievens, widow of Goosen Gerritsen van Schaick, to Harmen Lieverse for land at the Half Moon,” February 4, 1686/7, pg. 341).

351 Pearson & van Laer (1918, “Lease of land at Kinderhook from Lourens van Alen to Pieter Vosburgh,” December 9, 1676, pg. 355 and “Lease from Robert Sanders to Hendrick Meussen Vrooman of a farm on the east side of the Hudson River called Stone Arabia,” May 3, 1670); Scott (1983, December 22, 1674, January 19, 1674/5, and March 19, 1674/5); van Laer (1928, June 13, 1677); van Laer (1932a, July 6, 1680); van Laer et al. (1974b, “Lease from Johannes la Montagne to Bout Frances on the farm Vredendael,” June 14, 1643, “Lease of a farm on Long Island from Anthony Jansen to Edmund Adley, with inventory of live stock and implements delivered,” possibly 1646, “Lease from Cornelis van Tienhoven to Crigier Pisker and Gerrit Serdts of a parcel of land at Breuckelen, Long Island,” January 26, 1647); Versteeg et al. (1976a, “Ordinary session,” March 6, 1663 and “Ordinary session,” December 16, 1664, pg. 189); Versteeg et al. (1976b, March 21, 1671).

construction indefinitely (Versteeg et al., 1976b, April 15, 1674). The typical style of fence built in America was the “zigzag,” “worm,” or “Virginia” fence, and Cohen (1992) also believed it to be common in New Netherland although primary records often specify post-and-rail by name (Figure 3-4 shows this type on Manhattan in 1679).³⁵²

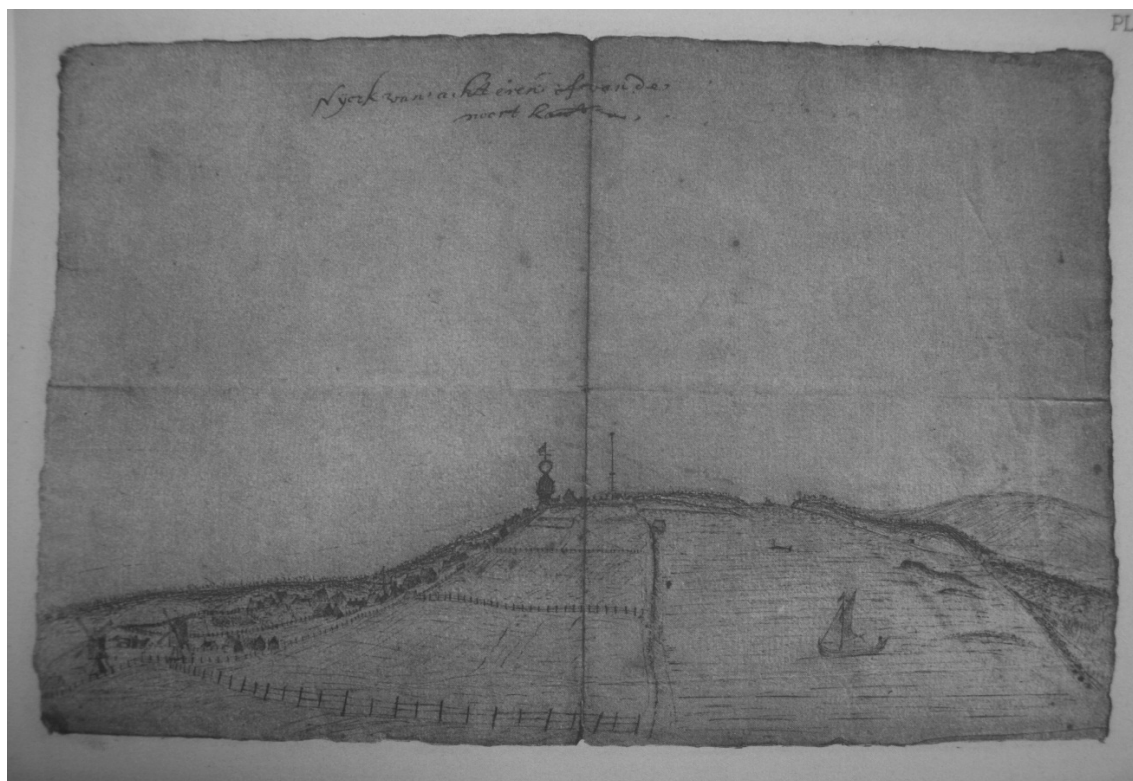


Figure 3-4. “N York van achteren of van de noortkant,” 1679, by Jasper Danckaertss (Stokes, 1998).

Fences of boards, palisades, and logs were also known in 1749 and Peter Kalm noticed a unique type of fence on his journey north of Albany that he had not seen in his previous travels in Pennsylvania, Delaware, and New Jersey: logs stacked four feet high resting in nooks carved in

³⁵² Fernow (1883, “Court Proceedings concerning the right of way in Middleburgh, (Newtown) Long Island,” July 9, 1658, “Judgement in a case of the Town of Gravesend against Anthony Jansen for trespass,” August 21, 1656, pg. 364); Gehring (1980, “Patent to Annetje Jans,” July 4, 1654); van Laer et al. (1974b, “Lease from Cornelis van Tienhoven to Crigier Pisker and Gerrit Serdts of a parcel of land at Breuckelen, Long Island,” January 26, 1647, “Lease from Cornelis van Tienhoven to Cornelis Jacobsen Stille of a farm near the Smith’s valley,” May 13, 1643, and “Lease of a farm on Long Island from Anthony Jansen to Edmund Adley, with inventory of live stock and implements delivered,” possibly 1646); Haley (1989); van Laer et al. (1974b, “Contract of Walter Davel to fence the plantation of Tonis Cray,” December 1, 1642 and “Contract of Thomas Hall and Thomas Goodman to construct a rail fence for Jan Damen,” March 26, 1644); van Laer et al. (1974c, “Lease from Remmert Jansen to Barent Jansen Bal of a farm on Long Island,” August 31, 1651 and “Lease from Rev. Johannes Megapolensis to Dirck Jansen Cuyper of a farm in Midwout, Long Island,” pg. 410).

short logs positioned perpendicular like a log cabin.³⁵³ To combat the theft of posts, rails, clapboards, and fences an order was made in 1655 that any violator would be whipped and branded; hanging was the penalty for second offenses. These drastic measures were done because of worries that “what has been sown will come to naught, and consequently there will be no grain to harvest next year in the fields.”³⁵⁴ Nevertheless, fencing and loose animals were still issues in the last two decades of the nineteenth century. In a two-week span in the late spring of 1787, for example, eighteen of Alexander Coventry’s neighbor’s cattle destroyed his wheat and damaged a meadow and later accessed a neighbor’s orchard meadow and wheat. Hogs belonging to a cousin also damaged Coventry’s wheat.³⁵⁵

Forests as Common Pasture

Most northeastern farmer used the forest as a commons where animals were permitted to run “at large” to access native vegetation that was valued for being free but often described negatively. In 1628, for example, WIC agent Isaack de Rasieres wrote to a company director to say that on Manhattan “The grass is good in the forest and valleys, but when made into hay is not so nutritious for the cattle as here [in Holland], in consequence of its wild state, but it yearly improves by cultivation” (Stokes, 1998, pg. 75). Four decades later the English traveler Daniel Denton observed that New York was a great place to settle in part because it provided an excellent environment for livestock. He believed a farmer

needs not fear their want of pasture in the Summer, or Fodder in the Winter, the Woods affording sufficient supply. For the Summer-season, where you have grass as high as a mans knees, nay, as high as his waste, interlaced with

353 Benson (1937); Gehring (1977, “Agreement between John Stevens and Thomas Crompton with affidavits relating thereto,” February 1676/1677); Gehring (1990); Pearson & van Laer (1918, “Lease of land at Kinderhook from Lourens van Alen to Pieter Vosburgh,” December 9, 1676, pg. 355); van Laer et al. (1974b, “Lease of Domine’s hook from Rev. Everardus Bogardus to Robert Bello and Marck Menloff,”); van der Linde (1983, September 27, 1662 and October 25, 1662); van Laer (1926, November 23, 1671, pg. 281).

354 Gehring (1991, “Ordinance concerning the improvement and preservation of fences,” October 7, 1655 and December 30, 1658, pg. 51).

355 Coventry (1778, May 31, 1787, June 3, 1787, June 5, 1787, and June 15, 1787).

Peasvines and other weeds that Cattel much delight in, as much as a man can press thorough (Royster, 2006, pg. 24).

In northeastern North America the primary native grasses were hairgrass (*Agrostis scabra*), beardgrass (*Andropogon scoparius*), poverty grass (*Sporobolus vaginiflorus*, *Aristida dichotoma*, and *Danthonia spicata*), panic grass (*Panicum* spp.), and wild rye (*Elymus* spp.) (Donahue, 2004; Fletcher, 1950). Early descriptions of native grasses in the vicinity of the Delaware River were positive (e.g., Murphy, 1867; Royster, 2006) but by the time Peter Kalm arrived in 1749 conditions had deteriorated. He attributed the degeneration and small-stature of livestock to hunger, writing that compared to seventy years prior

the cattle could hardly find food enough, and that therefore four cows now gave no more milk than one at that time. The causes for this change are easy to find... the country was little inhabited, and hardly a tenth part of the cattle kept which is there are present. A cow had therefore as much food at that time as ten now have. Further, most grasses here are annuals, and do not for several years in succession shoot up from the same root as our Swedish grasses. They must sow themselves every year, because the last year's plant dies away every autumn. The great numbers of cattle hinder this sowing, as the grass is eaten before it can produce flowers and seed. We need not therefore wonder that the grass is so thin on fields, hills and pastures in these provinces. This is likewise the reason why travelers in New Jersey, Pennsylvania and Maryland find many difficulties, especially in winter, to travel with their horses, for the grass in these provinces is not very abundant, the cattle having eaten it before it goes to seed (Benson, 1937, pg. 180-81).

Regardless of these hypothesized shortcomings, colonists relied on native vegetation to sustain their animals for over a century. In 1662 the Town of Westchester was ordered to allow people to pasture their cattle and cut firewood in the “common woods” (O’Callaghan, 1865, September 28, 1662, pg. 240). To solve a conflict regarding ownership of pasture, it was decided in 1671 that all the land within three miles of Schenectady would be “reserved as pasture” for all residents (van Laer, 1926, July 6, 1671, pg. 265). In 1680 when the town of *Whorekill* (Lewes, Delaware) was laid out the forest lying beyond the 60’×200’ lots was designated a “Common for

feed of cattel and firwood.”³⁵⁶ In response to Kingston’s wish to expand in 1685, the village of Hurley expressed concern that its residents would lose their traditional right to the commonage and in 1699 the residents of Flatbush asked that a group of men be prevented from “laying out and inclosing the common land” of the town; in both locations these commons appear to be forest.³⁵⁷ In 1736, Richard Nicholls was granted a patent on 300 acres adjacent to the 275 he already owned in Ulster County—the 300 acres were described as “barren” and “waste land,” but he wished to have them as “range for his cattle.”³⁵⁸

In 1700 the English settlers of Nantucket agreed with the Indians that half the island would be used by the Indians for growing wheat, but after the harvest “the grasse of that land is to belong wholly to the English.”³⁵⁹ On at least two occasions European settlers in New Netherland were similarly able to purchase grazing and mowing rights from the Native Americans. In 1656 Indians sold all the fresh and salt meadow between Cowharbour Brooke and *Nesaquake* (Nissequogue) River on northern Long Island, including Eaton’s Neck and Crabb Meadows, “wth all the Herbage that is, or shall bee hereafter, upon ye wood Lands wth in the aforesaid Bounds” but retained their own planting and hunting rights.³⁶⁰ Previous residents testified that the property was “all the Meadows betwixt Cow harbor & Nesaquake River wth the Herbage of the Uplands,” with another specifying that “it is to bee understood That I meane by Land, Meadow only; ffor I never understood after I came to live at Huntington any Upland bought within that Tract, but herbage only, as their Bill of Sale declares.”³⁶¹ In 1656 when the land that would become New

356 Gehring (1977, “Whorekill court to Gov. Andros concerning the parceling out of land,” June 26, 1680, pg. 325).

357 ALG (Vol. II, “Petition of the inhabitants of Hurly in relation to the enlargement of the bounds of Kingstown and the alteration of the dividing line between that town and Hurly, in order thereto, as petitioned for by the townsmen of Kingstown,” 1685 and “Petition of Engelbert Lot and others, inhabitants of the town of Flatbush, on the island of Nassaw, praying that Daniel Polhemus and others may be restrained from laying out and inclosing the common land of the said town,” December 14, 1699).

358 ALG (Vol. XII, “Petition of Richard Nicholls, for a grant of 300 acres of waste land, lying next to his tract of 275 acres, upon the Paltz creek, in Ulster county, and also for as much more as will make up the whole 2,000 acres, if he can discover so much vacant and unpatented land,” June 24, 1736).

359 O’Callaghan (1854a, “Earl of Bellomont to the Lords of Trade,” November 28, 1700, pg. 783).

360 Paltsits (1910b, July 31, 1656, recorded October 15, 1666, pg. 404).

361 Paltsits (1910b, May 4, 1669, recorded September 19, 1672, pg. 418 and September 11, 1671, recorded September 19, 1672, pg. 435).

Towne was sold, the original tribe retained their upland hunting rights though the new town was allowed to cut timber and owned “the Grasse for mowing [and] feeding.”³⁶²

Herders, Pounds, and Branding

As in New England, herders, branding, and limits to the commons were necessary because so many animals ran at large. The damage done to wetlands by free-ranging livestock probably mirrored that in New England and around the Chesapeake, where Anderson (2004) documented the destruction of seedbanks, clambanks, and important plants. The earliest record for a herder is from 1632 when Kiliaen van Rensselaer gave instructions on finding a swineherd for the animals in Rensselaerswijck (van Laer, 1908, July 20, 1632). Still, the patroonship’s manager didn’t know how many pigs there were in the colony because they “stray into the woods” (van Laer, 1927, pg. 27). In 1648 an order was made that goats and hogs on Manhattan must be enclosed within one mile of New Amsterdam and accompanied by a herder beyond that; any free-ranging animals in violation of these rules would be impounded.³⁶³ Regardless, in the early 1650s it was noted that loose hogs, goats, and sheep were damaging WIC’s fort and it was re-decreed that animals should not run free without a herder and any untended goats would be seized “for the benefit and use of the poor”³⁶⁴ Because the island’s forests remained in the public domain, however, animals were still trespassing within city limits in similar orders were issued in the mid-1670s.³⁶⁵ Settlers on the Delaware and at Harlem were required to engage herders beginning in the late-1650s.³⁶⁶ In the 1660s Governor Richard Nicolls sent a surveyor to draw a

³⁶² Paltsits (1910a, April 12, 1656, recorded July 13, 1666).

³⁶³ Fernow (1976a, March 10, 1648); Gehring (1991, “Ordinance constraining hogs and goats in New Amsterdam,” March 10, 1648); O’Callaghan (1868).

³⁶⁴ Fernow (1976a, March 10, 1648 and June 27, 1650); Fernow (1976g, 1673); Gehring (1983, “Folio 176,” 1653); Gehring (1995, “Ordinance prohibiting goats from running free in New Amsterdam,” pg. 128).

³⁶⁵ Fernow (1976a, March 10, 1648 and June 27, 1650); O’Callaghan (1866, April 12, 1674); O’Callaghan (1868, March 1648, June 1650, April 1674); Scott 1983, “Proclamacon about hogs,” March 24, 1675).

³⁶⁶ Gehring (1981, “Minutes of the administration of Jean Paul Jacquet, vice-director of the South River,” February 23, 1656); Riker (1904).

line demarcating the limit of grazing on northern Manhattan so that the new village of Harlem would be protected (Riker, 1904). New Castle passed an act in 1747 requiring swine to be ringed or yoked so that they did not damage “improved lands, meadows, or marshes” (Herman, 1992, pg. 147).

Livestock roaming within village limits was also a problem. In June 1665 cattle were ordered off the streets of Kingston and enclosed at night so people wouldn’t fall over them.³⁶⁷ Property owners in Beverwijck were required to maintain a fence around their lots, effectively creating a paddock out of village streets (Venema, 2003). In 1677 Governor Andros ordered all hogs in Albany to be ringed because of the destruction and none were allowed on city streets between 8am and 6pm. Noncompliance forced reissuance of similar orders the next spring, and again in 1679, 1686, and 1713.³⁶⁸ When Peter Kalm visited the city in the summer of 1749, however, he found that the streets were filthy from cattle allowed in the streets during the night (Benson, 1937). Even in 1796 when Jeremy Belknap visited Albany and Schenectady he

Was much amused with the sound of cowbells; all the cows of the city passing by [the] house on their return from pasture. At Skenectada the cows parade in the streets by night, and make dirty work before the doors. The whole town is a perfect cowyard (Snow et al., 1996, pg. 7).

Livestock were typically left to fend for themselves in the forest from the early spring until November, but even in 1786 colts were left to “run out the whole winter” in Claverack where they subsisted

chiefly on the roots of the grass which they paw up, though under two feet of snow. This cold and famine, stunt their growth so, that when the Spring comes, their ribs are as bare of fat, as the fields they fed off of are of verdure, there being no root of good grass left (Coventry 1978, August 21, 1786, pg. 123).

³⁶⁷ Versteeg et al. (1976a, “Ordinary session,” June 23, 1665).

³⁶⁸ Christoph (1993, “Laws and ordinances of the City of Albany,” 1686, pg. 48); Munsell (1855, “Journal of Rev. John Taylor”); van Laer (1928, March 5, 1678/9, April 2, 1679, April 19, 1677, April 20, 1677, and May 3, 1677).

After their owner used all his fodder, in 1660 horses and cattle at Rensselaerswijck likewise “had to look for food under the snow on the first of March.”³⁶⁹ In April 1677 Mary Block of New Castle became anxious for her outdrift to reopen because grass was beginning to grow.³⁷⁰ A century later Peter Kalm blamed this early and “continual grazing” for the extirpation of “a great part of the annual grasses and plants” (Benson, 1937, pg. 276). Other farmers did not put their stock out to pasture until there was sufficient pasture, however, and as of May 2, 1658 the patroon Jeremias van Rensselaer had not yet released a horse because the grass was not long enough.³⁷¹

The duties of a herder were generally to monitor their charges in common forests or pastures, often bringing them in the morning and returning them to their owners in the evening. In 1640 Tymon Jansen and others hired two goat-herders for a year at Mespath Kill with the understanding that the animals were “to run about every day, be the weather good or bad” in the forest.³⁷² In 1660 Jan Jansen explained that he blew a horn in the morning to take his charges to pasture in Manhattan’s forest and in 1666 Louwies DuBois and Antoni Crespel were employed in guarding and pasturing cows “through the whole of the forest” in the Esopus.³⁷³ Animals at Hempstead were kept on village streets overnight and herded to Cow Neck in the morning (Naylor, 1994). The cowherd of Beverwijck also brought cattle to the common pasture south of town every morning and back to the village streets in the evening (Benson, 1937; Grant, 1903; Venema, 2003). With the assistance of a child Uldrick Kleyn was hired to guard Albany’s cattle in 1667 from April 20th to November 16th. He was to blow his horn three times each morning at sunrise to signal the owners to bring their animals, take them to pasture, and return them to the

369 van Laer (1932b, “To Jan Baptist van Rensselaer,” June 3-6, 1660, pg. 229).

370 Gehring (1977, “Petition of Mary Block concerning her right of way,” April 4, 1677).

371 van Laer (1932b, “To Jan Bastiaensen van Gutsenhoven,” May 2, 1658?). Tares are commonly identified as a vetch (legume) or *Lolium temulentum* (darnel), the seeds of which are commonly planted along with crops because they resemble wheat.

372 van Laer et al. (1974a, “Agreement of Claes Groen and Pieter Lievesen to herd the goats of Tymon Jansen and others,” April 4, 1640, pg. 274-275).

373 Fernow (1976c, February 24, 1660); Versteeg et al. (1976a, “Ordinary session,” April 6, 1666, pg. 288).

church fifteen minutes prior to sunset. If he was found drinking in a tavern any injury sustained by the animals while in his care would be his financial responsibility.³⁷⁴

This contract was renewed in 1668 and animals were to be taken out April 3rd and returned November 6th; in 1669 the dates were April 13th and November 6th (Old Style). Zacharias Sickels agreed to tend cattle at Albany from April 6th or 12th through November 6th, 1681 (Old Style) and to “burn the brush and forewarn the farmers in order that no one may receive harm.” Presumably burning was done in spring to expose the ground and promote the growth of herbage, though the only time of year indicated was the “proper time.”³⁷⁵ By 1666 Harlem’s neat cattle were also permitted to graze on the common woods from April until November with a herder paid by their owners and young horses, cattle, and swine were allowed to run free in the common woods after branding/markings (Riker, 1904). The following year, Harlem’s cowherd, Knoet Mourisse van Hoesem, was employed April 15th to All-Saints’ Day, give or take two weeks depending on when winter arrived or the pasture failed. All-Saints’ Day was November 1st and “usually closed the grazing season” (Riker, 1904, pg. 283). Livestock were often pastured by people other than their owners and it appears that this job provided extra income for a number of people with different livelihoods.³⁷⁶

Orders were periodically made for the collection of stray animals in the woods and licenses were given to collect unmarked animals considered Crown property.³⁷⁷ Pounds were also constructed with “impounders” elected to retrieve and hold animals found to be

374 Gehring & Venema (2009, “Conditions and terms upon which Ulderick Klein accepts the cow herdership,” April 2/12, 1667); Pearson (1869, pg. 430).

375 Gehring & Venema (2009, “Sacharias Sickles accepts cowherdership,” April 5); Pearson & van Laer (1918, “Terms upon which Zacharias Sickels agrees to herd cattle Albany,” March 26, 1681, pg. 511).

376 Coventry (1978, May 31, 1789, 215); van Laer (1926, June 10, 1669, February 1, 1671/2, and October 3, 1672); van Laer (1928, April 4, 1676, August 15, 1676, and October 3, 1676); Versteeg et al. (1976a, “Ordinary session,” February 14, 1662, “Ordinary session,” September 24/October 4, 1667, and “Ordinary session,” October 7, 1664); Versteeg et al. (1976b, “Note of Johannes Winckelman, agent of the proprietors of the colony of Achter Col, in favor of Jan Vigne for moneys dispersed in wintering cattle,” October 16, 1643, pg. 167, and “Ordinary session,” March 2, 168/9).

377 Christoph & Christoph (1982, “An order concerning unimproved lan[d] on Mahatans Island,” July 23, 1677); Gehring (1977 “Petition of Luke Watson for a license to gather stray horses at Whorekill,” October 7, 1678); O’Callaghan (1865, April 12, 1680); O’Callaghan (1866, November 10, 1683, June 20, 1684, October 24, 1684, and November 6, 1684).

trespassing.³⁷⁸ Periodic round-ups of uncastrated horses were also made in order to control breeding.³⁷⁹ In 1670 the Overseers or Branders of Horses and Cattle on Manhattan ordered that only animals “with the Townes marke” were allowed on the island and called for the election of an official brander.³⁸⁰ Flatbush required marking in 1666 and other areas also had unique marks.³⁸¹

Wetland Pasture

Although Gedan and others (2009) claimed grazing to be the most common use of tidal marshes on a global-scale, references to pasturing on New Netherland wetlands are less common than for haying. Nevertheless, raising livestock on meadows was probably preferable to letting them run at-large, as illustrated by Secretary van Tienhoven’s 1650 declaration that “all descriptions of cattle can be reared and fed” on a piece of upland on the East River with “such convenience being a great accommodation for the settlers, who otherwise must search for their cattle frequently several days in the bush.”³⁸² In 1681 two men did purchase “a parcel of meadow land (*vlye Lants*)” and woodland at Half Moon near the Mohawk River for a “range for their cattle and that of other persons dwelling there.”³⁸³ Figure 3-5 shows what was probably a typical pre-1850 riverside scene of cattle grazing in a Hudson River intertidal wetland.

378 Christoph (1993, “Laws and ordinances of the City of Albany,” 1686, pg. 48); Gehring (2003, “Letter from Daniel Denton to Petrus Stuyvesant,” July 20, 1657, and “Letter from Petrus Stuyvesant to the magistrates of Rustdorp,” July 23, 1657); Munsell (1870).

379 Fernow (1976f, March 5, 1669/70, June 21, 1670, and December 10, 1671?); O’Callaghan (1866); Versteeg et al. (1976b, “Ordinary session,” February 22, 1670/1 and March 20, 1671/2).

380 Fernow (1976f, March 5, 1669/70, June 21, 1670, and possibly December 10, 1671); O’Callaghan (1866).

381 Christoph & Christoph (1990, “Proceedings of the North Riding sessions,” December 13, 1677, pg. 173); McLaughlin (1981); Murphy (1867).

382 O’Callaghan (1856a, “Information respecting land in New Netherland,” March 4, 1650, pg. 366).

383 Pearson & van Laer (1916, “Contract of sale between Anthony van Schaick and Sybrant van Schaick and Pieter Schuyler for land at Half Moon,” March 3, 1680/1, pg. 109).



Figure 3-5. “View of South Bay and Mount Merino,” by Henry Ary (Piwonka, 1977).

As with haying, references to grazing were most common in property disputes lodged with local and colony courts and most revolved around issues of trespass. In July and August 1656, for example, Anthony Jansen complained that the village of Gravesend forbid him to pasture cattle on land he thought was his; Gravesend also claimed the land and had allowed its livestock to graze on the meadow.³⁸⁴ It is difficult to determine if this was typical, however, because the grazing may have been done out of spite and Gravesend began mowing the meadow once Jansen’s animals were impounded.³⁸⁵ Jansen was again involved in a grazing-related dispute in May 1659, this time with the village of New Utrecht that had complained to Director Stuyvesant that Jansen was allowing his horses, hogs, and cattle to “[eat] the pasture from the meadows, by which the whole Town is injured.” The petitioners asked that he be ordered to drive

³⁸⁴ Fernow (1883, “Order on a complaint against Gravesend,” July 11, 1656 and “Report of the commissioners on the boundaries between Gravesend and Anthony Jansen and order of Council,” July 19, 1656, pg. 361, “Judgement in a case of the Town of Gravesend against Anthony Jansen for trespass,” August 21, 1656, and “Order for a resurvey of the boundaries of Jansen’s and Pennoyer’s patent,” August 23, 1656, pg. 366); O’Callaghan (1865, August 3, 1656).

³⁸⁵ Fernow (1883, “Judgement in a case of the Town of Gravesend against Anthony Jansen for trespass,” August 21, 1656 and “Order for a resurvey of the boundaries of Jansen’s and Pennoyer’s patent,” August 23, 1656, pg. 366).

his livestock into the woods as everyone else does and that they be permitted to impound any animals they find the meadows. Jansen had apparently been claiming the meadows as his own when they were actually held in common (O’Callaghan, 1849a, pg. 635). It is unknown whether the offense took place in May or at some time prior.

Another instance of livestock trespassing on meadows occurred in November 1668 on the Spuyten Duyvil Creek when residents of Harlem impounded four cows belonging to John Archer because he allowed them to enter their unfenced meadows.³⁸⁶ Similarly, in June 1675 Nathan Whittman of Gravesend testified that he saw Jaques Guyon “take downe the barre of his yard and let in his milch Cowes into the Meadowes or point from whence they might goe to the Hay.” He and another witness helped drive the cows out, but Guyon testified that he never put his cattle on the meadow without a herder. Gravesend declared the town fence defective and in need of inspection and Guyon was ordered to pay damages.³⁸⁷ Jan Louwe Bogert’s cattle were allowed to graze in his meadow on the Hellgate in April 1675 (he was also hired to overwinter other people’s cattle, including those of the weaver) (Riker, 1904). McLaughlin’s (1981) town history of Flatbush concluded that meadows were kept exclusively for hay and no animals were allowed thereon.

In 1670 several Swedes were granted patents for land on *Verdrietiges hook* (Trinity Hook, Delaware) with a “proporcion of meadow ground for hay for their cattle.” They may have wanted to access the meadows for grazing as well because William Tom had previously gotten a patent for “all that marsh or meadow ground” on the hook and forbade them to cut hay “or make bridges for their Cattle to goe into that Marsh” without permission.³⁸⁸ Governor Lovelace

386 Christoph & Christoph (1980, “An order concerning John Archers land upon the Maine,” November 6, 1668), Fernow (1881, “Council Minute. Dispute over land between the Town of Harlem and John Archer,” November 6, 1668, “An order for John Archer to remaine in peacable possession of his land till the 14th day of Febr. Next,” November 21, 1668, and “An order for the releasement of John Archers cattle formerly attached”); Paltsits (1910a, November 6, 1668); Riker (1904).

387 Christoph & Christoph (1989, “Calendar of the court of sessions at Gravesend,” June 16, 1675, pg. 171).

388 Fernow (1877, “Order confirming to Olle Olleson, Niels Nielsen, Sen., and others, a former patent for land on Verdrietiges hook (Trinity Hook), Del.,” May 16, 1670, pg. 474); Fernow (1877, May 14, 1675).

allowed their patents but Tom continued to take issues with the decision, and five years later he proposed that if they were to have the meadow he should have the remainder plus use of the Commonage.

The ability of livestock to graze on wetlands was related to the firmness of their substrate. Although in the 1670s Adolph Meyer's lot on van Keulen's Hook at Harlem was "fit only for pasture, being marshy," Peter Kalm observed that in May 1749 some of the "cyperus grass or sedge" meadows near Salem, New Jersey were "marshy, and no cattle had been on them" that year (Benson, 1937, pg. 293; Riker, 1904, pg. 297). Other wetlands had naturally firm soils as was the case near Flatlands where in 1679 Danckaerts and Sluyter described the area around *Beeren* (Baren, Bear) Island as a "kind of heath, on which sheep could graze" (Murphy, 1867). Salt marsh separated the island from the mainland and could be crossed at low tide. Van Wyck (1924) noted that this marsh was underlain by a different soil than other meadows in the area, basing this belief on a 1903 soil survey which showed that the "heath" was comprised of Galveston sandy loam, described in the report as one foot of sandy loam mixed with "eelgrass turf" underlain by gravelly, sandy, soil (Bonesteel, 1904). In contrast, the Galveston clay of other area marshes was described as about two feet of "black mud" and eelgrass roots underlain by silty clay.

The impression of the area as a "heath" may have also promoted by the character of the island, which was comprised of "coarse quartz sand containing varying proportions of fine gravel and broken fragments of marine shells" that in some areas formed dunes covered with "wiry grass, cedars, and oaks" (Bonesteel, 1904, pg. 103). The island was further described by Tooker (1911) as containing sedges and only a few cedar trees acting as "coarse pasture," probably made barren by post-clearance erosion and drifting sand. A complaint was lodged in 1679 that horses were being pastured on the island contrary to the lessee's wishes but grazing seems to have been its primary use over the next century (Black, 1981).

To obtain more information on the use of wetlands as pasture, sediment cores from two tidal marshes were examined for spores of fungi known to almost exclusively colonize herbivore dung. The genus *Sporormiella*, for example, has been used by paleoecologists to estimate megaherbivore density in late-Pleistocene deposits (Feranec et al., 2011; Raper & Bush, 2009). Geoarchaeologists have also begun to include *Sordaria* and *Podospora* in their work on grazed and manured sites.³⁸⁹ Sediment cores from Saw Mill Creek Marsh, Staten Island, and Piermont Marsh were collected and previously analyzed for pollen, macrofossils, charcoal, and organic matter content in Dr. Dorothy Peteet's laboratory at Lamont-Doherty Earth Observatory (Kleinstein, 2003; Pederson et al., 2005).

The Sawmill Creek Marsh samples were taken from a core retrieved from a 117-acre salt marsh on the Arthur Kill that is currently undergoing restoration (40°36'N, 74°11'W) (Kleinstein, 2003). The brackish Piermont Marsh is about 280 acres in area and is one of the four tidal wetland sites comprising the Hudson River National Estuarine Research Reserve (Montalto et al., 2006; Pederson et al., 2005). Today the vegetation of both sites is primarily characterized by common reed, cattail, saltmarsh cordgrass, saltgrass, saltmeadow cordgrass, big cordgrass, clubrushes, and marsh elder (Kleinstein, 2003; Montalto et al., 2006; Pederson et al., 2005). Piermont Marsh is the northernmost site of *Spartina* in the New York-New Jersey Estuary.

No evidence of coprophilous fungi was found in either core within the historical period following analysis of pre-prepared pollen slides housed at Lamont-Doherty. However, this proxy alone is insufficient to determine if grazing occurred elsewhere in the marshes or if livestock numbers were simply too low to leave countable spores. Davis and Shafer (2006) reported that although spores of one coprophilous species are common in some palustrine wetland substrates from the historic period, preservation can prevent identification in other aquatic sites. Raper and

³⁸⁹ Including in the Bay of Fundy diked grasslands (Graf & Chmura, 2006), grazed forests in England (Blackford & Innes, 2006), and archaeological sites in Europe (Marinova & Atanassova, 2006; van Geel et al., 2003).

Bush (2009) also noted that concentrations of those same spores decrease with distance from the grazing site. As a result, the absence of spores from the Saw Mill Creek and Piermont marshes does not preclude their colonial-era use as pasture but together with historical materials suggests that grazing could have been located elsewhere in the marshes or that livestock numbers were low.

Conclusion

Few records named wetlands as the source of hay and pasture in New Netherland as specifically as Adriaen van der Donck's 1655 *Description of New Netherland* and Danckaerts and Sluyter's 1679 *Journal of a Voyage to New York and a Tour in Several of the American Colonies* (reviewed in Chapter 1). Among the others are November 1677 records of a controversy between Southampton and Southold, Long Island, over title to the Aquebauke Meadows on either the Great or Little Peconic Bay where the Court of Assizes temporarily allowed both towns "liberty to m[owe] Each upon the one halfe the]reof at the season of the yeare or for their Cattle to feed".³⁹⁰ In 1680 the residents of Harlem petitioned to have Colonel Lewis Morris stop mowing hay on Stone Island because

if wee are Deprived of this our Just Right, wee Shall be Destitute of foode for our Cattle In the wintertime and must be Constrynd to turne our Stocks out into the woods where wee shall be in danger of being Damnyfyed by Severall Ill conveniences that attend the Same it being the cheifest of our Pasture ground.³⁹¹

Casagrande (1997) argued that early European settlers would have been attracted to salt marshes because of an evolutionarily derived preference for open landscapes and a fear of forests instilled by mythology. This chapter suggests that the reasons may have been simpler and more

³⁹⁰ Christoph & Christoph (1983, "Town of Southampton vs. Town of Southold," November 1, 1667, pg. 62).

³⁹¹ Christoph & Christoph (1991, "Petition of several residents of Harlem that Lewis Morris be restrained from cutting hay on Stony Island, with Colonel Morris's response," July 28, 1680, pg. 353).

utilitarian by showing how the provision of hay and pasture was also a motivating factor. Hay was harvested from wetlands as early as May and as late as October, with other times being July, August, and September; Vanderbilt (1882) also reported that Flatbush residents mowed their hay in September and October.

Grazing would have taken place in a different time of year as shown by the complaints lodged against farmers who allowed their animals onto wetlands during the summer months, Kalm's insinuation that cows were typically on meadows in May, and Bogert's animals grazing in April. In further support of early spring grazing is the tendency for livestock to run at large as soon as the snow melted in March or April. Analysis of two tidal marshes for evidence of coprophilous fungi failed to determine if they were grazed and highlight the value of historical records in reconstructing past land-use. Evidence for wetland grazing remains less compelling than for haying, particularly in palustrine wetlands for which there are fewer records in general. To understand how those sites were used in Dutch-settled areas, Chapter 4 explores the colonial-era use of a palustrine wetland in the floodplain of the Kinderhook Creek, Columbia County.

Chapter 4

Case-Study: The Vly, Kinderhook, Columbia County

In the absence of historical texts, proxy records of environmental change can be used to inform historians and ecologists on the past use of wetlands. In order to clarify questions about the agricultural use of palustrine wetlands and possible impacts of mowing and grazing, this chapter uses the Dutch-settled town of Kinderhook, Columbia County as a case-study for applying proxy records of historical ecology to questions of environmental history.

Study Area

European settlement of what became northern Columbia County began in the 1650s as Dutch farmers left Beverwijck in favor of the rich bottomland along Kinderhook Creek³⁹² (Figure 1-2; Ellis, 1878; Gehring & Venema, 2009). Settlement became more systematic after the English takeover of 1664 and the election of supervisors of roads, paths, fences, and enclosures indicate advanced settlement by 1669.³⁹³ Dutch culture in Kinderhook remained relatively intact for nearly 150 years: in 1755 when the Massachusetts Reverend Samuel Chandler traveled to *Kynderhook* he described it as a “Dutch Town compact and scituate on a River much Intervale” with about 100 families, and late-eighteenth-century visitors likewise observed Dutch-

392 However, In 1755 Samuel Chandler estimated that the Kinderhook area had been settled for about 120 years, or as early as the 1630s (Munsell, 1867, “Diary of Rev. Samuel Chandler – 1755, from Gloucester, MA going to Crown Point, pg. 374”).

393 Christoph & Christoph (1980, “Grant of land near Kinderhook to Thomas Powell and others,” March 29, 1665); Fernow (1881, “Petition of Thomas Powel and others for leave to purchase from the Indians a piece of land between Kinderhook and Neutenhook; granted”); Searle (2004); van Laer (1926, October 4, 1669 and October 6, 1669).

speaking farmers working in the traditional way.³⁹⁴ English wasn't adopted as the official language until after the Revolution (Ellis, 1878).

The broad, fertile floodplain of the Kinderhook Creek—Chandler's "Intervale"—was known as the *Groote Stuk* or "Great Piece." Wet meadow may have been common in this area along the base of floodplain terraces formed by the meandering paleo-Kinderhook Creek, wetlands that elsewhere in the county now support a variety of shrubs and herbs (McVaugh, 1958). After identifying wetlands on historical maps that are currently on the National Wetlands Inventory, one such site was selected for this case-study just north of the Village of Kinderhook at the intersection of Railroad and Albany avenues (42° 23' 56"N, 73° 42' 3"W) (Figure 4-1). In 1708 this ca. 20-acre wetland was referred to as "the meadow called y^e Groot Stuck Vley"³⁹⁵ and it continued to be called the "Vly" or "Vley" into the twentieth century (Collier, 1914). Accordingly, it is referred to here as the Vly.

394 Coventry (1978); Munsell (1867, "Diary of Rev. Samuel Chandler" – 1755, from Gloucester, MA going to Crown Point," pg. 374).

395 Deed of Dirck Wessels, Albany County Deeds 5:110, February 27, 1708 and recorded April 13, 1711.



Figure 4-1. 2012 National Wetlands Inventory map of the Vly (USFWS Wetland Mapper, 2013).

The hydrogeomorphic classification system would categorize the Vly as a groundwater slope wetland with unidirectional flow northeast toward the Kinderhook Creek, though there is also at least one spring in the surrounding terrace (Duck, 1985). The site does not currently experience overbank flooding from the Kinderhook Creek, which is approximately one kilometer away and separated by a road, but at some point in the past it was likely under water as a meander of that creek or one of any number of smaller anabranching channels (note meander scars in Figure 4-2).³⁹⁶ Water is not currently directed out of the Vly through large open channels but

³⁹⁶ Walter and Merritts' (2008) survey of mid-Atlantic streams revealed that the typical pre-European-settlement riparian landscape was characterized by multi-channeled waterways with interspersed wetlands. This stands in contrast to post-milldam single meandering channels with level floodplains seen today. A long-

some small channels with barely perceptible surface flow exist within the site.³⁹⁷ The water table is routinely at or near the soil surface, resulting in a low decomposition rate facilitating the accumulation of over one meter of peat in some areas.



Figure 4-2. 1948 aerial photograph of the Vly.

time resident described the Kinderhook Creek as “meandering through the meadows and the shrubbery on its banks” (van Schaack, 1878, pg. 2) and local historian Edward Collier similarly noted that during nineteenth-century freshets “the lowlands become a great lake, dotted with many islands” (1914, pg. 369).
³⁹⁷ A 1933 USGS map shows one channel running along the southern terrace and into the Kinderhook Creek, but it may have been ephemeral.

The US Fish and Wildlife classification system identifies the Vly as a broad-leaved deciduous forested palustrine wetland on a seasonally flooded or saturated substrate. Within this system a wetland with as much as 70% nonarboreal vegetation may still be classified as forested and the Vly does contain areas of scrub-shrub and emergent vegetation. A combination of the HGM and USFWS systems for the mid-Atlantic region might classify the site as a stratigraphic slope organic soil wetland, or possibly a spring seep (Brooks et al., 2011). In June 2012 the following species were recorded (asterisks indicate non-native species; Knab-Vispo, 2012):

Trees:

Red maple (*Acer rubrum*)
Hornbeam (*Carpinus caroliniana*)

Green ash (*Fraxinus pennsylvanica*)
Elm (*Ulmus* sp.)

Shrubs:

Speckled alder (*Alnus incana* sspg. *rugosa*)
Gray dogwood (*Cornus racemosa*)
Winterberry (*Ilex verticillata*)
Spicebush (*Lindera benzoin*)
Honeysuckle (*Lonicera morrowii*)

*Buckthorn (*Rhamnus cathartica*)
Elderberry (*Sambucus nigra* sspg. *canadensis*)
Steeplebush (*Spiraea tomentosa*)
Northern arrowwood (*Viburnum dentatum*)

Forbs:

Hog peanut (*Amphicarpaea bracteata*)
Jack-in-the-pulpit (*Arisaema triphyllum*)
Nodding beggar-ticks (*Bidens cernua*)
Purple-stem beggar-ticks (*Bidens connata*)
False nettle (*Boehmeria cylindrica*)
White turtlehead (*Chelone glabra*)
Water hemlock (*Cicuta bulbifera*)
Common dodder (*Cuscuta gronovii*)
Bonset (*Eupatorium perfoliatum*)
Flat-topped goldenrod (*Euthamia graminifolia*)
Spotted Joe-Pye weed (*Eutrochium maculatum*)
Rough bedstraw (*Galium asprellum*)
Water pennywort (*Hydrocotyle americana*)
Spotted jewelweed (*Impatiens capensis*)
Blueflag (*Iris versicolor*)

Swamp loosestrife (*Lysimachia terrestris*)
* Purple loosestrife (*Lythrum salicaria*)
Square-stem monkey flower (*Mimulus ringens*)
Halberd-leaved tearthumb (*Persicaria arifolia*)
Swamp smartweed (*Persicaria hydropiperoides*)
Clearweed (*Pilea pumila*)
Broadleaf arrowhead (*Sagittaria latifolia*)
* Climbing nightshade (*Solanum dulcamara*)
Canada goldenrod (*Solidago altissima*)
Rough-leaved goldenrod (*Solidago patula*)
Wrinkle-leaved goldenrod (*Solidago rugosa*)
Late purple aster (*Symphyotrichum patens*)
Skunk cabbage (*Symplocarpus foetidus*)
Cattail (*Typha latifolia*)

Graminoids:

Tussock sedge (*Carex stricta*)
Bristly sedge (*Carex comosa*)
Bebb's sedge (*Carex bebbii*)
Dark green bulrush (*Scirpus atrovirens*)
Fowl bluegrass (*Poa palustris*)

American mannagrass (*Glyceria grandis*)
Rice cutgrass (*Leersia oryzoides*)
Reed canary grass (*Phalaris arundinacea*)
* Common reed (*Phragmites australis*)

Other:

* Oriental bittersweet (*Celastrus orbiculatus*)
Grape (*Vitis* sp.)
Crested shield-fern (*Dryopteris cristata*)

Sensitive fern (*Onoclea sensibilis*)
Cinnamon fern (*Osmunda cinnamomea*)
Marsh fern (*Thelypteris palustris*)

Historical Descriptions

A nearly identical wetland complex south of Kinderhook was drained at some point in the early twentieth century. Both wetlands are included in the current NWI (Figure 4-3) and shown on the 1686 Vrooman Map of Kinderhook (Figure 4-4). A comparison of the two sites provides additional historical information about the Vly.

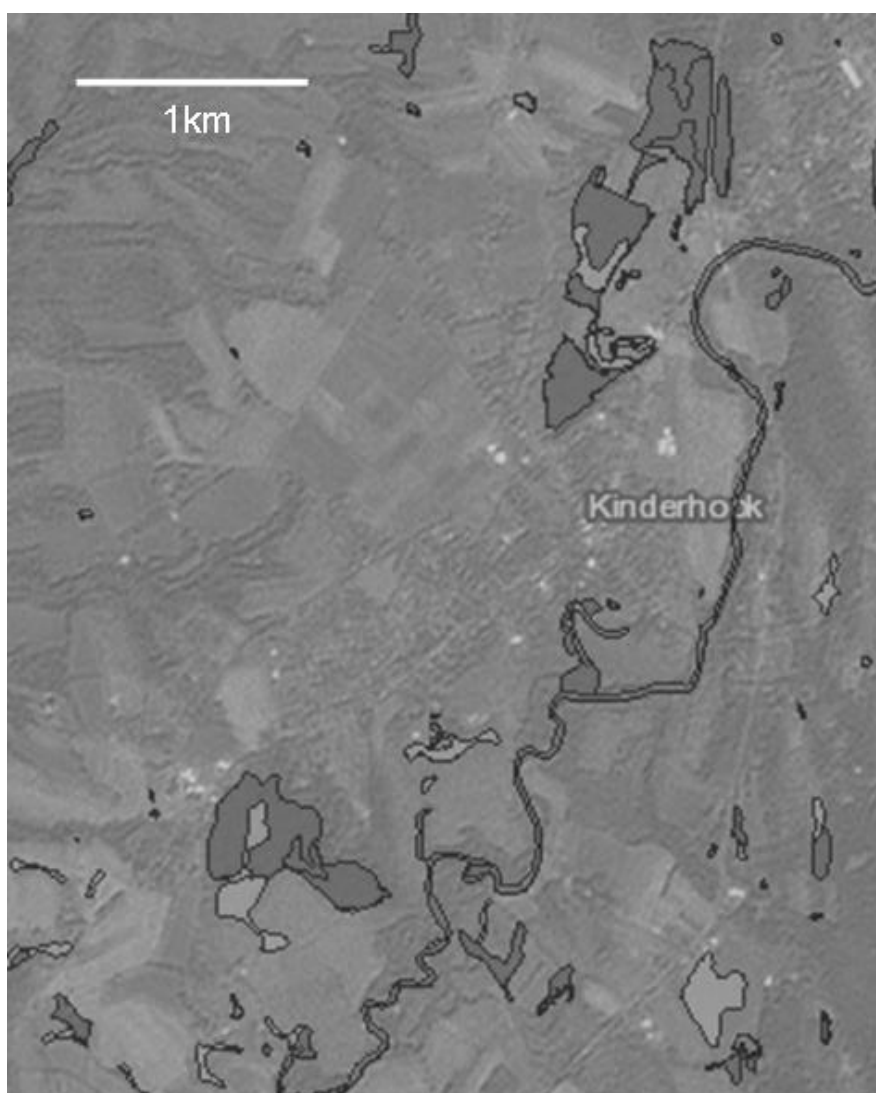


Figure 4-3. 2012 NWI for Kinderhook showing the two large wetland complexes north and south of the village (US Fish and Wildlife Service Wetland Mapper).

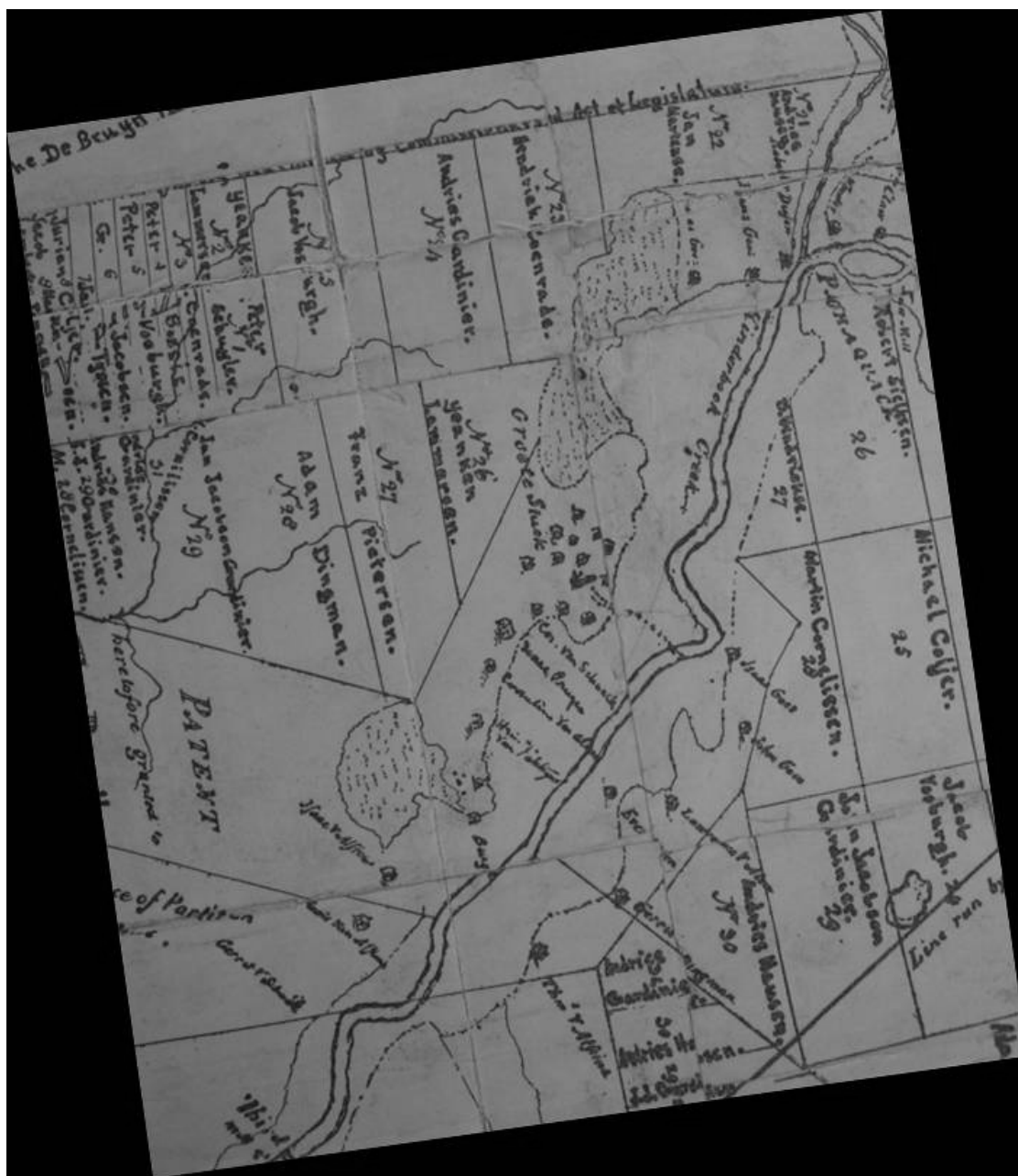


Figure 4-4. Detail of a reproduction of the 1686 Vrooman Map (rotated to align with Figure 4-3). Note the tract labeled “Patent” with its large wetland; this is the Powell Patent (Collier, 1914).

Both were labeled *Meadow* in John van Alen's 1796 copy of a 1762/3 map (Figure 4-5) and the southern wetland is termed "Meadow Land" in Rutger Bleecker's 1797 copy of a 1769 map (Figure 4-6). The Bleecker map labels creekside land as "Plough Land," suggesting that it was better-drained than the adjacent meadow and therefore arable. This meadow was owned by two proprietors of the Powell Patent in the 1670s and described as a "marsh (*vley*)" in a 1683 deed.³⁹⁸ Three years later the 70- or 80-acre "Vly or mash" was sold to a farmer from Drenthe for five beaver pelts.³⁹⁹ A few months later the new owner deeded "the half or moiety of that vley or mash" to another farmer for six pounds of money.⁴⁰⁰ At some point it became known as the "John Van Dyke Vly" and later owners prospered in dairy (Collier, 1914). The property is currently part of a farm and stables.

398 Pearson & van Laer (1918, "Agreement between Robert Orchard and Jannetie Donckes, the widow of Thomas Powell, regarding the settlement of their respective claims to land at Kinderhook," May 30, 1671); Pearson & van Laer (1919, "Deed from Jannetje Powell, widow of Thomas Powell, to Andries Hansen Scherp and Jurian Collier for land at Kinderhook," November 15, 1683, pg. 204).

399 Jan Martensen contracted for the construction of a barn on the low-lands by the creek in 1677 to be 50'x26' with side aisles, 40' horse trough, gable ends "with sloping peak," double door in front, five bents and loft beams—a typical Dutch design (Pearson & van Laer, 1918, "Contract of Harmen Bastiaensen to build a barn at Kinderhook for Jan Maertsensen," February 8, 1676/7, pg. 425).

400 A moiety or moiety title is one that does not include an entire parcel (Pearson & van Laer, 1916, "Deed from Jan Martensen and his wife to Gerrit Teunissen for one-half of the marsh on the north side of Jan Martensen's farm at Kinderhook," February 14, 1686/7, pg. 330).

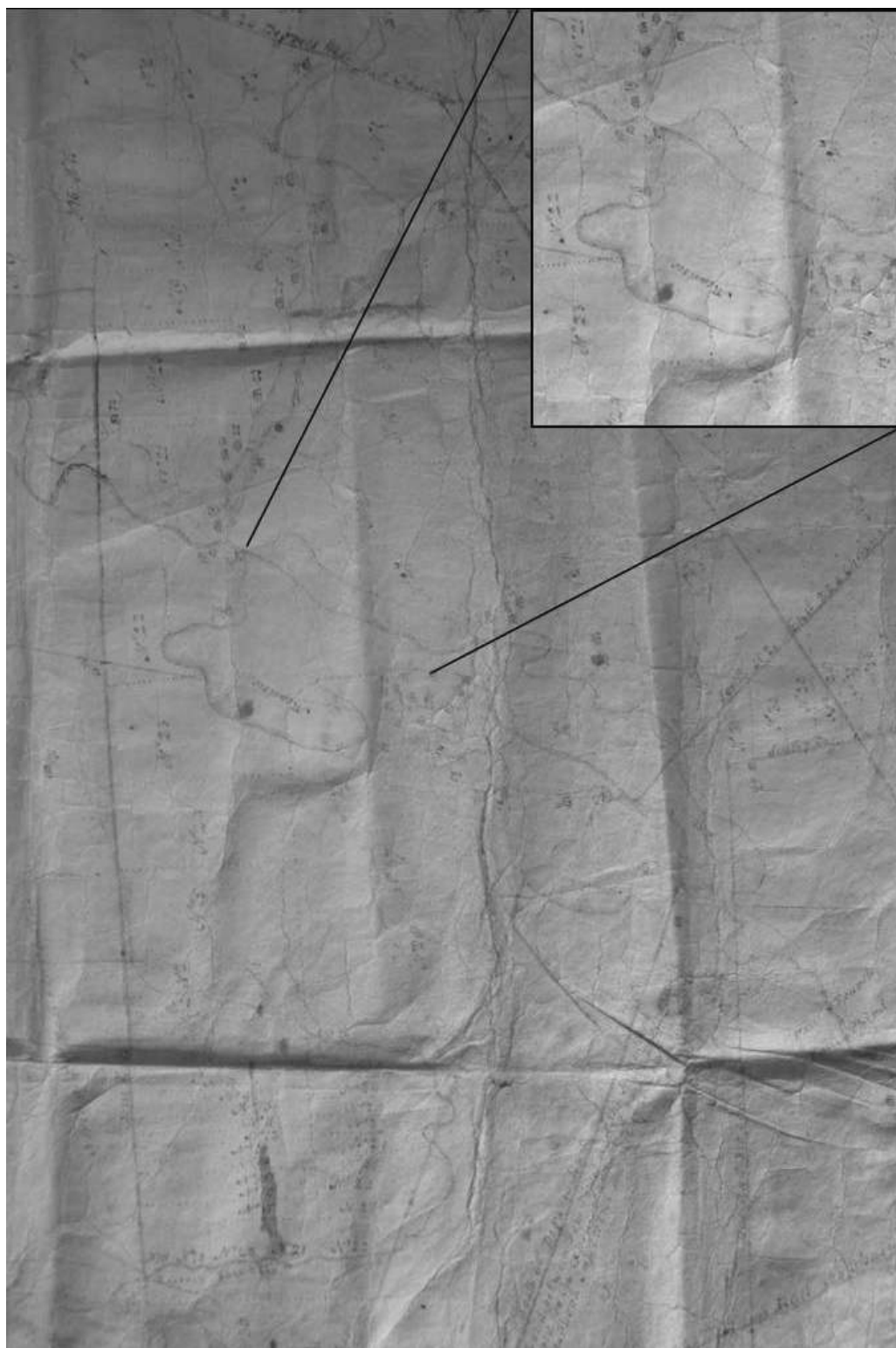


Figure 4-5. Detail of John van Alen's 1796 map (copy of a 1762/3 map held at the Columbia County Historical Society, Kinderhook, NY). The inset is a larger-scale highlight of the Vly. The John Van Dyke Vly is barely visible but is also outlined and labeled "Meadow" (Columbia County Historical Society).



Figure 4-6. Detail of the Bleeker Map of 1797 showing the John van Dyke Vly (copy of a 1769 map held at the Columbia County Historical Society, Kinderhook, NY) (Columbia County Historical Society).

The historical classification of some forested and scrub-shrub wetlands as *meadows* is supported by the notes of the local physician and farmer Alexander Coventry, who in 1787 described a farm in Kinderhook as having “a good deal of excellent meadow land, partly cleared.” In a visit to the Albany area he also saw a property with 40 or 50 acres of “good meadow land, partly cleared, but grown up again with brush.” At Coxsackie he noted a “considerable meadow” on one farm had been cleared and he later “cut down some brush in the low meadow” of his own farm at Claverack using a borrowed “brush-scythe.” These anecdotes support Thoreau’s late-nineteenth century supposition that some meadows had to be cleared before they were usable (see Chapter 1).⁴⁰¹

Much of the Vly now lies within Mills Park, a plot donated to the Village of Kinderhook by a prominent farmer and known as “the Grove”; adjacent land on “the Flats” between the Vly and Kinderhook Creek has long been farmed (Collier, 1914). Bordering the park to the northwest is a cemetery, created in 1817, and to the southeast is Railroad Avenue with houses built for employees of a steam-powered cotton mill constructed in 1850 and destroyed by fire in 1882 (visible in Figures 4-1, 4-7, 4-8; Collier, 1914; Horn, n.d.; Stott, 2007). A steam-powered railway built on that street in 1890 became electrified in 1900 and closed in 1929 (Horn, 1976; visible in Figure 4-7). The terrace surrounding the Vly were primarily forested with pine at the onset of Dutch settlement (Collier, 1914; van Schaack, 1878).

⁴⁰¹ Coventry (1978, August 12, 1787, pg. 167, October 6, 1787, pg. 170, November 28, 1787, pg. 181, and May 16, 1788, pg. 199); Foster (1999).

Methods

Core Extraction

A 50-cm Russian peat/flag corer was used to retrieve six overlapping, parallel cores within a one-meter radius. The first two cores were taken from the surface to 50cm, the second from 25cm to 75cm, and the third from 50cm to 100cm (the basal mineral layer).⁴⁰² Permission to core was granted by Kinderhook's Town Supervisor. The most recent soil survey indicates that the core site was within an area of Palms Muck (Pa), which is classified as a loamy, mixed, euic, mesic terric haplosaprist (NRCS OSD, 2011) (Figure 4-8).⁴⁰³ Palms Muck is found in the Great Lakes region and the water table is generally between 30cm above to 30cm below the surface from November to May. Vegetation may be grasses, sedges, alder, willow, dogwood, and poplar (*Populus* spp.); these soils were often drained and cultivated as pasture or truck farms (NRCS OSD, 2011). Similar to the 1929 soil survey by its predecessor (the Soil Conservation Service), the Natural Resources Conservation Service recently described this muck as typically 41 to 130cm deep in "hillside seep areas, and on backswamps of flood plains" and usually found as toeslope swamps and marshes. Two 0-100cm core sets were aligned by soil horizons and the cores labeled A1, A2, A3 ("A" cores) and B1, B2, and B3 ("B" cores). Each 1-cm interval produced a 5-cm³ sample.

402 Initially, an aluminum tube 100cm long and 8cm diameter (barrel thickness: 1mm) was driven down to the basal mineral layer. This method has been tested in many palustrine wetlands in the Northeast (Reinhardt et al., 2000) and was chosen in order to retrieve large samples (each 1-cm interval=50cm³ sample).

Unfortunately, this method resulted only in an 88-cm core (22% shortening, calculated using Morton and White's [1997] equation). This value is well beyond what Reinhardt and others (2000) considered negligible, i.e., compaction of 0 ± 1 cm. Russian peat/flag corers do not compress sediments and minimize contamination, and one was borrowed from the NYS Biological Survey.

403 The nearby Walpole sandy loam (Wa) is sandy, lighter in color, and better-drained.



Figure 4-8. 2012 NRCS soil survey for the Vly (Pa=Palms Muck); white dot is the core site (USDA NRCS Web Soil Survey).

Relative Dating Using X-Ray Fluorescent Spectroscopy

Several chronostratigraphic markers were required because this study was concerned with local-scale, high-resolution vegetation changes over the past four centuries. Among them was the relatively high concentrations of heavy metals in surficial peats that generally reflect atmospheric

deposition from pre-historical metal smelting, modern industrialization, and the twentieth-century increase in gasoline combustion (e.g., de Vleeschouwer et al., 2007; Zacone et al., 2007).

Ombrotrophic bogs are widely accepted as faithful archives of such activities because heavy metals only enter these systems through precipitation and downward migration is insignificant (Espi et al., 1997; Shotyk, 1996; Zacone et al., 2007). Minerotrophic wetlands have recently been shown to provide similar records. Lead (Pb), for example, had been thought to assimilate into minerotrophic sediments through groundwater but studies from Europe and South America show that concentrations are still relatively higher in surficial sediments—just as in ombrotrophic wetlands—and that its presence can not be attributed to natural biotic, lithologic, or hydrologic activity (Espi et al., 1997; Shotyk, 1996; Shotyk, 2002; West et al., 1997). The same has been shown for mercury (Hg) (Shotyk et al., 2003).

Measuring the concentration and accumulation of heavy metals in sediments has historically required destructive sampling and labor-intensive analyses but over the past decade X-ray fluorescence spectroscopy (XRF) has gained increasing attention as a non-destructive method. To quantitatively assess heavy metals, XRF devices are programmed to emit photons of particular energy levels to displace electrons in atoms of the target element. The device detects the excess energy released when electrons are replaced by others in higher-energy shells, and matched to an element-specific signature. Measurements are made per unit time and later converted to concentrations and accumulation rates following calibration with known samples. XRF detects elements in all phases so there is no differentiation between elemental, bivalent, or particulate Hg, for example.

Sediment samples are usually dried and homogenized (Givelet et al., 2004) but in recent years the use of XRF has expanded to include detection of heavy metals directly at the wet split-surface of cores (e.g., Richter et al., 2006; Tierney et al., 2005). Calibration is unnecessary when only a qualitative record of elemental composition is required because sequential values provide a

continuous record of relative changes. XRF core-scanning records are fast to obtain and require minimal sample preparation, making this technique increasingly popular with paleoenvironmental researchers. Benchtop XRF devices are typically used for laboratory analyses but handheld models are available for use in the field; here, a handheld scanner⁴⁰⁴ was used to assess the relative concentration of Pb and Hg in both the “A” and “B” cores. Historical records of mining, smelting, and manufacturing indicate that Pb would have increased after 1750, Hg after 1850, and both should peak again in the mid-twentieth century (Appendix A).

Each core was covered by a 4- μ m-thick sheet of SPEX Certi Prep Ultralene® Film to prevent desiccation and protect the scanner. The thin water layer that forms between the core surface and Ultralene can affect the detection of light elements but those with high atomic weights are not impacted (i.e., Pb=207, Hg=200) (Tjallingii et al., 2007). Cellulose can also reflect photons and otherwise dampen the signal returning to the XRF device and counts were normalized by the Compton backscatter peak because organic matter content of the cores ranged from 16.7% to 89% (e.g., Lowemark et al., 2011). Compton backscatter is ambiguous energy produced by the interaction of photons with additional atoms after contact with the target element and is highest in low-density materials comprised mainly of light elements, like soils. Compton Normalization returns a unitless value that provides a relative record of change. The device was programmed to optimize detection of Pb and Hg in a 3×4mm area for every 5-mm interval.⁴⁰⁵

Absolute Dating Using ¹⁴C

A single accelerator mass spectrometry (AMS) radiocarbon date was obtained for the 86-87-cm interval in Core B3 where eleven seeds from marsh bellflower (*Campanula aparinoides*)

404 Bruker Tracer III-V, borrowed from the New York State Museum's Bioarcheology Office.

405 Red filter, 40kV, 23 μ A, 60s sensing time, after a phone consultation with Dr. Bruce Kaiser, co-founder of Bruker (personal communication, 2011).

were present, providing a unique opportunity to estimate the timing of the Vly's transition to a wetland. Use of these seeds, as opposed to a bulk sediment sample, avoided the risk of hardwater or carbon reservoir effects (Birks, 2001). The seeds were dried, massed at 0.75µg, and sent to the National Ocean Sciences Accelerator Mass Spectrometry Facility (NOSAMS) at Woods Hole Oceanographic Institution (Woods Hole, MA).⁴⁰⁶ The date was converted into calendar years before present (ca BP) with CALIB software, REV 6.0.0 (Stuiver & Reimer, 1993), using the INTCAL09 calibration dataset (Reimer et al., 2009).

Dry Bulk Density and Carbon Content

Dry bulk density (DBD) and carbon content were not measured above 40 cm because it was impossible to retain all the water from over-saturated samples. From the "A" cores a 1cm³ sample from each 1-cm interval was dried in an oven at 65°C for 5 hours, the dry mass measured, and DBD calculated by dividing the dry mass by wet volume. The amount of organic matter was measured using carbon coulometry⁴⁰⁷ on 15mg of peat from each 1-cm interval of the "A" cores. Each sample was oven-dried at 65°C, ground into a homogeneous powder, and combusted at 850°C; the liberated CO₂ flowed into a titration cell and Total Carbon (TC) measured in micrograms. This value was converted to percent by comparison to the original sample mass. The same procedure was used to measure Total Organic Carbon (TOC) but the temperature was decreased to 450°C. Total Inorganic Carbon (TIC) was calculated by subtracting TOC from TC, and the amount of organic matter (OM) calculated by doubling TOC (carbon usually comprises half the mass of cellulose).

⁴⁰⁶ Submission date August 27, 2012; receipt #109298.

⁴⁰⁷ CM5200 Autosampler Furnace, UIC, Inc. Coulometrics. Used in the Center for Stratigraphy and Paleontology at the NYS Museum.

Plant Macrofossils

Plant macrofossils are fragments of vegetative material visible to the naked eye and include seeds, fruits, achenes, parts of stems and leaves, etc. Macrofossils can often be identified to genus and species and because they don't move far from their source they provide a detailed, local-scale vegetation record (Birks & Birks, 2000). However, the presence of macrofossils only indicates proximity to source and not abundance of the plant in question. Samples of 5cm³ were taken from every 1-cm interval of the "B" cores and deflocculated in 5% sodium hexametaphosphate overnight before washing through 250-, 125-, and 53- μ m sieves.

Residues from the 250- μ m screens were examined under a dissecting microscope, identified, and stored in vials with ultrapure water. Identification was aided by a comprehensive list of species found in Columbia County wetlands compiled from Woodworth (1839; 1840), McVaugh (1935; 1958), and Knab-Vispo (2009; 2012) (Appendix B). The Vly was deemed appropriate habitat for 667 of 728 possible species (58 are currently established). Fifty-three of those species produce propagules too small to see with a dissecting microscope (e.g., orchids [Orchidaceae] and some ferns [Pteridophyta]). Seed and fruit images for 77% of the remaining 614 species were obtained and served as the primary reference material in this study. Other references included illustrated texts by Breggren (1981), Martin and Barkley (1961), Montgomery (1977), and Harlow (1946).

Pollen, Non-Pollen Palynomorphs, and Coprophilous Fungi

Pollen provides a regional-scale perspective on vegetation and is useful for identifying changes in upland plant cover (Bennett & Willis, 2001). Brown (1988, pg. 425) determined that "backswamp bogs and cut-off paleochannels" like the Vly are suitable for pollen analysis but

because the Vly is sheltered on three sides by 20-m terraces and portions are forested, pollen is probably only suitable for reconstructing vegetation within 50 to 100m of the core site (Binney et al., 2005; Waller et al., 2005). Furthermore, upland understory and herbaceous pollen found in such sites is likely to be scarce and originate within 10m from the wetland edge (Waller et al., 2005). Lastly, Palms mucks are known to support scrub-shrub vegetation like alder and willow that form woody peats unsuitable for pollen preservation (Barthelmes et al., 2006; Barthelmes et al., 2010; Prager et al., 2006).

Pollen is included in this study in order to provide additional chronostratigraphic evidence in the non-woody peat above 40cm, so only pollen of vegetation known to provide this information was identified. Specifically, a common method for estimating the time of European settlement in North America is the rise in docks and sorrels, plantain, and ragweed (*Ambrosia* spp.), which are rapid colonizers of disturbed open lands (e.g., Faison et al., 2006; Russell et al., 1993). Docks, sorrels, and plantain are especially high pollen-producers (Broström et al., 2004), but the sheltered location of the Vly may have prevented much of it from entering the site. Arboreal species used as markers in the Northeast include the decline and disappearance of chestnut (*Castanea dentata*), which died out in the early-twentieth century, and the increase in birch following European settlement (Russell et al., 1993). Other readily identified pollen and non-pollen palynomorphs (NPPs) were counted including those of alder, birches (Betulaceae), pines (Pinaceae), monolete and trilete spores representing the ferns (Pteridophyta), and coprophilous fungal spores.

It is assumed that relatively high amounts of coprophilous fungal spores in the Vly, like *Sporormiella*, *Podospora*, or *Sordaria*, indicate grazing (manuring was unlikely to occur in palustrine wetlands given their early reputation as naturally fertile and the general lack of colonial-era manuring even in upland fields). Studies on woody peats have also benefitted from including such NPPs in their multi-proxy toolkit, at times identifying 2.6 times more NPPs than

pollen grains (Barthelmes et al., 2006; Prager et al., 2006). Pollen was extracted following the standard procedure of Faegri and Iversen (1989). From every other 1-cm interval from the “A” cores, 1cm³ was measured into a 15-mL plastic centrifuge tube. The following steps were then completed in succession:

- 1) deflocculation and removal of humic colloids with 10% hot KOH;
- 2) dissolution of carbonates with 10% hot HCl;
- 3) dissolution of silicate minerals with 49% hot HF;
- 4) dehydration with glacial acetic acid;
- 5) digestion of organic matter with acetolysis;
- 6) dehydration with 95% ethanol and tertiary-butyl alcohol;
- 7) residue mounting in silicone oil;
- 8) analysis at 400× magnification

Although most palynological studies count at least 300 grains per sample, 100 to 200 grains is all that can be expected from woody peats (Barthelmes et al., 2006). At least 100 grains were counted per sample and identified primarily with aid from Kapp’s (1969) guide. Identification of spores was made using images published by van Geel and others (2003).

Phytoliths and Diatoms

Phytoliths are siliceous cell casts and interstitial silica deposits found in plant tissue and along with macrofossils reflect local-scale vegetation. These fossils are often taxonomically-diagnostic to the subfamily and below for grasses (Gramineae). Phytolith analysis is a relatively new proxy measure of vegetation change and the unique characteristics of these fossils suggest their potential use in irregularly-flooded wetlands or those with decomposed woody peats. Specifically, they are relatively insoluble and inflammable, unaffected by dessication and saturation, and stratigraphy remains intact even in repeatedly-burned wetlands.

Several phytolith morphotypes may be found within a genus, species, and even individual plants, and the same morphotype may be found in many taxonomic groups (Rovner, 1971).

These issues of multiplicity and redundancy limit the number of diagnostic morphotypes (usually short cells) and a generalized classification scheme was therefore used. Twiss, Suess, and Smith (1969) created the first phytolith classification scheme for three grass subfamilies and subsequent systems validate this early attempt; Fredlund and Tieszen (1994), for example, successfully used a general classification scheme to reconstruct grassland types in the North American Great Plains. Piperno (2006) further refined the scheme with descriptions of phytoliths from twelve grass subfamilies.

The following are subfamilies of interest to the Kinderhook case study:

- 1) The Pooideae includes the cereals, tropical high-elevation grasses, and lawn/pasture grasses. Short cells include circular, rectangular, elliptical, acicular, crescent, circular crenate, and oblong forms; elongate wavy forms are especially diagnostic (Twiss et al., 1969).
- 3) The Panicoideae includes tall tropical grasses and those of the eastern North American prairie. Short cells include short-shaft bilobates, crosses, and cylindrical polylobates (Twiss et al., 1969).
- 4) The Ehrhartoideae includes rice cutgrass (*Leersia*), a wetland-affiliated genus present in eastern North America. This subfamily has “scooped” bilobates and crosses (Piperno, 2006).
- 5) The Arundinoideae includes common reed, a variety of which is invasive in North American wetlands. Brown (1984), Ollendorf, Mulholland, and Rapp (1988), and Mulholland (1989) found that leaves of common reed contain abundant saddle-shaped and short trapezoids. The only other subfamily that contains similar shapes is the xerophytic Chloridoideae. Therefore, the appearance of these shapes in this wetland may be interpreted as the establishment of common reed.

Cyperaceae produce diagnostic phytoliths at the family-level described by Ollendorf (1992) as conical with pointed apices and psilate surfaces; there may be more than one apex, or the main apex may be surrounded by smaller “satellite” apices. Phytoliths from achenes tend to be flat, granulate, and geometrically shaped (Piperno, 2006). Piperno (2006) also describes a few other relevant morphotypes: the horsetails (Equisitaceae) produce epidermal sheets with granulate or psilate surfaces; some ferns (Polypodiaceae) produce very long (over 70µm), flat-based

phytoliths with parallel, undulating ridges on top; conifers, including hemlock (*Tsuga canadensis*), produce silicified tracheids with pitted sides. Few diagnostic forms are currently known for woody angiosperms.

Phytolith samples were taken simultaneously with macrofossil samples by retaining the <53 μm fraction obtained from sieving. The liquid was prepared according to the standard wet digestion method modified from Piperno (2006), Horrocks (2006), and observed in workshops at the 8th Annual International Meeting on Phytolith Research held in Estes Park, CO (September 2011). This procedure yields more intact and representative samples than do other methods (Lentfer & Boyd, 1998) and involves the following sequential steps:

- 1) removal of clay-sized particles by decanting;
- 2) concurrent digestion of organic matter with 70% hot HNO_3 and dissolution of carbonates with 30% hot HCl ;
- 3) removal of humic colloids with 5-50% cold KOH ;
- 4) dehydration with 95% ethanol;
- 5) density separation of silicates with sodium polytungstate (2.35g/mL);
- 6) residue mounting in glycerin;
- 7) analysis at 400 \times magnification.

Two-hundred diagnostic phytoliths were counted per sample, as recommended by Strömberg (2006).

Charcoal

Charcoal was analyzed because some wetlands may have been burned to clear woody growth. Warden (1802, pg. 6) also documented a fire in the Vly that “burned for a month” in the late-1790s and would have left charcoal for use as a chronostratigraphic marker. In non-varved sediments a large quantity of charcoal in a given core interval represents a “fire event,” as opposed to a single fire, because each interval likely represents more than one year. Whitlock and Larsen (2001) agreed that local fire events are adequately reflected by macroscopic charcoal

$\geq 125\mu\text{m}$ in diameter collected at 1-cm intervals. They identified fire events as >50 such particles per cubic centimeter of sediment⁴⁰⁸ and the total number of charcoal particles $>250\text{-}\mu\text{m}$ diameter was therefore counted from each macrofossil sample.⁴⁰⁹ Evidence for regional fires was obtained by counting microscopic charcoal on pollen slides, which are generally between 5 and $20\mu\text{m}$ and therefore capable of being transported long distances by wind and the convective uplift of intense fires (Clark, 1988).

Results

Peat Characteristics

The following soil sequence was observed:

0-40cm: Oa1 horizon, sapric 2.5Y 2.5/1 (very wet, unconsolidated, dark; characterized by Cyperaceae rhizome nodules and some rhizomes of common reed)

41-60cm: Oa2 horizon; hemic 5YR 2.5/2 (firm, woody peat; characterized by wood fragments and radicels)

61-85cm: Oa3 horizon, fibric (firmer, woody peat; common reed displacement peat at 67-70cm)

> 86cm: Cg horizon, mineral soil, gleyed loam (firmest, alternating gray clay with brown, and black peat)

Typical dry bulk density for Palms muck is ca. 0.3 g/cm^3 in upper sediments and $0.4\text{--}0.6\text{ g/cm}^3$ in lower sediments (NRCS OSD 2011). This is slightly denser than what was found for the Vly cores, which did not rise above 0.2 g/cm^3 until 80cm depth; the maximum DBD was between 80 and 90cm and peaked at 0.5 g/cm^3 . However, the general downcore trend is one of increasing

408 See also Long et al. (1998) and Millsaugh & Whitlock (1995).

409 The $125\text{-}\mu\text{m}$ fraction was retained for future study because counting particles of this size proved to be extremely time-consuming. Because this fraction was not included in the analysis, the CHAR procedure of Whitlock and Larsen (2001) was not followed. However, by including particles above $250\mu\text{m}$, this study is still more robust than many paleoecological studies that count only microscopic charcoal particles. Furthermore, as will be discussed in Results, microscopic charcoal was not counted for the full 100-cm combined core length—it would be erroneous to apply CHAR only to the 60-cm section where both sizes were counted.

density, which is expected in a wetland where dewatering and compression of peat occur as deeper layers are buried (Figure 4-9). Total Carbon generally and gradually decreased downcore until a dramatic oscillation between 80 and 90 cm (Figure 4-9). This zone had obvious gray clay striations and a minimum carbon content of 8.05% existed between 86 and 87cm. It is possible that these clay layers represent deposits from overbank flooding of the paleo-Kinderhook Creek or one of its smaller paleochannels.

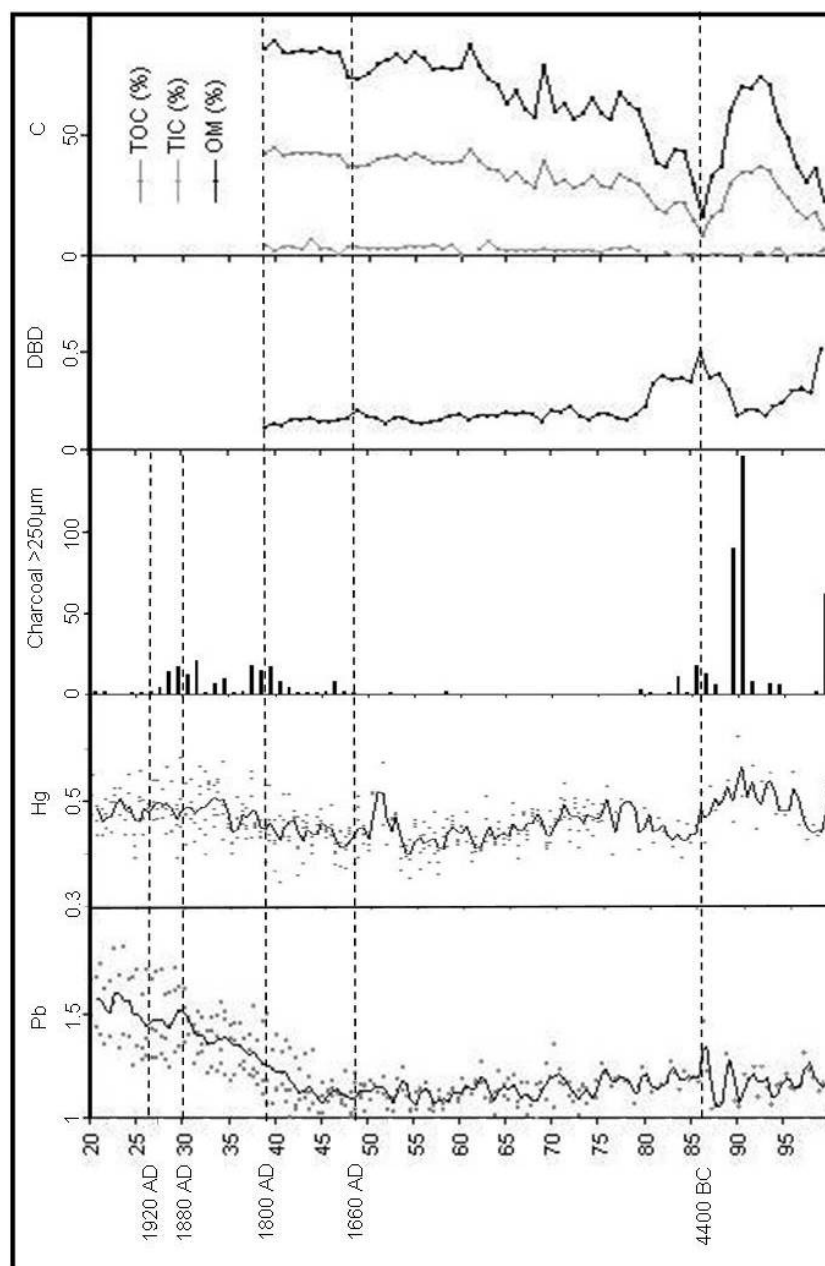


Figure 4-9. Pb and Hg content (Compton-normalized counts per second); charcoal >250µm (pieces per 5cm³); dry bulk density (g/cm³); and carbon content (percent). Measurements were not taken for Pb or Hg above 20cm or DBD and C above 40cm because the peat was too wet to be sampled reliably.

Chronostratigraphy

A clear and sustained rise in Pb began ca. 42cm and marked the gradual increase in local iron manufacturing after 1750 (Figure 4-9). No clear rise in Hg was seen, perhaps because prevailing westerly winds prevented assimilation of extralocal emissions. Hg mirrored fluctuations in TOC/TC and charcoal that could be attributed to the affinity of Hg for soil organics and/or the volatilization of Hg during biomass burning (Pirrone et al., 1998; Veiga et al., 1994). Significant increases in charcoal are common in post-European northeastern sediments and ca. 1660 was indicated by sustained presence of charcoal above 50cm (Figures 4-9 and 4-10; Russell et al., 1993). Wildfires during six severe droughts known from the lower Hudson Valley after 1633 may have also contributed charcoal; charcoal is common in regional sediment cores during times of drought and fire-frequency did increase in the metro-New York City area during twentieth-century droughts (Degaetano, 1999; Pederson et al., 2005; Pederson et al., 2012). The corresponding rise in coprophilous fungal spores of *Sordaria* above 48cm has also been interpreted elsewhere in North America as an indicator of European livestock (Figure 4-11; Davis & Shafer, 2006).

Increasing charcoal counts above 41cm probably reflect drought from the 1760s through 1770s and again in the 1790s identified through analysis of Hudson Valley tree-rings and contemporary anecdotal evidence (Breugel, 1994; Cook & Jacoby, 1977; Coventry, 1978). The particularly high charcoal count at 39cm likely indicates the late-1790s *in situ* fire reported by Warden (1802) and the presence of weedy chenopods and wood sorrel (*Oxalis stricta*) above that interval could be from clearance of the adjacent terrace (including for the cemetery in 1817) (Figures 4-11 and 4-12).

Sustained high charcoal above 30cm could be due to village-expansion up Albany Avenue in the late-nineteenth century, an 1880 fire that burned a part of the village, an 1882

cotton factory fire adjacent to the Vly (that was provided initial macroscopic particle input, followed by secondary input from downslope in washing), and the 1890 introduction of the Hudson-Kinderhook steam-powered railway adjacent to the Vly (which would have produced ash until electrification in 1900).

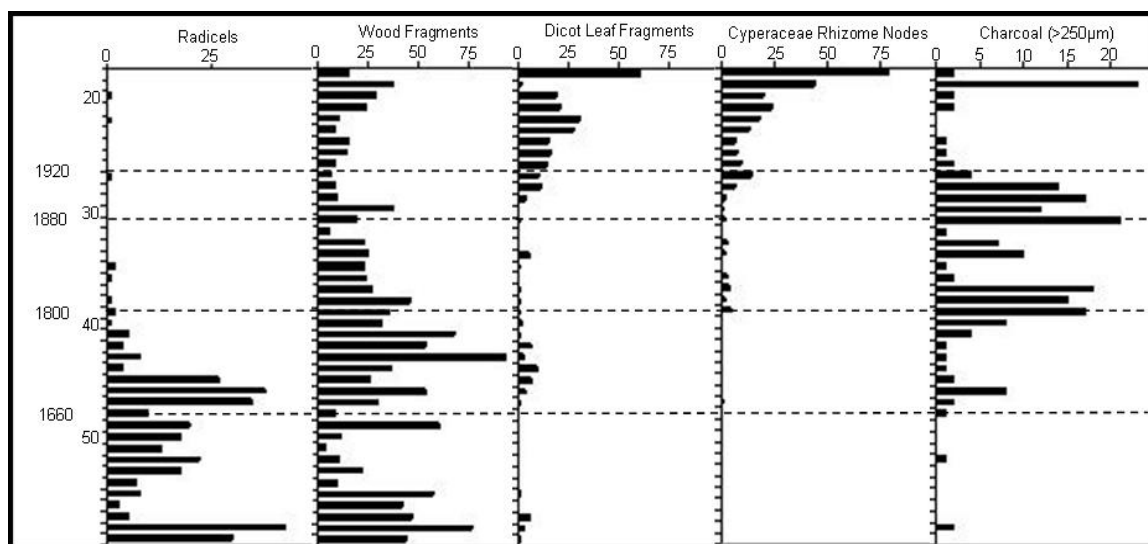


Figure 4-10. Selected macrofossil counts per 5 cm³, presented as total counts. Note: the volumes of samples 0-10cm and 10-20cm are more than 5 cm³.

Lead was a common gasoline additive until the 1970s and the increase in Pb above 26cm could be related to increasing automobile use after 1920. This approximate date is supported by the contemporaneous disappearance of chestnut that was gone from the Vly by the 1920s (Duck, 1985) (Figure 4-11). Furthermore, phytoliths from common reed and seeds from purple loosestrife appear around this time and McVaugh (1958) observed them spreading in Columbia County in the mid-twentieth century (earlier botanical surveys of Kinderhook did not make note of either [McVaugh, 1935; Woodworth, 1839; 1840]; Figures 4-12 and 4-13). The lack of a

significant rise in Hg in this period, however, suggests that mid-twentieth century sediments are above 20cm.⁴¹⁰

NOSAMS returned a high-resolution ¹⁴C date of 5580±30 BP for the marsh bellflower seeds at 86-87cm, indicating the Vly became a marsh between 6316-6399 cal BP (ca. 4400 BCE). Chou and Peteet (2010) found charcoal and macrofossil support for a warmer and drier climate below this interval at Piermont Marsh and cited other cases with palynological evidence. Shoreline reconstructions for a western Massachusetts pond also indicated regional-scale water-level fluctuations between ca. 10,400 and 6,600 cal BP with an increase between 6,400 and 5,600 cal BP (Newby et al., 2009). Combined with the presence of charcoal below the AMS date these results suggest that regional droughts may have resulted in fires in the immediate basin before higher water levels allowed the establishment of obligate wetland plants as marsh bellflower.

Linear interpolation between the AMS date and the year 1800 AD at 39cm gives an accumulation rate of approximately 0.01cm per year in the woody peat (1cm=100 years). This is unlikely, however, because other alder peats have been shown to accumulate around 0.3cm/yr (Barthelmes et al., 2006; Barthelmes et al., 2010; Brown, 1988). Furthermore, Webb and Webb's (1988) survey of nearly 300 small Northeastern lakes and mires concluded that accumulation rates of less than 1cm per century indicated sedimentary hiatuses. In a basin that transitioned from lake to peatland Muller and others (2012) considered an entire alder carr phase to be a hiatus.

⁴¹⁰ Cesium was also measured with XRF (diagram not shown) and the 1960s "bomb pulse" was not detected.

Page 167 captions:

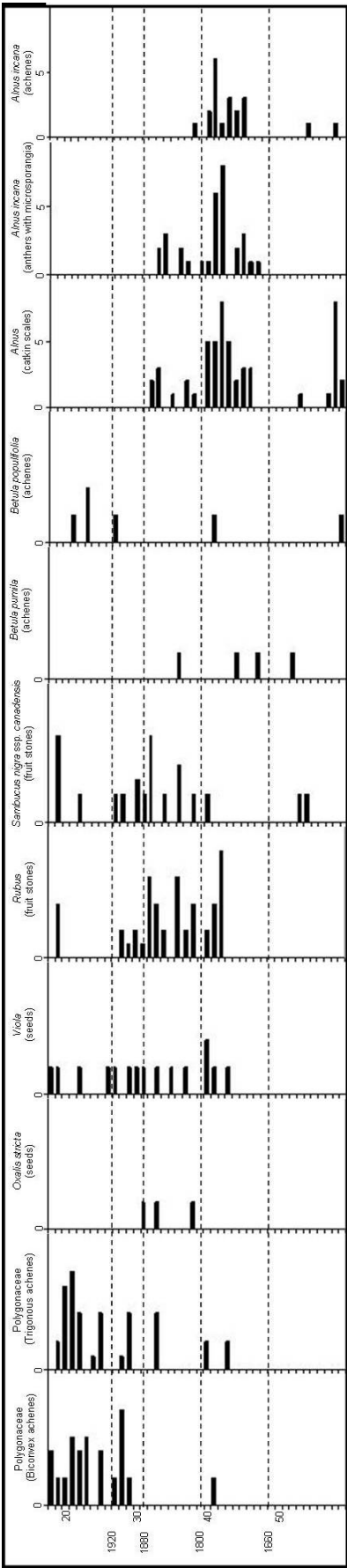
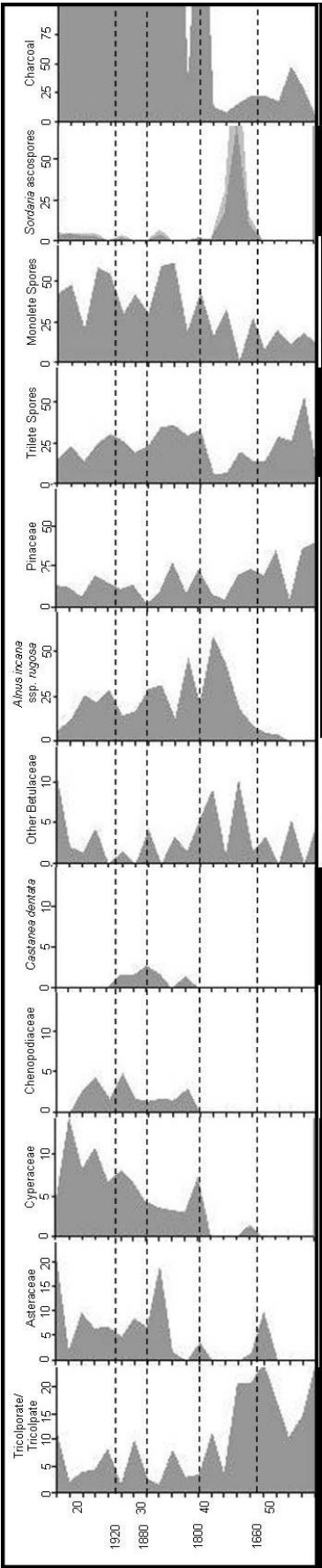
Figure 4-11 (top). Pollen spectra. Note: the light-gray area under *Sordaria* is the percentage of total pollen sum if spores tentatively identified as *Sordaria* are included. All pollen and NPP types are expressed as percentages of the total pollen count.

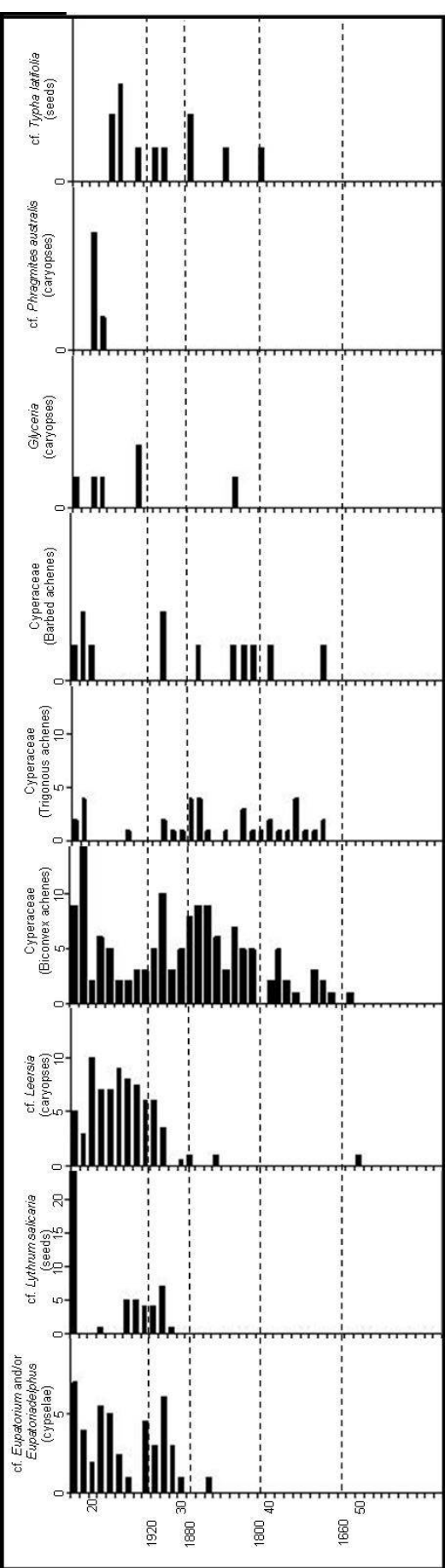
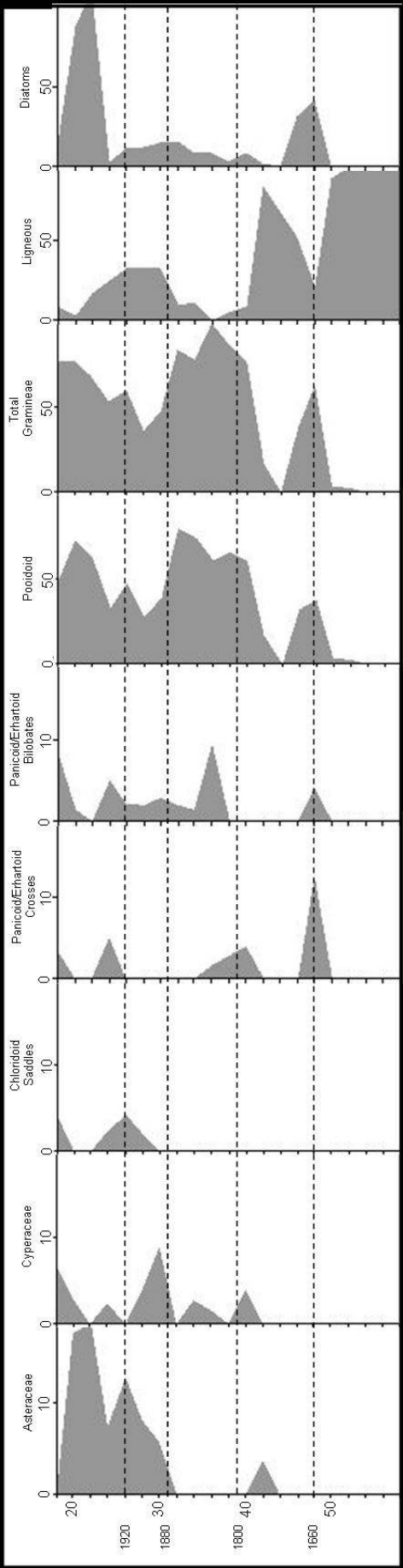
Figure 4-12 (bottom). Macrofossil counts per 5cm^3 presented as total counts. Note: the volumes of samples 0-10cm and 10-20cm are more than 5cm^3 .

Page 168 captions:

Figure 4-13 (top). Phytolith spectra. Morphological types are normalized as percentages of the diagnostic short cell total.

Figure 4-14 (bottom). Macrofossil counts per 5cm^3 presented as total counts. Note: the volume of samples 0-10cm and 10-20cm are more than 5cm^3 .





Vegetation Zones in the Historic Period

Macrofossils and macrofossil charcoal were analyzed for the full 1-m length of the core but other fossils were only analyzed within the 0 to 60-cm interval determined to encompass the historical period. Organic fossils were best preserved in the sedge peat above 40cm, including rhizome nodes and achenes of *Carex*. Wood fragments in the peat between 50 and 80cm were small and probably from alder and other shrubs. Macrofossils and macroscopic charcoal were nearly absent in the woody peat and give each spectra a bimodal appearance. Charcoal and obligate and facultative wetland species produced the most bimodal distributions, with alder fossils present in the most intervals. Alder pollen and macrofossils are presumed to be local because pollen is most abundant within 100 to 200m of a stand and achenes are not transported very far in wind (McVean, 1955; Salmi, 1962; Waller et al., 2005). Pteridophytes were consistently present because ferns produce great quantities of resistant spores; monolet spores were most likely supplied by species like crested wood fern, sensitive fern, and marsh fern, and trilete spores by cinnamon fern (Figure 4-15).

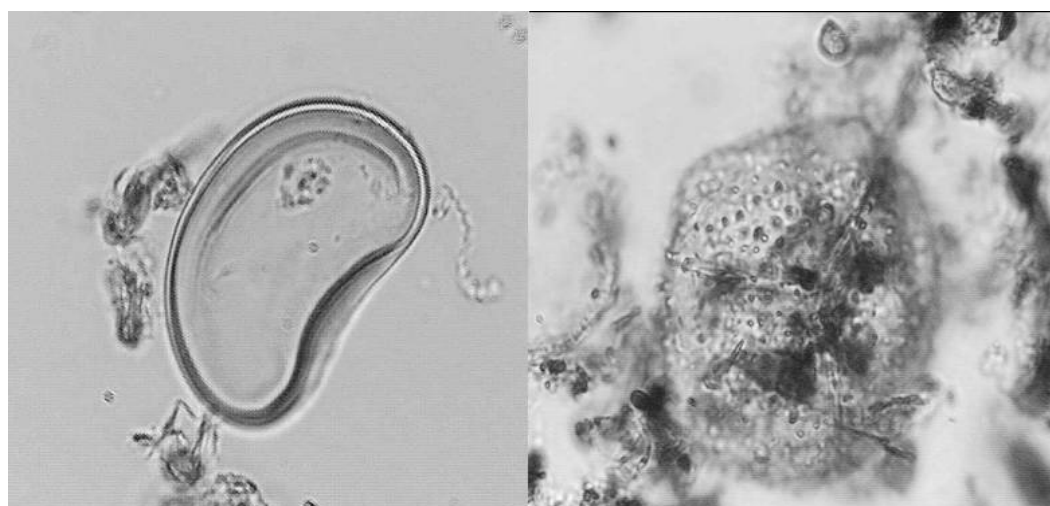


Figure 4-15. Monolet (L) and trilete (R) spores.

Bisaccate pollen grains probably representing white pine (*Pinus strobus*) were also common in every interval, most likely because it is highly resistant to decay (Figure 4-16). The general pollen category “Tricolporate/Tricolpate” encompassed many dicots and showed that broad-leaved plants have generally been present in the Vly. Without further identification, however, it is impossible to distinguish between forested and scrub-shrub cover. Dicot leaf fragments were included as a potential proxy for light levels but the taphonomic difference between the Oa1 and Oa2 horizons cast doubt on its reliability.



Figure 4-16. Pinaceae pollen grain

60-50cm

This forested or scrub-shrub zone was characterized by an abundance of ligneous phytoliths, wood fragments, radicels, some dicot leaf fragments, alder catkin scales and achenes, and fruit stones of elderberry (Figures 4-17, 4-18, 4-19, and 4-20). The length of this phase and its exact character are unknown because of poor fossil preservation.



Figure 4-17. Wood fragments.



Figure 4-18. Alder pollen grain.



Figure 4-19. Alder achenes (dark); birch achene (winged).

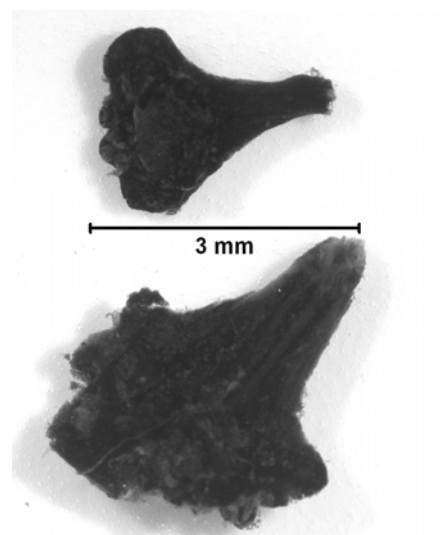


Figure 4-20. Alder bracts.

50-46cm

An open wetland phase was indicated by an abundance of diatoms and grasses, including the sun-loving wetland-obligate rice cutgrass that was identified by a caryopsis at 50cm and cross-shaped and bilobate phytoliths indicative of the *Erhartoideae* (Figures 4-21, 4-22, and 4-23). Asters and temperate cool-season Pooid grasses were also present. Sedges, primarily *Carex*, appeared in the macrofossil record at 49cm and dicot leaf fragments were absent. It is within this

phase that European colonists arrived in Kinderhook as evidenced by the beginning of the constant presence of macroscopic charcoal and rise in Betulaceae above 46cm (Figures 4-24 and 4-25; Figure 4-19 also shows a birch achene). Macroscopic charcoal values were not sufficiently high to indicate burning of the Vly itself but the introduction of the coprophilous fungi *Sordaria* at 48cm suggests that livestock were present at a low density.



Figure 4-21. Rice cutgrass caryopses.

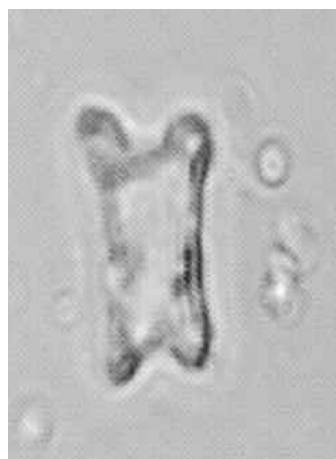


Figure 4-22. Cross-shaped phytolith.



Figure 4-23. Bilobate phytolith.

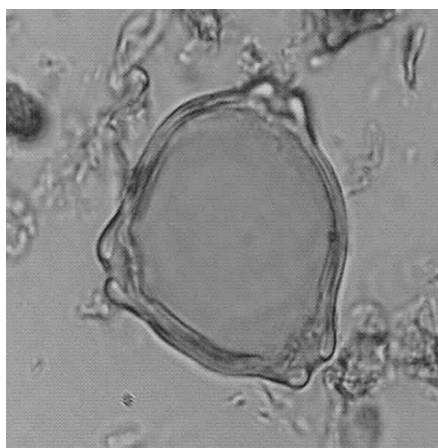


Figure 4-24. Birch pollen grain.



Figure 4-25. Birch pollen grain.

46-40cm

The absence of diatoms and Panicoid/Erhartoid phytoliths indicated this phase was drier than the preceding one. Grasses, sedges, ferns, chenopods, knotweeds (Polygalaceae), and violets (*Viola* spp.) became established, an assemblage known from alder thickets in the Great Lakes region (Cohen & Kost, 2007). Alder is strongly indicated by ligneous phytoliths, wood fragments, radicels, dicot leaf fragments, catkin scales, achenes, and anthers with microsporangia. Blackberry and elderberry were also present. The high concentration of the coprophilous fungi *Sordaria* at 46cm (48%) suggested that European settlers allowed a high density of livestock to graze within the Vly (Figure 4-26). Davis and Shafer (2006), for example, reported that while concentrations of another coprophilous species in aquatic sites typically do not exceed 4% they can reach 50% in livestock enclosures.

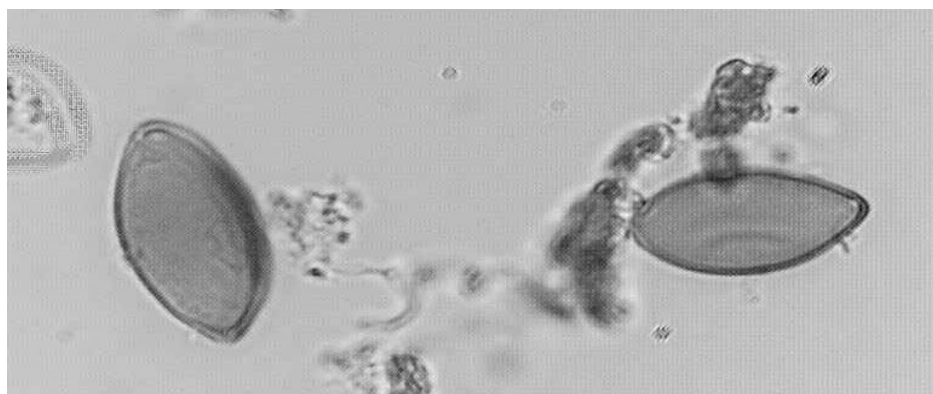


Figure 4-26. *Sordaria* ascospores.

40-0cm

A return to wet conditions was indicated by increases in diatoms, rice cutgrass, smartweeds, cattail, and asters like boneset (*Eupatorium* spp.) and Joe-Pye weed (*Eutrochium* spp.) (Figures 4-27, 4-28, and 4-29). Alder was present but less common than in the preceding zone. Sedges, again mainly *Carex*, remained prominent (pollen, macrofossils, rhizome nodes comprising the peat) (Figures 4-30, 4-31, and 4-32). The abundance of dicot leaf fragments was likely due to preservation rather than closing of the canopy. Purple loosestrife and common reed were present above 30cm and chestnut disappeared above 26cm (Figure 4-33). Particularly wet conditions were indicated above 30cm by high amounts of asters, rice cutgrass, smartweeds, and sedges.

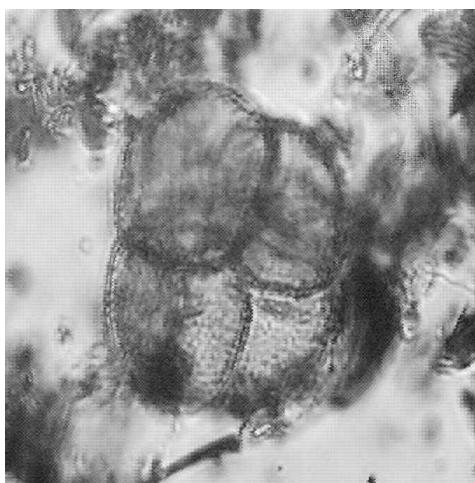


Figure 4-27. *Typha* pollen tetrad.

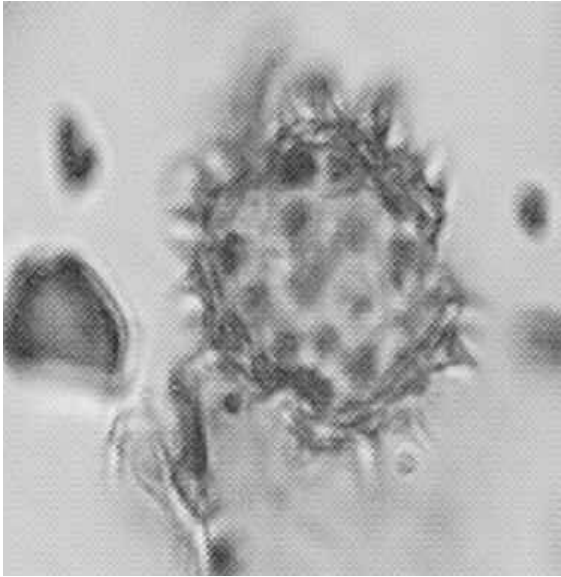


Figure 4-28. Aster pollen grain.

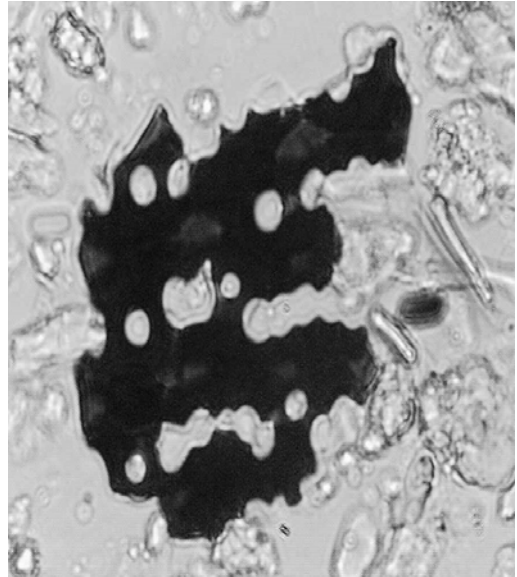


Figure 4-29. Aster "perforation plate."

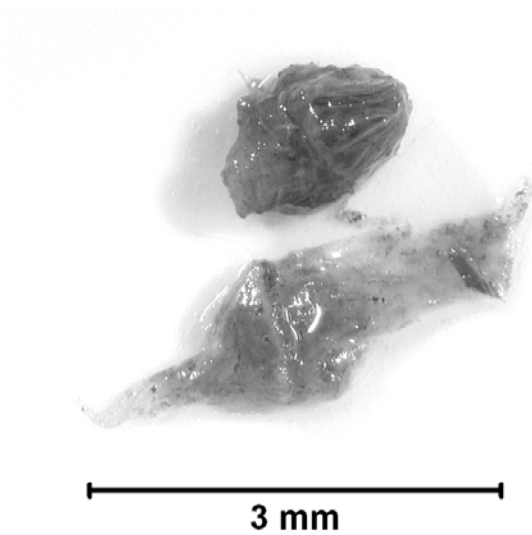


Figure 4-30. Cyperaceae rhizome nodes.



Figure 4-31. Trigonous Cyperaceae achenes.

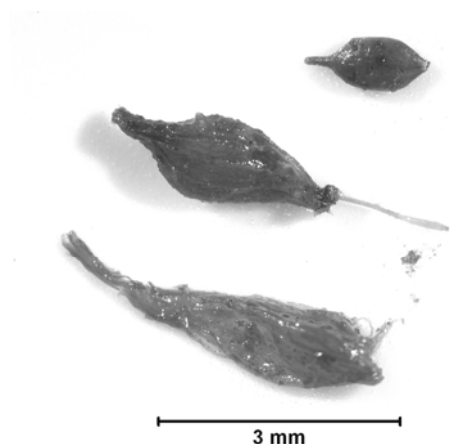


Figure 4-32. Sedge achenes in perigynia (bottom), biconvex achene of cf. *C. scoparia* (top).

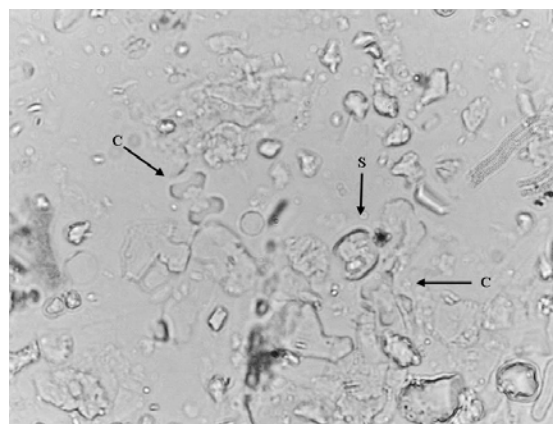


Figure 4-33. Cross- (C) and saddle- (S) shaped phytoliths from 0-10cm, indicating common reed.

Discussion

Pokorny, Klimesova, and Klimes (2000) used similar methods as those presented here to reconstruct a spring-fed oxbow surrounded on three sides by a terrace in central Europe. When the oxbow contained open water, remains of algae and aquatic plants were followed by those indicative of a eutrophic fen with peat accumulation. Later, an oligotrophic sphagnum mire formed that was subsequently colonized by black alder (*Alnus glutinosa*) to create a fen carr.⁴¹¹ Alder repeatedly declined and became reestablished after the initial development of carr and this cycle has been shown in many other European floodplain wetlands: periods of open wet meadow alternate with periods of black alder carr every ca. 120 years in relation to the tree's life span (Barthelmes et al., 2010). Once initiated, the transition from open wet meadow to closed carr may only take 20 years.

⁴¹¹ The term *carr* is Scandinavian, and is used primarily to describe forested wetlands in Europe.

Individuals of speckled alder are comprised of up to 20 clonal stems 10-17m high and 17-25cm in diameter (Furrow, 1979; Huenneke, 1987). Although this species is a shrub rather than a tree like black alder, and each stem may live only 25 years, the clone itself can live for a century. Alder is shade-intolerant like other pioneer species but it has the highest tolerance for soil saturation, making it one of the most common woody species in wetlands. However, establishment of alder on wetlands in Europe, Japan, and the Adirondack Mountains of New York occurs only when sufficiently dry microsites are available, e.g., tussocks (Barthelmes et al., 2010; Brown, 1988; Hurd et al., 2001; McVean, 1955). Alder promotes drying by increasing evapotranspiration that in turn allows more of that shrub to germinate, and White (1965) estimated that it only took five to ten years for a previously mown sedge meadow to support 25% alder cover.

It is possible that the Vly experienced similar cycling because alder scrub-shrub wetlands were probably common in mid-Atlantic valley bottoms prior to European settlement (Walter & Merritts, 2008). The full one-meter macrofossil record indicated open and wet conditions above basal mineral soil, suggesting that a shallow oxbow existed that was subject to occasional flooding after the Kinderhook Creek (or its paleochannels) meandered away from the site nearly 6,400 years ago. A regional drought between ca. 5,600 and 4,900 cal BP may have aided in the transition from wet conditions signaled by marsh bellflower ca. 6,400 cal BP to drier alder thicket (Newby et al., 2009). The establishment of alder was a natural phenomenon that occurred as peat accumulated in the basin and microsites became available for achene germination, and may have been sustained by lowered water tables caused by large-scale drought during the Medieval Climate Anomaly (MCA, ca. 800-1200 AD). A sediment core from Piermont Marsh indicated that the lower Hudson Valley experienced prolonged warm, dry conditions and an increase in wildfire during the MCA (Pederson et al., 2005). Tree-ring records from that area also showed recurring droughts in the sixteenth and seventeenth centuries and that the second half of the

seventeenth century was particularly dry (Cook & Jacoby, 1977; Pederson et al., 2012). Pederson and others (2012) noted a particularly severe drought in the Hudson Valley from 1663-1667, which could have dried the Vly sufficiently to allow high-density grazing. Persistent drought suggests that a disturbance other than a naturally high water table initiated the open wet meadow phase that began just prior to Dutch settlement. When an even-aged alder thicket reaches the end of its lifespan the entire community can rapidly change and pathogen outbreaks can also cause simultaneous alder decline in European carrs (Douda et al., 2009).

The increase in alder and biconvex sedge achenes (perhaps from tussock sedge) that overlap with *Sordaria* might be explained by grazing as well as drought. Pearson and Leoschke (1992) observed that grazed minerotrophic wetlands in the American Midwest tended to develop hummocky topography because trampling and selective grazing create troughs intermixed with sedge-topped pedestals. Tussock sedge also naturally creates pedestals. Both tussock sedge and alder are generally unpalatable to livestock and as drier microsites established on pedestals alder would have become established. The increase in sedge could also be due to mowing (Segerstrom & Emanuelsson, 2002). Conversely, sedges could be absent below 50cm simply because of taphonomic constraints on fossil preservation.

The invasion of alder and sedges may have also been influenced by the end of mowing and/or grazing. Foster and Motzkin (2003) documented the establishment of red maple and tussock sedge in abandoned wetland pastures in the Northeast and McVaugh (1958) noted that wet meadows in Columbia County became overrun with alder after agricultural abandonment. This phenomenon was seen a few miles to the south of the Vly at President Marin van Buren's homestead where in 1788 Alexander Coventry saw "extensive meadows" (Coventry, 1978). The farm was leased to tenant farmers for the first two decades of the nineteenth century and by the time van Buren purchased the property in 1839 the "meadow lands [were] overgrown with dwarf adder" presumably because the tenants lacked the time, labor, or finances to keep the land open

(Searle, 2004, quoting van Buren, 1841). A similar phenomenon was recorded by Thoreau in 1856 along the Sudbury River in Massachusetts where alder, willow, and birch had become abundant in the riparian meadow because mowers were tending to mow around saplings (Foster, 1999). Alder thickets also invaded wet prairies of the American Midwest when mowing was discontinued (Prince, 1997). The Vly's alder phase was probably prolonged by long-term bouts of dry weather documented in the area around the turn of the nineteenth century.

The decline in alder macrofossils and pollen above ca. 39cm, and increase in graminoid fossils, is similar to what Rybníček and Dybníková (1974) found in central Europe when tracing the conversion of black alder carrs to open wet meadows around the turn of the nineteenth century. They concluded that anthropogenic deforestation to create grasslands increased naturally occurring graminoids followed by clover and other fodder crops. In the Vly, however, where there is no evidence for deforestation or planting and graminoid pollen probably entered the basin from clearance of the surrounding terrace. Furthermore, herbaceous species may have benefitted from the pluvial conditions that began ca. 1800, particularly after the late-nineteenth century (Pederson et al., 2012). Warden called the Vly a “bog” in 1802 and Collier referred to it as a “swamp” in 1914, which would have been just prior to the disappearance of chestnut; the fossil record supports this characterization. The establishment of common reed and purple loosestrife around that time indicates that their presence was not owed to earlier grazing.

Conclusion

Dutch settlers in the Kinderhook region were attracted by fertile soils along the Kinderhook creek, some of which took the form of wetlands or *meadows* like the Vly north of the village and the John van Dyke Vly to the south. These types of wetlands may have been used to supply colonial livestock with hay and pasture and evidence from the Vly shows that grazing did

indeed take place there. The character of these wetlands, however, has been variable: the Vly originated as an oxbow of the paleo-Kinderhook Creek before becoming a marsh ca. 4,400 BC and alder became established as drier microsites became available and peat accumulated as a result of natural succession and long-term drought conditions. When the thicket died back in the mid-seventeenth century it was temporarily replaced by open wet meadow; after a time alder probably re-established because of a return to drought conditions in the late-1660s that lasted until around 1800 AD. It is during the transition from open wet meadow to drier alder thicket that Dutch settlers arrived in Kinderhook and used the Vly for grazing cattle. After ca. 1800 the region experienced moister conditions and the site's water table rose sufficiently to support a long-term and increasingly diverse wetland vegetation assemblage, especially after the late-nineteenth century.

Chapter 5

Wetlands and Settlement Patterns

Colonists in New France and New England tended to cluster near wetlands to access food, fiber, hay, and pasture, resources that Chapters 3 and 4 showed to be important to settlers in New Netherland. However, as indicated in Chapter 2, many of New Netherland's chief settlements were located in areas where Native Americans had created clearings and where poor soils or frequent flooding prevented tree growth. Even Russell (1976), whose map of New England clearly shows the relationship between wetlands and early settlements, admitted exceptions for towns oriented toward trade, fishing, or settled by people without livestock. Similarly, some of the first settlements in New Netherland formed around trade (New Amsterdam, Beverwijck/Albany) and tobacco planting (Brooklyn, Harlem). Furthermore, new settlement nuclei that formed after the creation of palisaded villages for defense may not have been as close to wetlands as the settlements they replaced. This chapter specifically explores the connection between settlement and wetlands in order to determine if they also played a role in the organization of New Netherland's settlement.

Economic Value

The monetary value of some types of meadows is illustrated by tax records. In every Long Island village in the 1670s and 1680s—English and Dutch alike—upland and meadow were both taxed at £2 per morgen or £1 per acre.⁴¹² For the purpose of tax-collection the majority of

⁴¹² However, in 1662 the money to build a new parsonage in Jamaica, Long Island was raised by taxing the meadows of the town's freeholders, because "every mans right and proportion in that township did arise from the quantity of meadow land he possessed." Christoph & Christoph (1989); Christoph (1996); O'Callaghan (1850, November 13, 1711, 225, "Memorial of the Clergy &c. Relating to Mr. Poyer and the Church of Jamaica").

these towns reported their property as a combination of “Land and meadow,” “Land and marshland,” “Land and valley,” “Land & Meadoe,” “Upland & meadow,” “Land and meadows Ackrs,” or simply listed the total as “Land.” In 1683 Brooklyn noted if the total morgens of land owned was only land or land and meadow combined, but did not list them separately (nearly 65% of its residents possessed only land). Only three towns, all English, listed them separately: Westchester (“land” and “medow,” “upland” and “meadow”), Eastchester (“land” and “medow”), and Flushing (“Landes” and “madoes,” “Upland acres” and “meadow acres”).

In 1675 residents with both types of property tended to own more meadow than upland. Between 1675 and 1683 the average meadow ownership of Westchester and Flushing residents remained stable while upland ownership increased; in 1683 Westchester residents with both types of property continued to own more meadow than upland while in Flushing the situation was reversed. Tables 5-1 and 5-2 provide a break-down of property taxes on Long Island for 1675, 1676, and 1683 (data from Christoph & Christoph [1989] and Christoph [1996]). Tax rolls are misleading, however, because as Chapters 2 and 3 explained many settlements were based on individual upland grants and shared use of forests and meadows. When rights to the commons are considered it is likely that all residents had access to meadow even if it was not owned outright, and that the total amount of accessible meadow was greater than the rolls suggest. The rest of this chapter provides information on the settlement patterns of other New Netherland towns gleaned primarily from court records and requests for grants, patents, and deeds.

Town	Residents	With Upland and Meadow	With Only Land	With Only Meadow	Largest Property Size (both)	Smallest Property Size (both)	Average Property Size (both)
1675							
Brooklyn	60	36	5	4	40	4	15
Bushwick	36	16	0	1	50	2	17
Flatbush	51	28	3	0	36	12	19
Flatlands	37	21	5	0	52	8	26
New Utrecht	30	11	11	0	72	16	39
1676							
Brooklyn	56	34	12	0	40	1.5	16
Bushwick	35	14	7	1	50	11	23
Flatbush	45	27	4	1	36	7	20
Flatlands	34	19	5	0	59	5	25
New Utrecht	28	2	20	0	100	12	23
1683							
Brooklyn	63	8	40	0	24	2	14
Bushwick	26	14	6	1	61	8.5	28
Flatbush	45	42	-	-	160	28	70
Flatlands	38	27	-	-	35	2	24
New Utrecht	31	25	-	-	200	12	51

Table 5-1. Results of property inventories for the five Dutch towns on western Long Island. Includes data only for taxed residents with livestock and/or property (i.e., not single men). Property sizes in morgens except Flatbush and New Utrecht (acres).

Town	Residents	With Upland and Meadow	With Only Land	With Only Meadow	Largest Property Size (both)	Smallest Property Size (both)	Average Property Size (both)
1675							
Flushing	60	30	17	1	110	7	27
Eastchester	20	14	1	1	30	9	19
Westchester	41	36	3	2	-	-	-
Newtowne	82	75	0	0	93	1	18
Brookhaven	31	29	2	0	28	3	9
Huntington	69	42	0	6	48	6	20
Southold	79	79	0	0	80	2	20
1683							
Flushing	59	32	20	0	90	4	24
Westchester	48	37	2	2	80	2	22
Newtowne	90	82	-	-	80	2	19
Brookhaven	52	47	-	-	94	1	16
Hampsted	133	108	-	-	266	1	26
Easthampton	73	59	-	-	30	1	12
Gravesend	33	24	-	-	115	16	57
Jamaica	84	74	-	-	70	3	20

Table 5-2. Results of property inventories for the English towns on Long Island. Includes data only for taxed residents with livestock and/or property (i.e., not single men). Property sizes in acres.

Wetlands as the Basis for Settlement

Tables 5-1 and 5-2 present the only quantitative data currently available in the translated primary records used in this research; the most common references to wetlands were those pertaining to property disputes and systematic settlement.

New Amsterdam

WIC owned approximately 90 acres of low salt marsh just north of Corlaer's Hook in what is now the Lower East Side of Manhattan, which were called Stuyvesant Meadows because the director owned a farm nearby (Hill & Waring, 1899). Figures 5-1 and 5-2 illustrate the extent of these wetlands and the proximity of early farms (Figure 5-2, the Manatus Map, is probably the earliest survey made of Manhattan). The locations marked 1, 2, 3, 4, 5, and 6 on the Manatus Map are WIC-owned farms formed in the 1630s (Nos. 2 and 3 should be between 16 and 17 on the marsh and 4 and 5 should also be farther north; Nos. 16 and 17 were not WIC-owned). The farm labeled 1, shown with a four-post barrack, was the "Noble Company's Great Bouwery." With the exception of the Great Bouwery, WIC's farms were transferred to private ownership within a decade of their establishment following repeated failures to become productive; in 1638, for example, they were untenanted and without livestock.

Stokes (1998, pg. 120) explained that the salt marshes on Corlaer's Hook were divided into four parcels of 11 acres each for the use of four farms, but the "meadows had to be taken wherever found, often at some distance from the farm." Farm No. 6 was located on a small wetland at what Welikia (2013) identified as marine shrubland and floodplain forest with some beach, emergent marsh, and mudflats. Hill and Waring (1899) described it as a small pond with a "wet meadow" connecting it to the river. Number 15 and the unlabeled structure nearby were

located near the mouth of the Great Kill against the “*Reed valley beyond Sappokanican*,” i.e., on a wetland near the tobacco-producing flats that became Greenwich Village (Stokes, 1998, pg. 192). Only two farms, 7 and 9, were located near the large wetland complex surrounding the body of fresh water on lower Manhattan called the Collect (or, simply, the Fresh Water).



Figure 5-1. Detail from “The Viele Map 1864.” Shaded areas represent wetlands (Stokes, 1998).

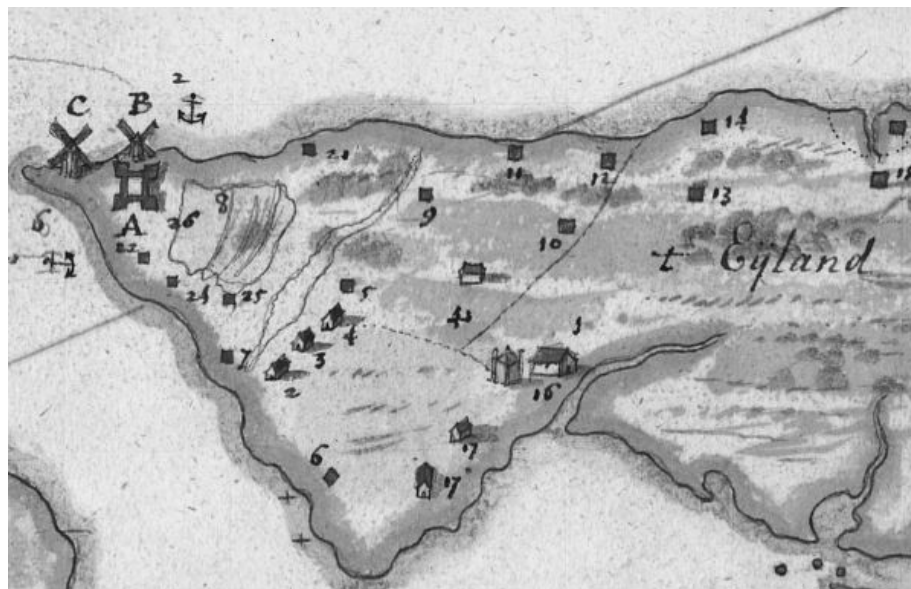


Figure 5-2. Detail of “Manatvs gelegen op de Noot [sic] Riuiet,” 1639 (Library of Congress).

Harlem and the Bronx

Tobacco plantations were common on northern Manhattan's clear flats but other farmers were enticed by extensive wetlands. A stretch of tidal marsh with numerous waterways existed between 135th and 151st streets, Sherman Creek contained the "Great Meadow," and tidal marshes, mudflats, and eelgrass meadows were present along Spuyten Duyvil Creek (Welikia, 2013). The mainland shore and islands in the Hellgate probably contained similar habitats. Figures 5-3, 5-4, and 5-5 illustrate the extent of these wetlands and the proximity of early settlement and land division. It is telling that a flat-bottomed scow for transporting hay (*Wey schuyt*) was included among the property owned by the original proprietor of the *Muscoota* flat. It may have used it to haul hay away from a large tidal wetland on the Harlem River called Montagne's Hay Meadow, which was located near No. 19 on Figure 5-4 called *Vredendael* (Riker, 1904). No. 42 in Figure 5-4 was Jochem Pietersen Kuyter's plantation *Zegendal* and No. 45 was the plantation granted to Isaac de Foreest 1647 and that later became the village of Harlem. All of these pre-1640 settlements were located near flats and wetlands.

In 1658 the Director General and Council of New Netherland ordered that the new village of Harlem be established to promote agriculture and protect the island, including "the Cattle pasturing thereon."⁴¹³ Patents in the area were requested with "as much marsh or hayland as shall be parceled out in proportion to other farms and uplands" even prior to formal establishment.⁴¹⁴ In order to attract farmers to the new village each new resident after 1658 was issued 18 to 24 morgens of arable land, six to eight of *valley*, and would be exempt from taxes for 15 years.⁴¹⁵

At Harlem each houselot was paired with a plot of land for gardens, a six-morgen strip of farmland on Jochem Pieters Flat, and about three morgens of salt marsh for hay that might be

413 Gehring (1991, March 4, 1658, "Ordinance establishing a new village at the northern end of Manhattan"); O'Callaghan (1868, March 4, 1658, pg. 335, and "Ordinance of the Director General and Council of New Netherland for Establishing a New Village at the end of Manhattan Island").

414 Gehring (1980, August 26, 1655, 78, "Patent to Cornelis van der Donck").

415 Gehring (1991, March 4, 1658, "Ordinance establishing a new village at the northern end of Manhattan Island").

across the Harlem River, on Little Barent's Island, Stony Island, in the Great Meadow on Sherman's Creek, or farther north on the Spuyten Duyvil Creek (Cohen, 1992; Riker, 1904). In 1664 Nicolaes Meyer was given a patent for several lots near Harlem: two lots on "Jochim Pietersz's" flat, one "on the land of Montagne," two small parcels on van Ceulen's Point, two lots of marshland, the southernmost portion of "the stone island," and a double lot and two gardens within the village of Harlem.⁴¹⁶ A late-1660s inventory shows that one wealthy resident owned six lots in Jochem Pieter's Flat, three on van Keulen's Hook, and meadow on Little Barent's Island; other residents, however, owned one or two lots only (Riker, 1904; Figure 5-5 shows the location of these lots). In 1664 Jan Pietersen Slot was given a patent for a house and garden lot in Harlem plus eight morgens "in the great marsh" nearly six miles to the south on Corlaer's Hook.⁴¹⁷

No. 43 in Figure 5-4 was the tobacco planter Jonas Bronck's plantation, *Emmaus*, where he was also known to mow the meadows. Some of these meadows may have been freshwater because following his death his widow's new husband requested a patent for the original 250 morgens including "all the fresh meadow thereunto annexed or adjoining" (Riker, 1904, pg. 384). A "large fresh marsh" also existed behind Juryaen Fradel's nearby point of land between Hellegat and Long Island Sound.⁴¹⁸

Not indicated is Adriaen van der Donck's *Colendonck* (what is now Yonkers) that he purchased in 1645 for the purpose of farming and operating a mill on the *Saeghkil* (Saw Kill). This property was across the Spuyten Duyvil Creek from Manhattan and adjacent to the island of *Paprinnein*, or *Papiriniman*, described as 60' tall, a half-mile long, and surrounded by meadows.⁴¹⁹ Foreshadowing things to come, in the 1650s van der Donck expressed his desire to

416 Gehring (1980, January 29, 1664, 104, "Patent to Nicolaes Meyer").

417 Gehring (1980, January 4, 1664, "Patent to Jan Pietersen Slot").

418 Gehring (1980, September 5, 1645, "Patent to Juryaen Fradel").

419 Gehring (2000, "Petition of Adriaen van der Donck concerning land granted him at Saeghkil in 1645"); Hall (1912).

move to *Colendonck* as soon as possible and secure several morgens of marshland on the Spuyten Duyvel because other people were beginning to settle in the area and he wanted a guarantee of his meadow ownership.⁴²⁰



Figure 5-3. Detail from “The Viele Map 1864.” Shaded areas represent wetlands (Stokes, 1998).



Figure 5-4. “De Manatus. Op de Noort Riuier [The Manatus map, Castello copy],” 1639 (Stokes, 1998).

⁴²⁰ Gehring (2000, “Petition of Adriaen van der Donck concerning land granted him at Saeghkil in 1645,” pg. 205).

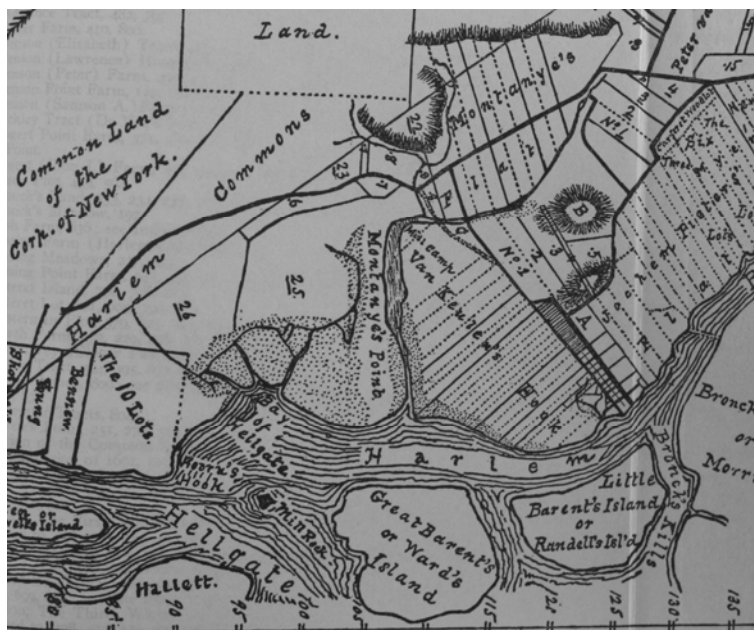


Figure 5-5. Detail from Riker's (1904) map of Harlem. Speckled areas indicate wetlands.

Meadows on the Harlem River and Spuyten Duyvil Creek featured prominently in late-seventeenth-century court cases because their ownership was disputed by new residents with ambiguous grants and patents. The village of Fordham, for example, grew after 1664 when John Archer (Jan Arcer) began settling farming families near meadows northeast of Harlem across the Harlem River.⁴²¹ Several independent farmers also owned meadows in that vicinity including George Tippet and Richard Betts who acquired “Land & meadowe” previously owned by van der Donck in the late-1660s.⁴²² These men were repeatedly accused of trespassing on Archer’s land and despite orders for new surveys and the deaths of some of key plaintiffs the issue remained unresolved as late as December 1674 when Archer reportedly imprisoned Betts’ son for several hours.⁴²³

421 Christoph & Christoph (1980, “Liberty to John Archer to settle 16 families at Spiting Devil,” May 3, 1669, pg. 247).

422 Murphy (1867); Paltsits (1910a, May 3, 1669 and July 6, 1668 – recorded February 22, 1670 and July 6, 1668 – recorded February 22, 1670, pg. 201).

423 Christoph & Christoph (1982, October 8, 1669, “An order for the proporcioning the quantity of meadow for Jno Archer at Fordham” and December 26, 1674, “Complaint by the widows Betts and Tippet that the constable and proprietor of Fordham Manor imprisoned Samuel Betts”); Paltsits (1910a, July 31, 1669 and October 8, 1669).

Papiriniman in Spuyten Duyvil Creek was deeded to Johannes Vervelen as a gubernatorial grant while he was contracted to operate the ferry between Harlem and Fordham, but in 1675 he complained to the Mayors Court that Archer was trespassing on his land.⁴²⁴ The Manor Court of Fordham determined Archer was the owner but the Court of Assizes ultimately restored the meadow to Vervelen because *Papiriniman* was outside the jurisdiction of Fordham.⁴²⁵ However, the Court also found that a previously ordered survey was ambiguous and ordered another to be done in the presence of both men; the Court may have ultimately found for Archer because in 1679 he again claimed the “Neck of land Hummock or Island Commonly called Papiriman” and demanded “a fatt Capon” as rent every New Year’s Day.⁴²⁶ Repeated meadow disputes occurred over the next quarter of a century until the Phillips family acquired *Papiriniman*, its meadow, and the lands and meadows formerly comprising van der Donck’s estate to create Philipse Manor (Phillipsburg Manor) (Hall, 1912). The largest tidal wetland on the Hudson River, Piermont Marsh, also became part of the manor and is described in a later section.

Yet another plaintiff against Archer was David des Marest, who in September of 1676 appealed a previous verdict from a lawsuit brought against him by Archer for “a Lott of Meadow ground at or neare Fordam by spiting Devill”—after presentation of evidence for their ownership the Court of Assizes found for des Marest.⁴²⁷ A year later Richard Cage’s wife complained that they had leased land from John Archer for seven years but that Archer had since seized their meadows and part of their wheat land, and their house lot and barn also targeted for confiscation.⁴²⁸

424 Christoph & Christoph (1980, “The articles of agreement whereby Johannes Vervelen is to operate a ferry between Spuyten Duyvel and Fordham,” possibly 1669); Christoph & Christoph (1989, “Petition of Johannes Vervelen, complaining against John Archer,” 1675, pg. 223); Scott (1983, August 17, 1675).

425 Christoph & Christoph (1983, 1676); Scott (1983, August 17, 1675).

426 Paltsits (1910a, January 1, 1678/9, pg. 220-221).

427 Christoph & Christoph (1989, “Petition of David Des Marest appealing a judgment,” September 18, 1676, pg. 454-455); Christoph & Christoph (1983, 1676); O’Callaghan (1866, September 18, 1676).

428 Christoph & Christoph (1982, “An order upon complaint of the [wife] of Richard Cage against John Archer,” September 17, 1677).

In 1667 a conflict over meadow ownership on the Spuyten Duyvil Creek revealed that “the Inhabitants of Harlem have for divers yeares mowed their Hay in the meadows on the other side of Harlem River.”⁴²⁹ However, five years later Harlem was told to relinquish their claim because the court determined the meadows were too far from their village to provide any real benefit; they were compensated with closer meadow in the Bronx.⁴³⁰ Harlem also claimed to own some meadows at Stone (or Stony) Island in the Hellgate but that lot was part of Jonas Bronck’s original patent that was ultimately transferred to Colonel Lewis Morris in 1676 (founder of Morrisania) (Riker, 1904). Col. Morris asserted his ownership of the parcel and began mowing it. During the summer of 1680 Daniel Turner and other Harlem residents again petitioned to show their “possession of the Meadows at Stone Island” or land with “Sertain marsh or Meadow ground called by the name of Stony Island” because Morris mowed the meadow the year before, his slaves had disrupted their mowing that year and took away three canoes laden with hay, and he threatened to do so again the next year. Morris was fined 50 shillings of damage, plus court costs, and for the difficulty the plaintiffs found in feeding their cattle that winter he was fined 40 pounds.⁴³¹ In 1683 the plaintiffs again brought suit over the meadows, which they won but was subsequently overturned (Riker, 1904).

Harlem also lost other long-used East River meadows in the 1670s. Prior to 1667 when the English Captain Delavall purchased the island, Little Barent’s Island in the Hellgate was used as a calf pasture and its meadows were divided among ten Harlem residents; two years later Delavall also purchased meadow on the north side of Great Barent’s Island (Riker, 1904). He asked that other meadow owners fence in their lots or be made to buy the island from him, but ultimately he purchased all the meadow lots.

429 Christoph & Christoph (1980, “A warrant to the constable of Westchester about some meadow ground claim’d by Harlem,” August 16, 1677, pg. 153); Paltsits (1910a, August 16, 1667).

430 Christoph & Christoph (1982, “An order about some meadow in difference beneath the town of Fordham,” November 9, 1672).

431 Christoph & Christoph (1991, “Order concerning a dispute between residents of Harlem and Col. Lewis Morris over land on Stone Island,” pg. 251, “Judgment of the Mayor’s Court in a suit by Daniel Turner et al. against Lewis Morris for trespass on Stony Island,” July 6, 1680, and “Petition of several residents of Harlem that Lewis Morris be restrained from cutting hay on Stony Island, with Colonel Morris’s response,” July 28, 1680, pg. 353); Riker (1904).

Wetlands were allocated to new settlers in a more systematic way elsewhere on the mainland. In July 1666, for example, it was decided that meadows on Rattlesnake Brooke (Westchester County) should be allocated to the Ten Farms as six acres to every 100th estate and eight acres to the 200th, “lying most convenient for each Lott,” and the remainder is to be left as a commons in order to attract more settlement.⁴³² The following year the Ten Farms, referred to as Eastchester, were described as including the upland between Hutchinson’s River and Rattlesnake Brook as well as Hutchinson’s Meadows.⁴³³ In November of 1667 Augustine Hermans was permitted to have 50 morgens with proportionable meadows in Westchester and in 1671 Micah Spicer was allotted 30 acres of land on Throgmorton’s Neck, “with meadow in propoertion.”⁴³⁴

Western Long Island

In 1651 WIC identified Long Island as “the most important and best piece for the Company” and believed it should be managed for farmers.⁴³⁵ The year prior, Secretary van Tienhoven described “fine hay-valleys” and “numerous valleys of sweet and salt meadows” on both the north and south shores.⁴³⁶ Meadows were apparently more common on the south shore, however, because early residents of the north shore owned “marshy necks of land” fifteen miles away on the Great South Bay in order to access sedges and blackgrass to feed their livestock (Cooper, 1882, pg. 83). Similarly, a resident of Huntington wrote in 1882 that the salt meadows south of town were among the first purchases from the Indians followed by fresh meadows then “brushy plains” or uplands. In 1749 a visitor commented that the south shore was primarily “turned into meadows” while the north shore was “arable land” (Benson, 1937, pg. 325).

432 Christoph & Christoph (1980, “A letter written to the constable and overseers of Westchester,” July 7, 1666); Fernow (1881, “A letter written to the Constable and Overseers of Westchester, concerning the division of land,” July 7, 1666).

433 ALG (Vol. I, “Deed from Gov. Nicolls to Philip Pinckney, James Everts and others, for a tract known as the “Ten ffarmes, or Eastchester,” March 9, 1667).

434 Christoph & Christoph (1983, “Augustine Hermans vs. Town of West-Chester,” November 1, 1667); O’Callaghan (1866, June 19, 1671, pg. 6).

435 Gehring (2000, “Letter from the directors at Amsterdam to director general Petrus Stuyvesant,” March 21, 1651).

436 O’Callaghan (1856a, “Information respecting land in New Netherland,” March 4, 1650, pg. 366).

Most early land acquisitions were by groups of men or the town as a whole and divided into smaller parcels (Munsell, 1882). As late as the 1780s and 1790s there were still tracts of undivided and common lands being disposed of in flatlands, including the *Crane Vly* and *Long Vly* (van Wyck, 1924). Prior to the 1650s the marshes and flats along the southern shore from Coney Island to Jamaica Bay seem to have been held in common but by mid-century the population of both people and cattle had grown sufficiently that villages and neighbors began arguing over boundaries and rights to certain tracts.⁴³⁷ McLaughlin (1981) analyzed the town records of Flatbush and found that village lots of 50 acres were parceled out with parcels in the *Canarisse* (Canarsie, on Jamaica Bay) and Third Kill meadows, which were divided into eight blocks of six parcels each and assigned to village shareholders by random drawings. For example, in 1654 Cornelis van Ruyven bought 25 morgens of land “with so much meadowland as shall be granted with each lot.”⁴³⁸ Ten years later he was granted 25 morgens, the No. 16 lot in the nearby meadow (two morgens), the No. 7 lot in the far meadow (three morgens), and the No. 11 lot in the flat (two morgens). This entry is notable because van Ruyven was the Secretary and Receiver-General of New Netherland but was allotted land as anyone else.⁴³⁹ In 1655 Jan Hendricksen van Gunst likewise purchased 25 acres with “as much meadow and pasture land with it as is allotted or shall still be assigned to the aforesaid lot along with the other neighbors.”⁴⁴⁰ Even a decade later Gerrit Snediger was granted 27 morgens along with two pieces of meadow to share with Jan Snedicker (the No. 4 lot of two morgens and No. 8 lot of three morgens), plus lot No. 29 in the flat (two and a half morgens).⁴⁴¹

437 Fernow (1883, “Council Minute. Proceedings against Quakers at Jamaica, Long Island and Land at Flatbush,” January 13, 1661, 491 and “Council Minutes. Long Island land matters,” June 3, 1661, pg. 501).

438 van Laer et al. (1974c, “Contract of sale from Dirck Jansen to Cornelis van Ruyven of a house, barn and 50 acres of land in Flatbush, Long Island,” November 24, 1654, pg. 378).

439 Fernow (1883, “Patents for land on Long Island,” February 26, 1664); Gehring (1980, “Patent to Cornelis van Ruyven,” February 26, 1664).

440 van Laer et al. (1974c, “Contract of sale from Jan de Jongh and Jan Hendricksen van Gunst of 25 acres of land on the west side of the village of Midwout, Long Island,” May 22, 1655, pg. 400).

441 Fernow (1883, “Patents for land on Long Island,” January 29, 1664).

The residents of Flatbush requested formal documentation of their ownership of Canarsie in 1661.⁴⁴² However, the town wanted to delay the surveying of its meadowland until the town had a chance to talk to the director about the recent request by Flatlands for the same. The meadow was surveyed in June, split in half, and further subdivided into lots because the Director deemed it “necessary for the peace, progress and increase of the said villages.”⁴⁴³ In September 1666 another issue arose between Flatlands and Flatbush over the “Meadowes Canarsie” and they were ordered to decide if they wanted a trial at the Court of Assizes or have the governor alone determine a course of action.⁴⁴⁴ In 1674 properties in Flatlands were still deeded with disjunct meadow lots at Canarsie, including a 200-acre farm belonging to Roelof Martense Schenck that included a village lot, upland lots on *Vrieden Hook*, *Varcken’s Hook*, Bestevaer’s Island, and in the rear of the “Great Valley” with the buildings there, as well as two valley lots at *Canuressingh* (O’Callaghan, 1866, March 19, 1674). The desire of these towns to possess adjacent Canarsie is understandable, but in 1659 New Utrecht also requested permission to use a meadow at *Canarisy* because their current one was not sufficient to maintain their cattle if it was divided into lots (O’Callaghan, 1849a).

The area that became New Utrecht was first settled by Anthony Jansen (Antony Jansen van Salee—“The Turk”) who in 1639 was granted 100 morgens of land near Coney Island plus a peninsula of land surrounded on three sides by marshes; he received his official patent in May 1643.⁴⁴⁵ WIC had banished him from Manhattan but he was given this land to support his family and granted a ten-year lease “exclusive of the pasture and meadow land.”⁴⁴⁶ In 1652 Cornelis van Werkhoven of Utrecht bought adjacent land from the Indians and lived there until his death three

442 Fernow (1883, “Council Minute. Proceedings against Quakers at Jamaica, Long Island Land at Flatbush,” January 13, 1661, pg. 491).

443 Fernow (1883, “Council Minutes. Long Island land matters,” June 16, 1661 and June 23, 1661, pg. 502).

444 Christoph & Christoph (1980, “A letter written to the inhabitants of Flat Lands, touching the difference between them, and the inhabitants of Flat Bush,” September 15, 1666); Fernow (1883, “A letter written to ye inhabitants of fflat Lands, touching the difference between them, & ye Inhabitts of fflat Bush,” September 15, 1666).

445 Gehring (1980, “Patent to Antony Jansen van Salee,” May 27, 1643).

446 van Laer et al. (1974a, “Bond of Anthony Jansen from Salee to pay the Company 100 guilders a year for 10 years for the use of a tract of land on the North river granted to him by Director Kieft,” August 3, 1639, pg. 205).

year later.⁴⁴⁷ The guardian of his children and property manager was surveyor Jacques Courtelyou, who applied in 1657 for a patent on 130 morgens of marshland near Coney Island and Anthony Jansen “on behalf of the new village of Werckhooven” that he named for his former employer (later named New Utrecht). The tract was inclusive of “kils, creeks, swamps and marshes, drowned and sandy lands.”⁴⁴⁸ Jansen countered that he actually bought that land from the Indians in 1651 but his request to retain the meadows closest to his house was denied.⁴⁴⁹ In September 1664 some boundary issues arose between New Utrecht and Gravesend, “particularly about some meadow grounds,” which may have coincided with the hay harvest. The meadow had previously been granted to New Utrecht who then lost it to Gravesend; New Utrecht argued that it felt the loss grievously and the case was ordered into arbitration.⁴⁵⁰

In 1642 Director Kieft granted 6,666 acres to Francis Doughty and other proprietors for a new settlement on Long Island first called Maspeth.⁴⁵¹ Doughty’s own farm contained 34 morgens of upland and eight of meadow.⁴⁵² In 1642 Tymon Jansen was granted a patent for land along the marshes of the *Mespachtis* (Mespeth) Kill, so long as he “shall possess and use the marshes enclosing his land in rear and front and divided by kils, it being understood the marshes on the long and the broad side.”⁴⁵³ The following year he was also granted one marsh and 22 morgens of land between two others.⁴⁵⁴ Burger Jorisz was also granted land on the Mespeth Kill bordering marshland in 1645 and a decade later acquired an additional 29 morgens of land and

447 Gehring (2000, “Indian deed for New Utrecht on Long Island,” 1652).

448 Fernow (1883, “Patent for land on Long Island (New Utrecht),” August 27, 1657, pg. 397); Gehring (1980, “Patent to Jacques Corteljou,” August 27, 1657 and “Patent to the inhabitants of Utrecht”); Gehring (2003, “Letter from the directors to the Director General and Council,” December 19, 1656 and “Petition concerning the estate of Cornelis van Werckhoven”).

449 Fernow (1883, “Council Minute. Land matters concerning New Utrecht, Long Island; school,” August 13, 1658).

450 Christoph & Christoph (1980, “A warrant for the arbitration of the differences between Gravesend and New Utrecht,” September 24, 1664, pg. 46); Fernow (1883, “A warrant for the arbitration of the differences between Gravesend and New Utrecht,” September 24, 1664); Fernow (1976e, April 3, 1664).

451 Fernow (1883, “Patent for a large tract of land on Long Island (Newtown, Long Island),” March 28, 1642).

452 Fernow (1883, “Patent for land at Mespeth, Long Island,” March 25, 1658).

453 Gehring (1980, “Patent to Tymon Jansen,” 1642, pg. 14).

454 Gehring (1980, “Patent to Tymen Jansz,” July 13, 1643).

half of a marsh on the creek from Claes Carstenzs.⁴⁵⁵ In 1643 the Indians attacked the village and re-settlement did not widely occur until the mid-1650s when several patents were made, typically for 25 morgens along a marsh and extending into the forest to a well-known swamp or thicket.⁴⁵⁶ Some patents specified both upland and marshland: Pieter Stoutenburch was given six morgens of “a certain small marsh” and half a morgen of woodland within the marsh near Burger Jorissen’s land, Jacob Hey received 25 morgens of land at the outlet of *Mespachts Kill* along with six of marsh that the previous owner used on the creek, and Jan Hendriksen Steelman was given a patent for 34 morgens of land and eight of marshland.⁴⁵⁷

As early as 1634 a common meadow existed nearby at an island called Aernhem in the Mespath Kill, which in 1656 was patented to Nicasius de Sille and later became Boswijck (O’Callaghan, 1865, July 11, 1634). The residents of Maspeth were to consolidate themselves into a village for defense at Aernhem and de Sille given the authority to lay it out.⁴⁵⁸ That year a complaint was lodged with the Council that residents of Aernhem were “mowing and using the marshlands” that had been granted to Middelborch (Maspeth) and requested that a boundary be drawn between their haylands. Commissioners were sent to evaluate and allot shares.⁴⁵⁹

In 1656 *Middelburgh* (Middelborch, Maspeth) complained that Thomas Stevensen dammed a creek they used to water their cattle, put a fence along the creek so their animals could not access it, and fenced 20 morgens in one meadow within their jurisdiction. Director Stuyvesant decreed that “no private bouwery or plantation should prejudice a village community” and he had erred in granting Stevensen so much meadow, but that because Stevensen was the

455 Gehring (1980, “Patent to Burger Jorisz,” July 3, 1643, “Patent to Claes Carstenzs,” September 5, 1645, and “Patent to Adriaen Huybertsen,” January 26, 1664).

456 Gehring (1980, “Patent to Jacob Luby,” November 30, 1654, “Patent to Luycas Dircksen,” November 21, 1654, “Patent to Peter Terragon,” November 27, 1654, “Patent to Reyck Leydecker,” December 10, 1654, “Patent to Roeloff Jansz,” “Patent to Jan Swaen,” “Patent to Dirck Smit,” December 15, 1654, “Patent to Jan Catjou,” August 21, 1656, and “Patent to Pieter Jansen Winckelhoeck,” December 28, 1656).

457 Gehring (1980, “Patent to Pieter Stoutenburch,” “Conveyance to Jacob Hey from Dirck Volckertsen,” September 9, 1653, and “Patent to Jan Hendriksen Steelman,” March 25, 1658).

458 Gehring (1980, “Patent to Nicasius de Sille,” March 27, 1656); Gehring (1995, “Petition of the inhabitants of Mespads Kill concerning a survey of Aernhem” and “Decision on the foregoing petition”); Riker (1852).

459 Fernow (1883, “Council Minutes,” April 4, 1656); Gehring (1995, “Minute concerning land at Middelborch and Arnhem,” April 4, 1656).

oldest settler there he should have half the meadow and Middelburgh the other half to hold in common.⁴⁶⁰

In 1661 the Director and Council granted all the meadows on the Mespath Kill to the village of Boswijck and divided them into lots. Likely as a result of Boswijck's victory, Jan West accepted a patent on 21 morgens of land and one morgen of marsh at Maspeth plus three morgens of marsh "on the south side of Long Island."⁴⁶¹ The Director and Council's solution was not to everyone's advantage, however; Thomas Wandel argued that the magistrates of Middelborch had granted him a ten-morgen parcel of meadow in 1654 and without it he wouldn't have "a foot of salt meadow near his bouwery and without which it would be almost impossible to live on the land."⁴⁶² After testimony of them original 1655 surveyors the Director decided Wandel could retain ownership of the meadow.

Boswijck was quickly dissatisfied with its amount of newly awarded meadow because the following month representatives approached the Council to say they were "much embarrassed for want of meadowland" and had sent men to find parcels not included in any patent and therefore available. They found four, including of "fresh water meadows," and asked that they be divided among ten men; their request was approved (Fernow, 1883, May 17, 1661, pg. 499-500). Boswijck's acceptance of freshwater wetlands suggests that sub-standard meadows were beginning to have value by this time, and in 1670 Captain William Laurence even sought out a "piece of Swampy Meadow Ground" in the nearby village of Flushing that was characterized as "lande uncapabell of manewering" (Paltsits, 1910a, February 24, 1671, pg. 76).

In June 1669 boundary issues again arose between Boswijck and New Town regarding a "meadow or valley" near the head of *Mashpeake-kills*, and both were ordered by Governor

460 Fernow (1883, "Report of the commissioners appointed to inquire into some differences between inhabitants of Middelburgh, (Newtown) Long Island," September 22, 1656, pg. 367).

461 Gehring (1980, "Patent to Jan West," June 17, 1661, pg. 103).

462 Fernow (1883, "Council Minute: Salt meadows at Mespathkil; Gysberts Island; Church at Midwout; New Arnhem; Excise on Long Island," April 7, 1661, pg. 498).

Lovelace to send representatives to court.⁴⁶³ New Town declared that they bought the meadow from the Indians and held a patent for it prior to Boswijck's establishment; Boswijck countered with their own patent, Director Stuyvesant's permission for them to have it if it was not previously claimed, and Governor Nicolls's 1664 decision that it belonged to them. A jury found for Boswijck and New Town had to pay court costs.⁴⁶⁴

As discussed in Chapter 2, the area around Wallabout Bay was initially purchased from the Native Americans primarily for use as tobacco plantations. As was the case in Harlem and the Bronx, however, some farmers had marshes included in their patents.⁴⁶⁵ A pre-1750 map of Gowanus Creek shows "Meadows" on both sides and "Broken Meadows" bordering on "Flats" in the East River off Red Hook, and in 1642 Cornelis Lamberts Cool was granted a patent for the *Gouwanes* area along with "a part of the hay marsh, located near the marshland of Antony van Salee, containing 28 morgens."⁴⁶⁶ In 1647 Jan Forbus gained title to 65 morgens on Wallabout Bay with a marsh.⁴⁶⁷ As mentioned earlier, in 1656 Sarah Joresey requested 20 morgens of land with an adjacent marsh in order to have as much as her neighbors; in 1661 the town itself requested additional meadows on the bay to supply their livestock.⁴⁶⁸

To the northeast, Sellers Neck lay between two creeks within the original bounds of Jamaica and was described in 1667 as "meadow ground or valley."⁴⁶⁹ Cortelyou surveyed and divided them based on quality in 1662 and in June Brooklyn received 100 morgens, Middelborgh 80, and Mespath 80.⁴⁷⁰ In 1663 Brooklyn complained that its meadows on the neck were "very

463 Christoph & Christoph (1980, "A warrant to the constable and overseers of New Towne," June 21, 1669); Fernow (1883, "A warr't to the constable & overseers of New Towne," June 21, 1669); Paltsits (1910a, June 21, 1669, 238, and June 28, 1669).

464 Christoph & Christoph (1983, "Town of Boswijck vs. Town of New Towne," November 4, 1669); Fernow (1883, "Council Minute" and November 4, 1669, "Trials in the Court of Assizes of Long Island land titles," June 28, 1669); Paltsits (1910a, March 4, 1664 and June 28, 1669).

465 Gehring (1980, "Patent to Willem Cornelisz," February 19, 1646).

466 Bergen (1876) and Gehring (1980, "Patent to Cornelis Lamberts Cool," April 5, 1642, pg. 14).

467 Gehring (1980, "Patent to Jan Forbus," May 15, 1647).

468 Fernow (1883, "Council Minutes," April 4, 1656 and "Council Minutes. Long Island land matters," June 3, 1661); Gehring (1995, "Petition of Sara Joresy for land on Long Island," and "Response to the foregoing petition").

469 Furman (1987, quoting Governor Nicoll's patent to Brooklyn, pg. 287).

470 Fernow (1883, "Council Minutes," June 15, 1662).

far and it is very difficult to bring in the hay dry and in good condition, for the preservation, with Gods blessing, of our cows and what depends on it in farming” (Fernow, 1883, March 1, 1663, pg. 522). However, van Wyck (1924) believed Brooklyn’s interest stemmed from the lack of its own large tracts of salt meadow.

In February 1667 a dispute arose between Jamaica and Middelborgh because the latter had been in possession of one-third of Sellers Neck for some time but had not compensated Jamaica.⁴⁷¹ The following month Jamaica agreed to sell Brooklyn the entire of Seller’s Neck for 12 pounds cash or its equivalent.⁴⁷² It is not known what occurred on Seller’s Neck during the next decade but in 1678 there was an issue over the ownership of 20 acres of meadow that had previously been laid out as the “Eleven penny Lotts” for 39 residents of Gravesend. Captain James Hubbard challenged the ownership of a portion of the meadow that had been occupied by Charles Bridges for several years; the court found that it did belong to Bridges but ordered another piece surveyed for Hubbard because he had a “right to a Lott or dividend with the rest of the Towne.”⁴⁷³ These cases show that meadow was becoming scarce on western Long Island in the 1660s because Sellers Neck is nearly ten miles from Brooklyn, Gravesend, and New Town.

In 1675 a group of farmers were ordered to be settled within the Town of Huntington with meadow in proportion to their upland lots.⁴⁷⁴ A decade later a group of men at Huntington petitioned for a license to purchase vacant land from the Indians within the town limits—each asked for 50 acres of upland and 20 of meadow.⁴⁷⁵ In 1676 John Cornell was granted 100 acres

471 Christoph & Christoph (1980, “A warrant to the constable etc. of New Towne to pay their proporcion of the purchase of Sellers Necke to the inhabitants of Jamaica,” February 7, 1667).

472 Christoph & Christoph (1980, “Mr. Anthony Waters assurance to the inhabitants of Breucklyn, on behalf of the towne of Jamaica of their proporcion of Sellers Neck,” March 1, 1667); Fernow (1883, “Mr. Anthony Waters assurance to the Inhabitts of Breucklyn, on behalfe of the Towne of Jamaica of their proporcion of Sellers Neck,” March 19, 1666/7).

473 Christoph & Christoph (1991, “Minutes of the court of the West Riding,” December 18, 1678, pg. 52).

474 Christoph & Christoph (1982, “Recommendation to Huntington to provide new sites for displaced farmers,” November 13, 1675).

475 ALG (Vol. II, “Petition of Thomas Higby, of Huntington, in behalf of himself and others, for a license to purchase, for each of them, out of the vacant land, in that town, the quantity of 20 acres of meadow ground, and 50 acres of upland,” November 20, 1685).

of land “with Meadow proporcionable” on the west side of Cow Neck, an unpopular decision with Hempstead residents who had been using the neck as a common pasture.⁴⁷⁶

Long Island meadows were typically allocated in proportion to the amount of upland owned, exemplified by the Director and Council’s response to several 1654 petitions from western Long Island villages “requesting an allotment of their hayland etc.” It was determined that each settler was to have eight morgens of marsh or meadow for every 25 of arable land, whenever possible.⁴⁷⁷ However, meadows were also sometimes assigned based on the number of cattle owned. In 1664 the towns of Jamaica, New Towne, Flatlands, Flatbush, and Brooklyn argued over the ownership of some “ffly Lands or Meadowes” (Paltsits, 1910b, March 6, 1664, pg. 481). To more accurately apportion them, Governor Richard Nicolls also requested a “true and full account of y^e Number of yo^r Cattle and Horses, wth a computaçon as near as possibly you can, of yo^r respective meadow Ground in your home Lotts.”⁴⁷⁸ These “South Meadowes” were surveyed in 1666 according to their “goodnesse and the meanesse” and parceled into lots of 20, 30, and 50 acres (Paltsits, 1910b, June 2, 1666, pg. 483).

Staten Island

Settlement on Staten Island was proximal to waterways that were “so serviceable to them in enabling them to go to the city, and for fishing and catching oysters, and for being near the salt meadows” (Murphy, 1867, pg. 141). In 1887 these meadows were mainly comprised of saltmeadow cordgrass and blackgrass, which were most common along New Creek, Great Kills, Fresh Kills, and on the Arthur Kill (Bayles, 1887). Lord Adam Gordon wrote in 1765 that

476 Christoph & Christoph (1989, “Order for the surveying of land, which will be granted to John Cornell,” October 3, 1676); Christoph & Christoph (1990, “Minutes of a meeting with Indians from various parts of Long Island about land titles,” 1677; Christoph & Christoph (1982, “Order to the surveyor to lay out land for John Cornell at Cow Neck,” October 3, 1677); Naylor (1994).

477 Fernow (1883, “Council Minute. Appointment of commissioners to lay out land on Long Island,” May 13, 1654); Gehring (2003, May 13, 1654).

478 Christoph & Christoph (1980, “A letter from the Governor to the constables and overseers of Flatlands concerning their meadow ground,” December 28, 1665), Fernow (1883, “A Lre from ye governor to the constables and overseers of Flatlands concerning their meadow ground,” December 28, 1665, pg. 573).

blackgrass was also a valuable fodder species in the nearby marshes of New Jersey (Russell, 1976). European settlement of the island began after 1638 when David Pietersen de Vries asked Director van Twiller for permission to establish a colony for himself and his brother; he returned early in 1639 with some settlers but soon leased it after failing to attract a sufficient number (Murphy, 1835).

Staten Island was essentially abandoned after repeated attacks by the Raritans; in 1640, for example, several murders prompted WIC to cancel contracts with would-be settlers.⁴⁷⁹ Even the far-away *Heeren XIX* was skeptical about the ability to populate Staten Island.⁴⁸⁰ Within a decade, however, Hendrick and Alexander van der Capelle had purchased half of the island and WIC soldiers were protecting settlers sent in 1656.⁴⁸¹ However, a further request for aid was denied because the Council felt that guarding the van der Capelle's small handful of people and cattle was an unwise use of resources.⁴⁸² It was suggested that the livestock be moved to *Nayeeck* (Fort Hamilton in Brooklyn) or van Werckhoven's land (New Utrecht), and only one family remained on the island in 1657 after the rest moved to Fort Orange and Long Island.⁴⁸³ In December of that year WIC agreed to help restore the settlers.⁴⁸⁴

Systematic settlement began in 1669 when a proposal was made to settle families from Bermuda on the southern shore where each home lot would have sufficient acreage for a house and gardens, a plot of arable land, and a "convenient propor[tion]" of meadow.⁴⁸⁵ In October

479 van Laer et al. (1974a, "Release by Cornelis Melyn of Joris Dircksen from this contract to live on Staten Island," August 15, 1640 and "Release by Cornelis Melyn of Frans Jansen from his contract to reside on Staten Island").

480 Gehring (2000, "Letter from the directors at Amsterdam to Petrus Stuyvesant," February 16, 1650, pg. 84); Murphy (1835).

481 Gehring (1995, "Petition of Dirck van Schelluyne for a security force on Staten Island," April 27, 1656); Gehring (2000, "Letter from the directors in Amsterdam to Petrus Stuyvesant," April 4, 1652, 148); Gehring (2003, "Indian deed for Staten Island," July 10, 1657 and "Letter from the directors at Amsterdam to the director general and council," December 22, 1657).

482 Gehring (1995, "Response to the foregoing petition," April 27, 1656).

483 Gehring (1995, "Paper presented to the council concerning relations with the Indians," and "Recommendation of the high council in the foregoing paper," January 26, 1656); Gehring (2003, "List of surviving settlers sent to Staten Island by Hendrick vander Capellen Toe Rijssel").

484 Gehring (2003, "Letter from the directors at Amsterdam to the director general and council," December 22, 1657).

485 Christoph & Christoph (1980, "Propositions and conditions for a competent number of families from the island Barmudas to settle a townshipp upon Staten Island, belonging to these his Royall Highnesse Territoryes") and Fernow (1881, "Propositions and conditions for a competent number of familys from ye Island Barmudas to settle a township upon Staten-Island, belonging to these his royal Highnesse Territoryes")

1670 Cortelyou was ordered to lay out 40 lots in each of three new towns.⁴⁸⁶ The site of *Oude Dorp* (Old Town) may have been selected because the area boasted “a large plain, with much salt meadow or marsh, and several creeks” on the Great Kill (Murphy, 1867, pg. 141; Figure 3-2). In 1671 Cortelyou was ordered to lay out five- to ten-morgen meadow lots on the Great Kill with any extra to be distributed by the governor according to how much livestock was owned.⁴⁸⁷

Danckaertss and Sluyter estimated that in 1679 about 100 families lived on Staten Island, with Dutch and French being about equal in numbers and English being the minority (Murphy, 1867). By that time, however, four of Old Town’s seven houses were abandoned because the land had already “worn out and barren” (Murphy, 1867, pg. 144). Still, in 1680, Daniel Stillwell petitioned for 82 acres of upland and eight of meadow in that area (O’Callaghan, 1866, December 20, 1680 and November 21, 1695). In March 1682 a surveying error prompted Stillwell and another man to ask for new lots with “meadow Proportionable.”⁴⁸⁸

A new locus of settlement began forming at the Fresh Kills on the western shore of the island, which like the Great Kill was flat and “with much marsh” (Murphy, 1867, pg. 141). The Arthur Kill, into which the Fresh Kills flows, was generally characterized by “very great Marshes or Meadows” (Royster, 2006, pg. 19). In the 1670s and 1680s, soldiers were given 80 acres of upland and ten acres of meadow on the Fresh Kill; together they were called the “soldiers’ lots.”⁴⁸⁹ In a 1676 list of Staten Island patents the majority of tracts were 80 acres of upland with six acres of salt and four of fresh meadow; proportions for larger tracts also generally contained upland and meadow a similar proportion, but in some cases the ratio was smaller.⁴⁹⁰

486 Christoph & Christoph (1982, “Mr. Jaques Cortilleau ordered and appointed for the convenient laying out 40. lotts, for the settling of 2 townships on Staten Island,” October 24, 1670) and Paltsits (1910b, October 24, 1670).

487 Christoph & Christoph (1982, “Order to Captain Jaques Cortilleau for laying out the souldiers lotts on Staten Island,” June 14, 1671); Paltsits (1910b, June 14, 1671).

488 Christoph & Christoph (1982, “Grant and order for survey of land on Staten Island for Daniel Stillwell and John Morgan,” March 5, 1682, pg. 265).

489 ALG (Vols. I and II, e.g., June 26, 1683).

490 ALG (Vol. I, “Draught of a patent to Richd. Charlton, for 160 acres of land, with 20 acres of meadow lying upon the northwest side of Staten Island,” 1677); Gehring (1977, “List of Delaware and Staten Island patents,” March 25, 1676).

In 1678 two men requested lots on the island, one at the Fresh Kill and the other at nearby Smoking Point, which were approved because the governor wanted to “have the country settled and particularly that Isl[and].” Each man was granted seven acres of upland and ten of meadow.⁴⁹¹ Over the following years other settlers were granted lots near the Fresh Kills, typically to the south; many of the grants were for 80 acres of upland.⁴⁹² Some grants were smaller and some for over 100 acres were also made, including one of 150 acres plus 20 of salt and fresh meadow in 1684 to William Pinhorne (O’Callaghan, 1866, July 18, 1684). Not all large properties were paired with sizeable tracts of meadow and parcels as small as one or two acres sometimes accompanied requests for surveys.⁴⁹³

Several other men were granted at least one lot each of 80 acres along with numbered meadow lots. Francois Martino, for example, was given 80 acres under the “Iron Hill,” 80 acres in the previously laid-out lots, 16 acres of salt and fresh meadow on the Fresh Kill (in two lots, one being half of Number 3 and the other half of Number 13), and two house lots in the “old Towne” (probably *Oude Dorp*).⁴⁹⁴ To promote efficient settlement, Philip Welles was instructed to survey the island in 1683 and lay out land according to patents held by new residents and determine how much land was possessed by those without patents so that their title could be made official (O’Callaghan, 1866, February 23, 1683). The specific order was for each resident to have “his proper quantity or proportion of land or meadow according as is granted him by Patent.”⁴⁹⁵

Later that decade, Christopher Billip’s land on the southern tip of Staten Island was paired with 30 acres of salt meadow in the *valey* at Smoking Point about five miles away,

491 Christoph & Christoph (1990, “Letter to Andrew Norwood to survey lots on Staten Island for Edward Land and John French,” March 26, 1678, pg. 283).

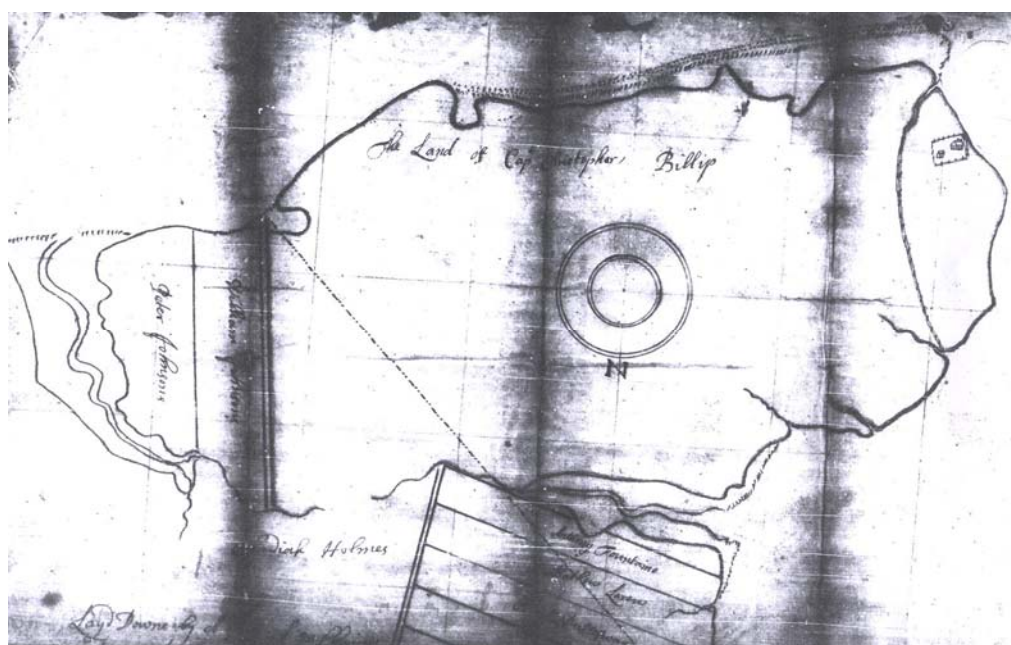
492 Chrisoph & Christoph (1990, “Warrant to Andrew Norwood to survey lots on Staten Island for Martin Haddaway, Daniel Perring, and Claes Smith,” April 6, 1678); Christoph & Christoph (1991, “Draft of land patents on Staten Island for Francois Martino, Louis Lackman, and George Cummins,” pg. 175 and “Names of persons applying for patents on Staten Island,” December 1680).

493 ALG (Vol. II, “Petition of Hans Lawrence, of the county of Richmond, praying a warrant for a survey of a piece of land on Staten Island, containing about 40 acres; together with a small island of meadow, of about 2 acres, lying gat the mouth of oyster creek, for which he has a patent,” 1697 and “Description or a survey of a lot of land, on the west side of Staten Island, at Smoking Point, containing 85 acres , together with one acre of meadow, fronting the said land, and acres at the mouth of the fresh kill, over against Cedar point, laid out for John Lake and Joakim Gulick,” May 6, 1697).

494 Christoph & Christoph (1991, “Draft of land patents on Staten Island for Francois Martino, Louis Lackman, and George Cummins,” pg. 175).

495 Christoph & Christoph (1982, “Warrant to Philip Welles to survey land on Staten Island,” February 28, 1683, pg. 295).

comprised of “small spots” “among a great quantity of bogg and sunck mash.”⁴⁹⁶ Billip was also to have all the meadow adjacent to his land with the exception of that belonging to his neighbor Anthony Fontaine (Figure 5-6). That same year Thomas Lovelace’s farm on the Kill van Kull was assigned 30 acres of salt meadow five miles away at Cedar Point near Fresh Kills.⁴⁹⁷ Some settlers were granted substantial meadow lots at the Fresh Kills independently of any upland; in 1684 William Barker asked for a survey of 20 acres of meadow (Figure 5-7), in 1694 Paul Richards requested one for 30 acres, three years later Thomas Codrington petitioned to have 24 acres of meadow laid out in two parcels, and Thomas Stillwell asked to have one tract laid out.⁴⁹⁸



496 ALG (Vol. II, “Description of a survey of 1,600 acres of land, lying upon ye west end of Staten Island, beginning upon the north side of a certain creek opposite to the land of Gabriel Manuealle, crossing said creek, and running by the main river to the bay, laid out for Christopher Billip, by Phillip Welles, surveyor,” January 28, 1687 and “Description of a survey of several small pieces of salt meadow, on the northwest side of Staten island, near the Fresh kills, beginning at the southernmost branch of the Fresh kill, where it joins the sound; thence southward to Jacob de Muffes his creek, including a peninsula of meadow called Edsalls’ islands, laid out for Christopher Billip, by Ro; Fulerton,” July 6, 1687).

497 ALG (Vol. II, “Description of a survey of 340 acres of land, lying upon the east end of Staten Island, bounded on the north by the Kill van Kull, and known by the name of Loulace’s Farme, laid out for Capt. Thomas Loulace, by Phillip Welles, surveyor,” March 5, 1687).

498 ALG (Vol. II, “Description of a survey of 20 acres of land, lying at the Fresh kill, on Staten Island, laid out for William Barker, by Aug: Graham, surveyor,” July 24, 1695 and “Petition of a survey of 24 acres of meadow, lying at Fresh kill, upon Staten Island, laid out in two parcels, for Thomas Codrington, by Aug: Graham, surveyor,” May 17, 1697, and “Warrant from Gov. Fletcher to Aug: Graham, surveyor general, to survey and lay out for Thomas Stillwell, a tract of meadow land on Staten Island,” November 25, 1697); O’Callaghan (1866, July 19, 1684 and July 12, 1694).

Figure 5-6. "Description of a survey of 1,600 acres of land, lying upon ye west end of Staten Island, beginning upon the north side of a certain creek opposite to the land of Gabriel Manuealle, crossing said creek, an dos running by the main river to the bay, laid out for Christopher Billip, by Phillip Welles, surveyor," 1687 (ALG, Vol. II).

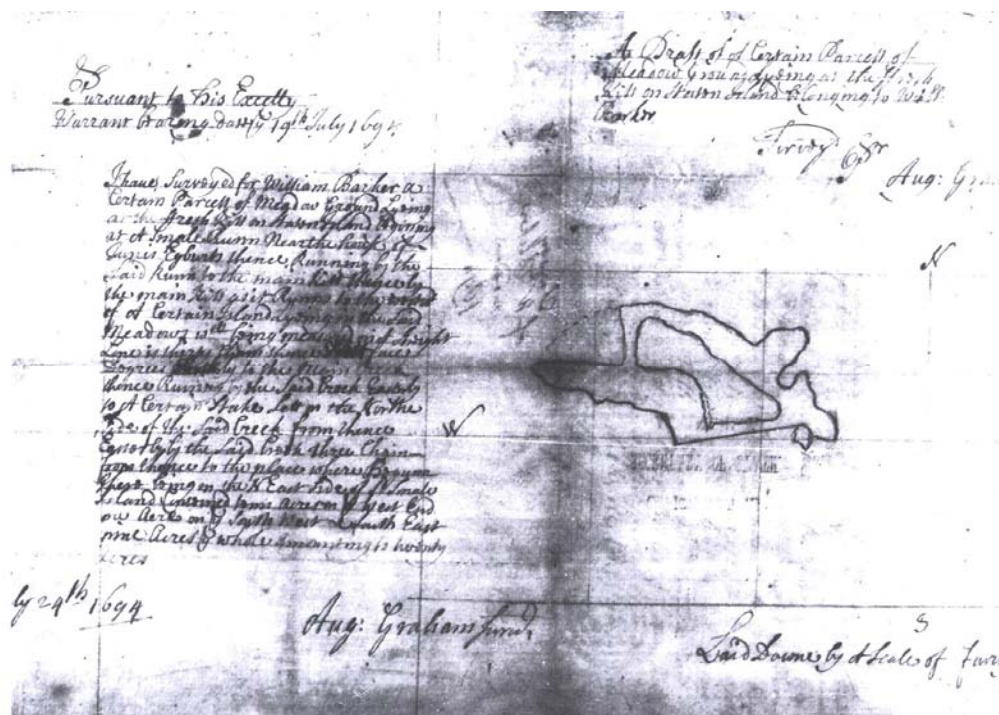


Figure 5-7. "Description of a survey of 20 acres of land, lying at the Fresh kill, on Staten Island, laid out for William Barker, by Aug. Graham, surveyor," 1695 (ALG, Vol. II).

Many surveys were done on Staten Island parcels in 1702, including several for French settlers who were presumably Huguenots who had left France following the revocation of the Edict of Nantes. Thomas Stillwell asked for a survey of his "vacant Marish Boggy Meddow & Beach" on the south side of the island and Abraham Luteiue, who had purchased eight acres of meadow from Stillwell, also asked for a patent on his parcel.⁴⁹⁹ Caleb Heathcote and others asked for a survey of 350 acres of upland and 50 of meadow between the "old town lotts" and the "north lotts."⁵⁰⁰ Peter la Count asked for a patent on his 83 acres of land plus meadow on the

499 ALG (Vol. III, "Petition of Abraham Luteiue, praying a patent for some land and eight acres of meadow, bought from Thomas Stilwell, in Staten Island," April 13, 1702 and "Petition of Thomas Stillwell, praying that a warrant of survey may be issued to lay out a piece of beach, marsh and boggy meadow, lying near ye old town on ye south side of Staten Island," April 13, 1702).

500 ALG (Vol. III, "Petition of Caleb Heathcote and company, praying that a warrant may be issued to survey 350 acres of upland and 50 acres of meadow, more or less in the county of Richmond," November 6, 1702).

west shore and Francis Martino asked for a patent for land “with meadow proportionable.”⁵⁰¹ A French group requested a survey on two lots of land plus 150 acres of salt meadow that were laid out in “sundry small pieces” including a 16-acre meadow in the Fresh Kills with a “hammock of upland.”⁵⁰² Two men requested a patent for 100 $\frac{3}{4}$ acres of land and 15 of meadow, at least 12 of which were specified as salt.⁵⁰³ Another group requested a survey of land including 150 acres of “meadow & swamp land” (ALG, Vol. III, April 13, 1702). Nathaniel Brittain also asked for a patent for his land on Staten Island that partially contained a “swampy reedy meadow.”⁵⁰⁴

One issue with granting land with meadow “in proportion” was that meadow tracts were not always specified, as seems to be the case for Anthony Tysson who asked for a patent on 27 acres of meadow granted to him in proportion to his 130 acres of upland. Apparently the words “meadow proportionable” had not been “legally established [to indicate] meadow or to any meadow whatsoever.”⁵⁰⁵ Nevertheless, as late as 1737 land on Staten Island was still transferred in terms of upland and its meadow in proportion (Clute, 1877).

Hudson River Tidal Wetlands

Accounts of tidal wetlands on the Hudson River are few. In 1749, for example, Peter Kalm simply observed that south of Albany “On the banks of the river were wet meadows, covered with sword grass (*Carex*), and they formed several little islands” (Benson, 1937, pg.

501 ALG (Vol. III, “Petition of Peter La Count, praying a patent for 83 acres of land on the west side of Staten Island, together with a piece of meadow in the neighborhood of the same,” April 13, 1702 and “Petition of Francis Martino, praying letters patent for a tract of land on Staten Island, with meadow proportionable, granted him by Coll. Dungan.”

502 ALG (Vol. III, “Petition of Francis Vincent, Jaques Pullion and Mark Desachoy praying a warrant to survey two lots of land on Staten Island, situate on the rear of Wm. Pullion, John Brevell and Francis Osleton’s lotts, with one hundred and fifty acres of salt meadow, on the said island, in order to the obtaining a patent for the same,” October 29, 1702 and “Description of a survey of sundry small pieces of land, lying upon Staten Island, laid our for Francis Vincent and others,” November 24, 1702).

503 ALG (Vol. III, “Petition of Abraham Lakeman and Peter L. Conte, executor so f the last will of John L. Conte, deceased, praying a patent for sundry pieces of land and meadow, lying on the west side of Staten Island,” December 11, 1702).

504 ALG (Vol. III, “Petition of Nathaniel Brittain, praying a new patent for land, in Richmond county,” April 13, 1702).

505 ALG (Vol. III, “Petition of Anthony Tysson, praying a patent for 27 acres of meadow, adjoining his land, in the county of Richmond,” April 23, 1702).

332). Two decades later Richard Smith noted that he “passed by Sunday Islands whereof Scutters Island affords a good low Bottom fit for Meadow and some of it improved” and also wrote that the northern end of Schodack Island was “fine cleared Bottom not in Grass but partly in Wheat & partly in Tilth. However there was one rich Meadow improved” (Halsey, 1906, pg. 14). Only a few of the islands surveyed by James Frost in 1811 contained labels or symbols indicating shoals, marshes, or mudflats, and the only indications of wetlands along the eastern shore between Kinderhook and Troy were “Widow van Buren’s Meadow” and some “drowned lands.” Richard Smith commented near Fishkill in 1769 that he saw “some Appearance of Meadow Land of which [I] have hitherto seen very little” and at Beekman’s Manor (Rhinebeck), he “saw one Piece of Good Meadow which is scarce here away” (Halsey, 1906, pg. 8). A 1785 visitor only noted that there were some “meadows bounded by rocks” and made only brief notice of Piermont Marsh’s “extensive meadows” (Coventry, 1978, September 14, 1785).

The first mention of Piermont Marsh was in April of 1640 when David Pietersen de Vries sailed to Fort Orange. At *Tapaen* (now Orangeburg) he saw *een groote Valaye leyt van ontrent tweea drie-hondert morgen Kleylandt, en leyt drie a vier voeten uyt het Water, ende komt uyt het hooghe Land teen Kil door loopen*—a meadow of 200-300 morgens of clayland just three or four feet above the water with a stream running through it. He purchased the land from the Indians because it was just a few miles north of his patroonship *Vriessendael* (de Vries, 1911; Murphy, 1835). He does not seem to have done anything with the land and it may have remained vacant until after the 1664 English takeover when the western shore of the Hudson River became increasingly populated. A few settlers arrived in the vicinity of Piermont Marsh in the 1670s and 1680s but the marsh was not included in many patents (Haagensen, 1986; Fabend, 1991; Green, 1886).

The first permanent settlement occurred in the 1680s after a group of proprietors bought a large tract of land (Tappan Patent) within what they thought was the province of East Jersey.

Because they intended to move their produce down the Hackensack River and avoid duties at New York the patent did not include access to the Hudson River except the Tappan Slote running through the marsh (Haagensen, 1986; Fabend, 1991). This group lost their trade advantage when it was decided that the Tappan Patent would be within the province of New York because they were then forced to ship goods through Piermont Marsh to New York markets. Perhaps knowing this would be the case, in 1685 a wealthy land speculator obtained a patent for the marsh and the adjacent land (Lockhart Patent) then promptly sold half the marsh (67 acres) to Ffderick Fflypson (Frederick Phillipse) for only five shillings (Haagensen, 1986; Fabend, 1991; Figure 5-8).

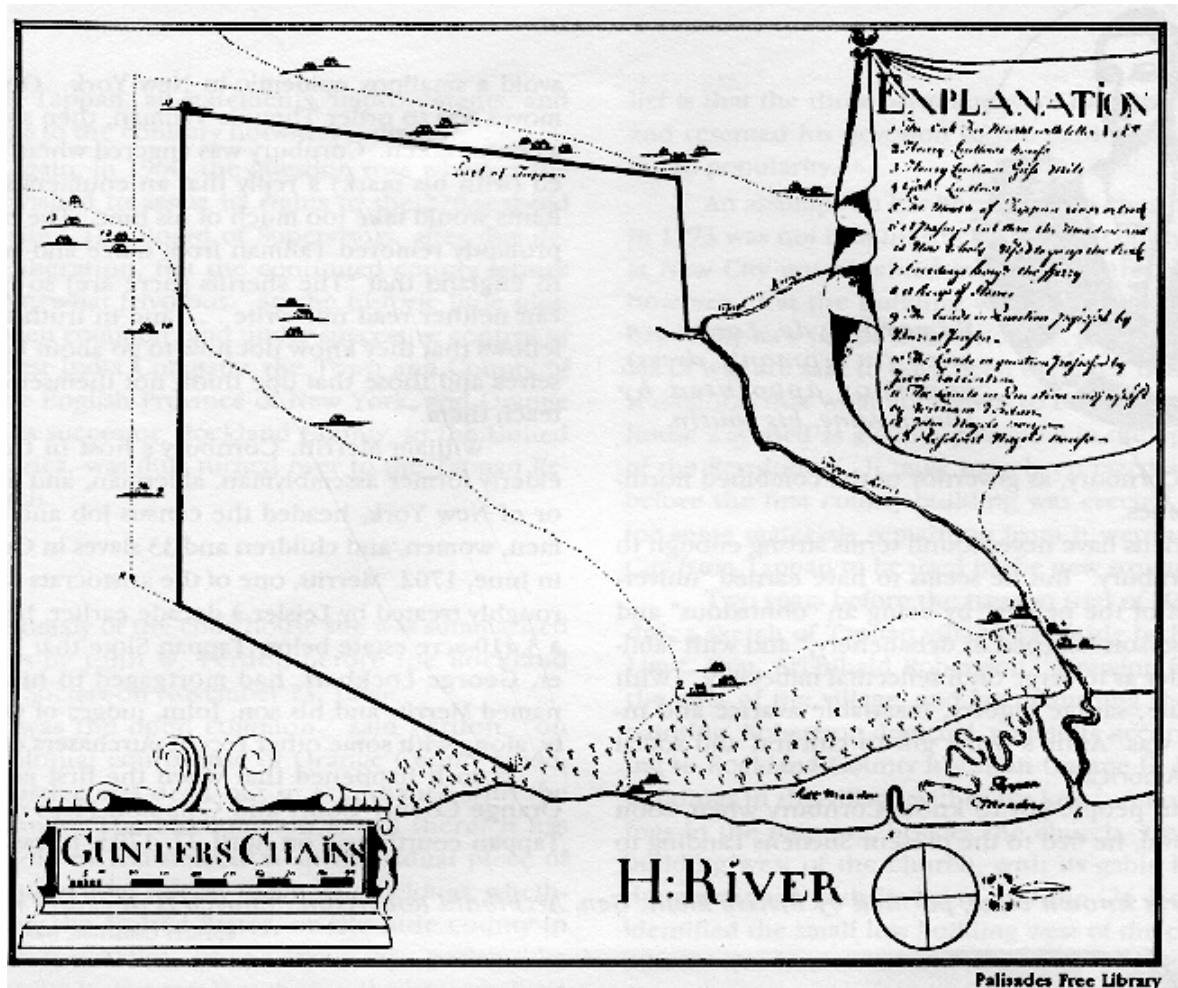


Figure 5-8. Lockhart Patent, 1745, by Philip ver Planck (Palisades Free Library).

Phillipse was the wealthiest man in the province at that time and owned a large manor across the river as well as plantation land at Tappan. The purpose of these transactions was to collect fees on goods moving to and from the Tappan Patent by controlling the Tappan Slote. In 1692 Frederick Phillipse's son petitioned for six and a half acres of salt meadow north of Tappan Creek, presumably to gain control over the entire creek; his grandson later inherited the family's share in the marsh and in 1896 the southern portion of the marsh was still called the "Philipse Tract."⁵⁰⁶

Although the chief value of Piermont Marsh to Lockhart and Philipse was control of trade, its vegetation was still used by farmers. In 1777 a soldier at Orange Town (Rockland County) observed that the families of soldiers who had left to fight in the Revolution were left "without wood, without meal, and without fodder at home for their cattle and many of those near the drowned land depend entirely on those meadows for the support of their stock."⁵⁰⁷ Even in the 1830s and 1930s the marsh was divided into tracts (Figure 5-9).⁵⁰⁸

In 1704 about one-quarter of the Tappan Patent was divided into lots, each with approximately 12 acres of meadow along the Hackensack Creek and the remainder held in common until 1721 (Prince, 1995). Some proprietors had their holdings scattered to accommodate their needs for upland and meadow; Cosyn Haring, for example, had 304 acres of upland in four locations and one piece of meadow (Fabend, 1991). Just south of this patent, at the Palisades, properties were platted as long lots extending inland from the river; each owner had "access to meadowland, farmland, woodland, and cordwood 'pitching places'" (O'Brien, 1981, pg. 149).

⁵⁰⁶ Haagensen (1886), Hall (1912); O'Callaghan (1866, February 11, 1692).

⁵⁰⁷ Fernow (1883, "Die veneris, 10ho A. M. January 3d 1777," December 24, 1776, pg. 142).

⁵⁰⁸ "Salt Meadow Lots Orangetown Rockland Co NY" (July 22, 1931, revised September 24, 1942. Prepared by the Palisades Interstate Park Commission. Map 35, Palisades Free Library, 2009) and "Salt meadow Lots" (March 22, 1837. Map 11, Palisades Free Library, 2009).



Figure 5-9. Detail of “Salt Meadow Lots Orangetown Rockland Co NY,” July 22, 1931, revised September 24, 1942, and prepared by the Palisades Interstate Park Commission (Palisades Free Library).

Just upriver, five tidal meadows were drawn within the bounds of Cortlandt Manor in 1774: *Teller’s* (Croton) Point at location 1, *Salsburge’s* (Iona) Island with “Salsburge’s Meadow” at location 11, one near Parson’s Point with a meandering creek, and another unnamed (Figure 5-10). The Croton Point meadow, initially called *Verdreda Hook*, *Sleeper’s Haven*, or *Navish*, was requested in 1697 by a group of men who described it as a piece of upland separated from the mainland by a marsh or meadow called *Senasqua*.⁵⁰⁹ The meadows have since been obliterated by a landfill. Like Piermont Marsh, Iona Island and its brackish and freshwater marshes are part of the Hudson River National Estuarine Research Reserve. The Brick Kill ran by Parson’s Point in the mid-1800s and a brickyard was nearby, perhaps in the location of the former marsh there (Wade & Croome, 2010). Not all of the long-lots on the river have direct access to a meadow and no wetlands are shown in the manor’s interior.

⁵⁰⁹ A fresh meadow on the Hudson River in Dutchess County also had a name: *Mansacking*. ALG (Vol. II, “Petition of Lucas Keerstede, Johannes Kipp and William Teller, in behalf of themselves and others, praying a patent for a neck or point of land on the east side of the North or Hudson’s river, over against the Verdreda hook, commonly called by the name of Sleeper’s haven, and by the Indians, Navish, the meadow being called Senasqua, bounded by a creek called and known by the name Nannakans,” 1697, and Vol. III, “Petition of Jacob Regnier and company, praying a patent for a parcel of vacant land, in Dutchess county, adjoining the land of the widow Pawling,” March 23, 1704).

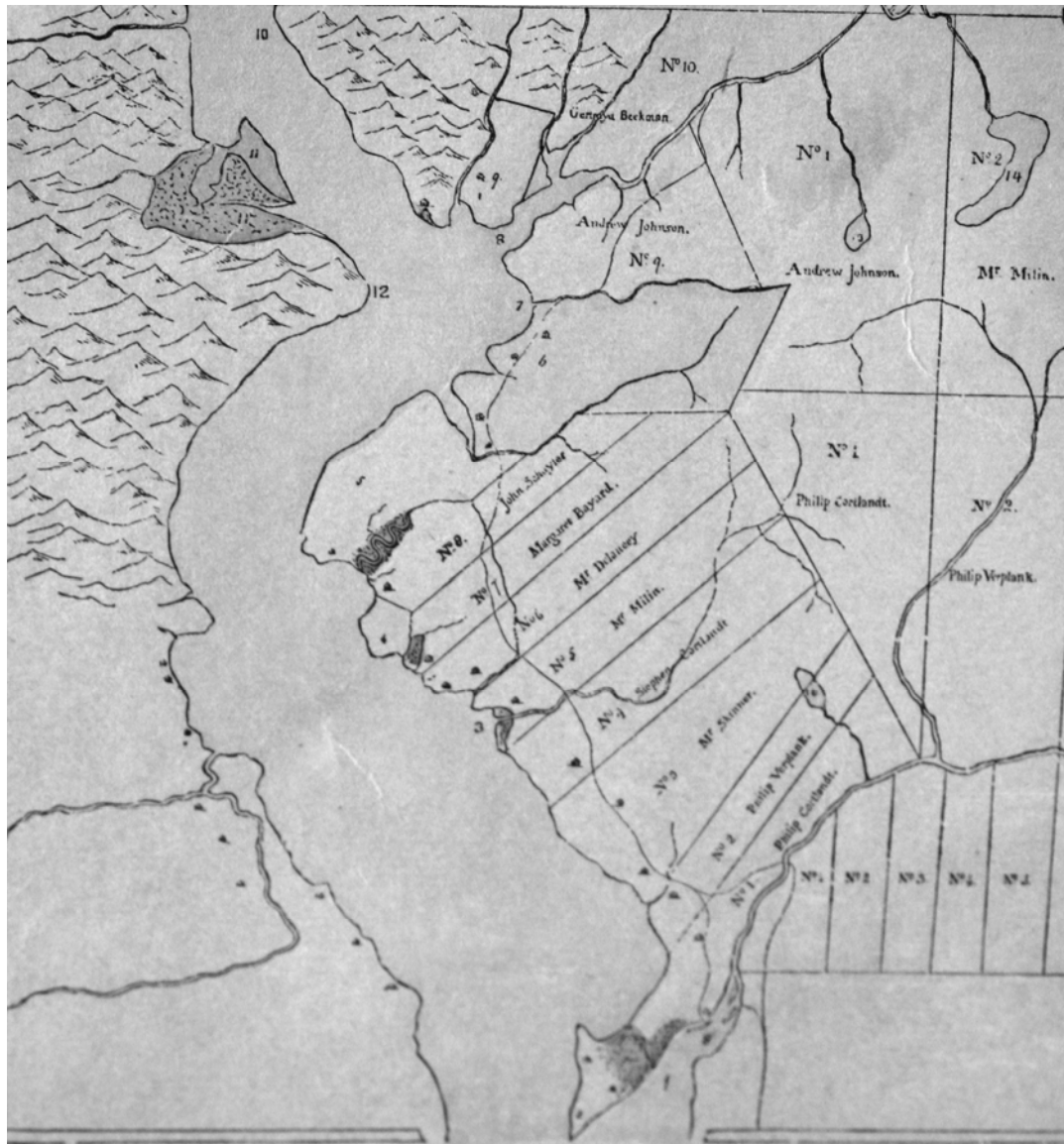


Figure 5-10. "Cortlandt Manor map: prepared expressly for this work / copied for Piere Van Cortlandt esqr., June 1774, by G. Baneker" (New York Public Library).

Hudson Valley Palustrine Wetlands

Palustrine wetlands in the Hudson Valley also had value because in 1652 Goosen Gerritsz's request for a "thicket or swamp" was denied because it was "considered best to keep this for common use" (van Laer, 1920, January 22, 1652, pg. 51). In May 1687 Margareta Schuyler approached Maria van Rensselaer to inquire about purchasing the *vley* lying behind

Schuyler Flats—her request was also denied as others were also interested in making the purchase.⁵¹⁰ A century later a visitor to the Flats described this wetland as being a swamp drained by two creeks (both called *Vleykil*); this wetland is visible on a reproduction of a 1767 map of Rensselaerswijck but no longer exists according to the National Wetlands Inventory (Grant, 1903; Figure 5-11). The Flats also contained a tidal wetland (the Little River Environmental Area) but no pre-1800 descriptions were found for it except one mentioning a “pebbly strand” (Grant, 1903).

Wetlands called *verdronke landt* at what is now Brunswick (Rensselaer County) are also visible on the 1767 map, in an area with a variety of palustrine wetlands where “Mud Turnpike” ran (Figure 5-11). The house labeled 102 is referenced in the legend as being “at the beaver dam,” suggesting that the adjacent wetland originated as a beaver pond that infilled to become wet meadow. Around that time a visitor to nearby Vermont described the value of such beaver-made wetlands by explaining

Why then did we so much rejoice over the dwelling of these old settlers? Merely because their industry had saved us much trouble: for, in the course of their labors, they had cleared above thirty acres of excellent hay-land; work which we should take a long time to execute, and not perform near so well; the truth was, this industrious colony, by whose previous labor we were thus to profit, were already extirpated, to my unspeakable sorrow, who had been creating a beaver Utopia ever since I heard of the circumstance (Grant, 1903, pg. 129).

⁵¹⁰ van Laer (1935, “Kiliaen van Rensselaer to Richard van Rensselaer,” possibly May 1687).



Figure 5-11. Detail of “A map of the Manor Renselaerwick: surveyed and laid down by a scale of 100 chains to an inch / by Jno. R. Bleeker, surveyor, 1767; from the original in possession of Genl. Stephen Van Renselaer [sic]” (New York Public Library).

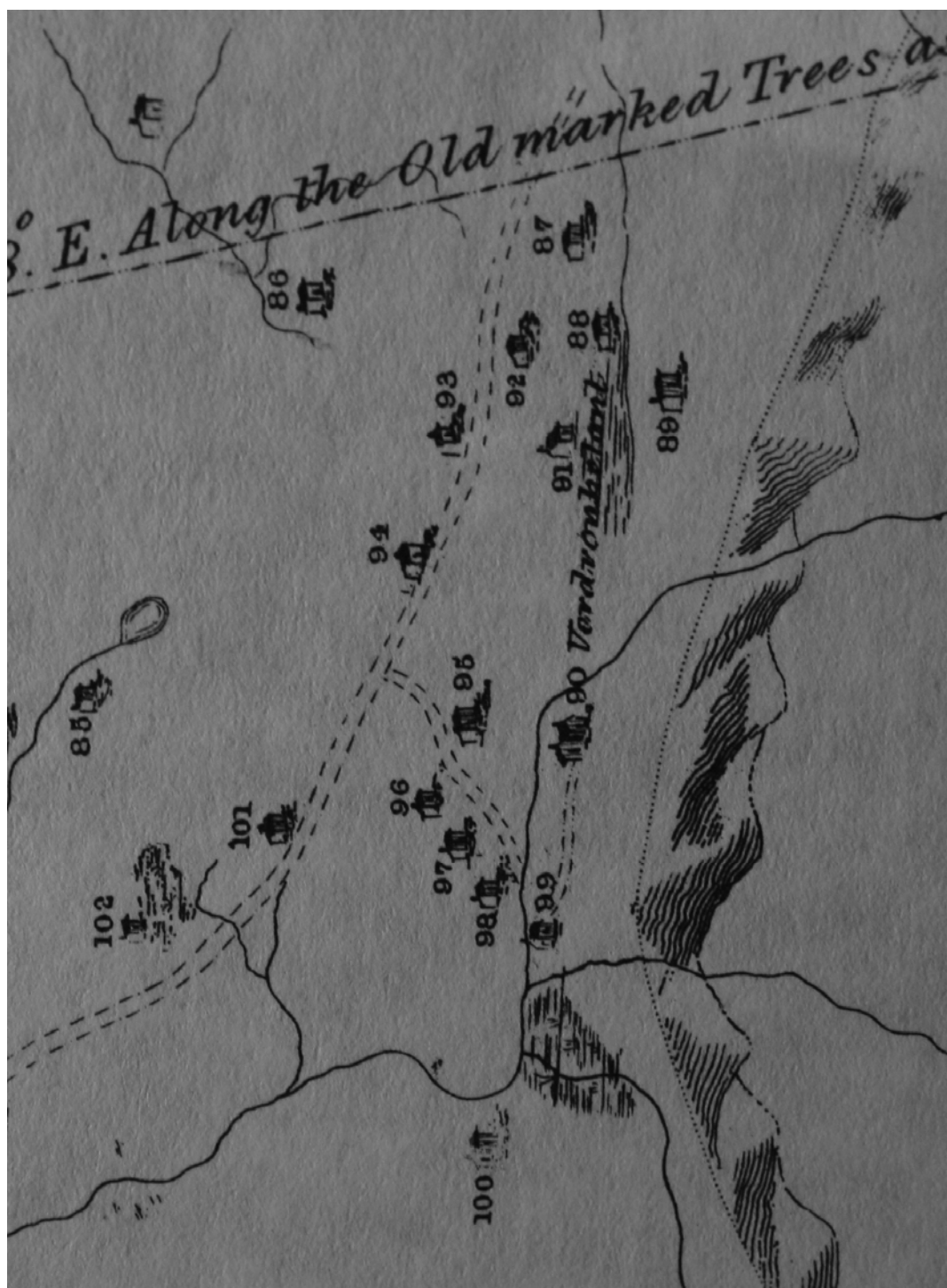


Figure 5-12. Detail of "A map of the Manor Renselaerwick: surveyed and laid down by a scale of 100 chains to an inch / by Jno. R. Bleeker, surveyor, 1767; from the original in possession of Genl. Stephen Van Renselaer [sic]" (New York Public Library).

A duplicate of a late-1780s map of a Rensselaerswijck map shows a *vers vaters fly* (fresh water fly) at what is now East Greenbush (Rensselaer County) (Figure 5-13). This site may have been a large wetland owned by the patroon that was excavated to become today's shallow Hampton Manor Lake (Anderson, 1807; Breig, 2012; Dunn, 2002a).

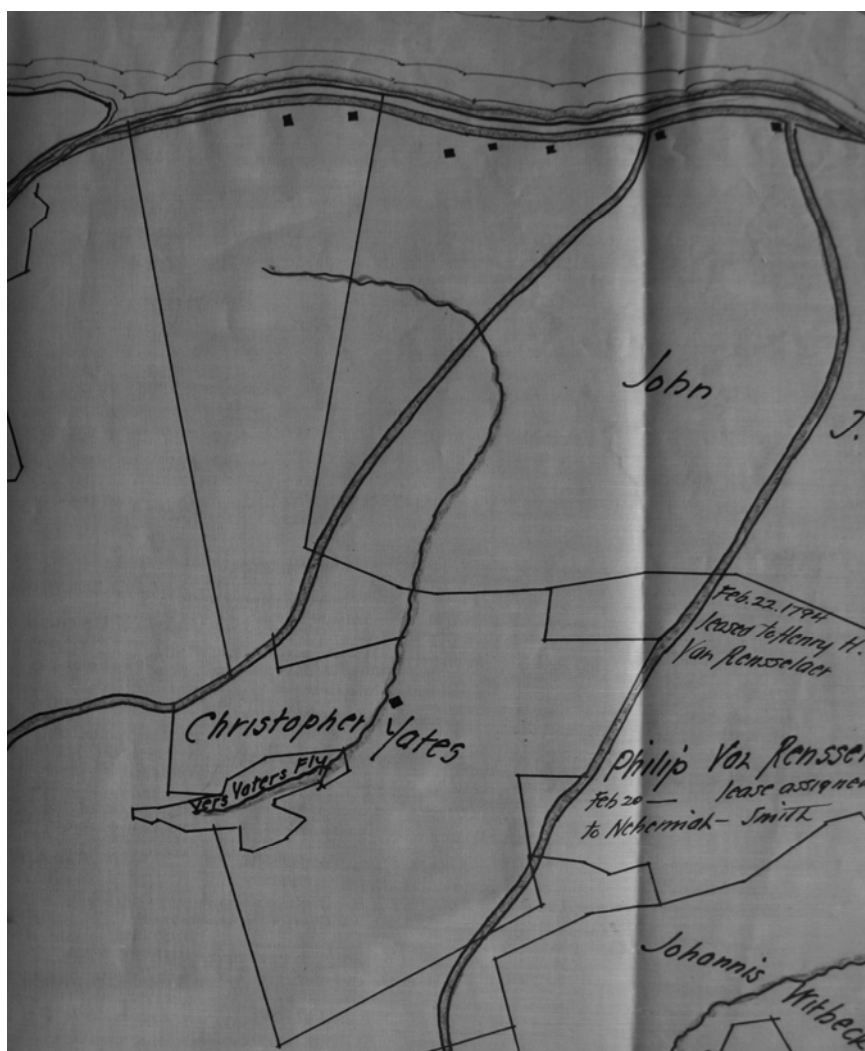


Figure 5-13. Detail of “Map of that part of the Manor of Rensselaerswijck which is called Green Bush: surveyed into farms in the fall of 1788 and spring of 1789, and laid down to scale of 20 chains to an inch, by John E. Van Alen / R. Schermerhorn Jr.” (New York Public Library).

Only two wetlands are shown on a 1714 map of Livingston Manor, which was Robert Livingston's 160,000-acre estate straddling the Columbia-Dutchess county border (Figure 5-14). At that time there were only a few houses established, among them the Witbeak and Brusie farms near the "marshes." One of these wetlands may have become Bells Pond, which in the early twentieth century consisted of open water with littoral emergent wetlands (Figure 5-15).

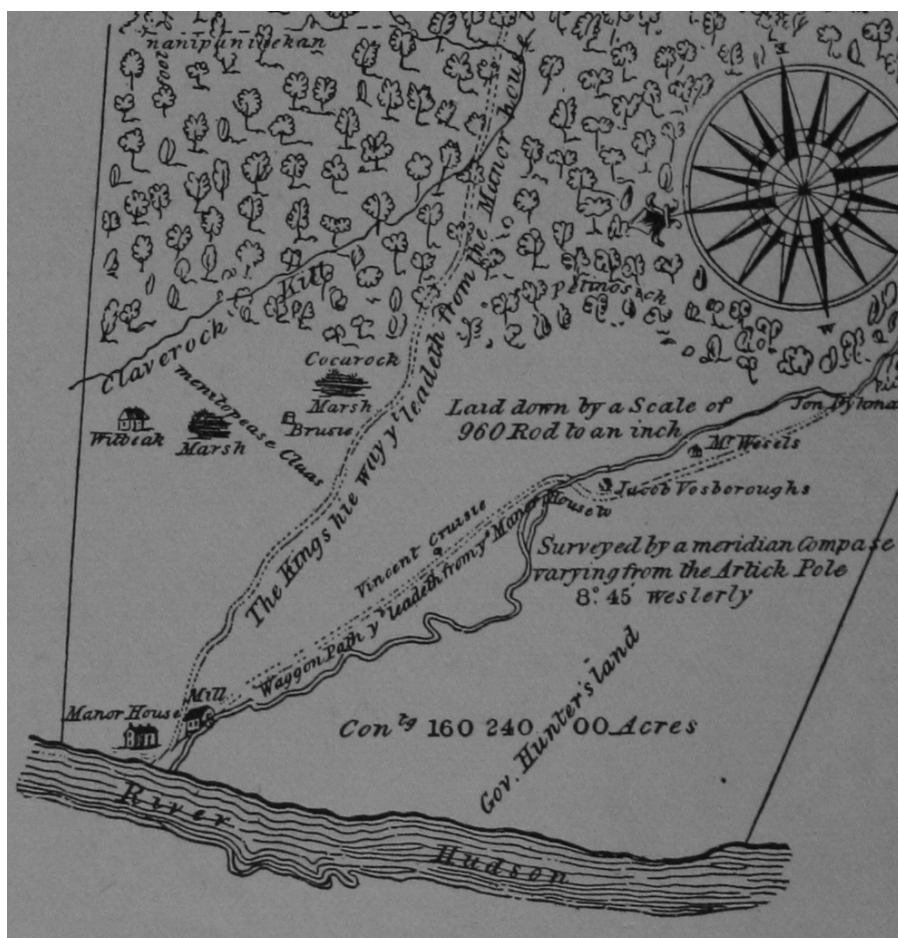


Figure 5-14. Detail of "Map of Livingston Manor, 1714" by John Beatty (New York Public Library).



Figure 5-15. An early twentieth-century postcard showing Bells Pond.

It doesn't appear that water features were highly sought for house lots in Beverwijck/Albany. Properties in town were equally likely to be on or near "the hill" as on one of the five streams flowing through town; those that did border streams or the Hudson River did not maximize water frontage (Gehring & Venema, 2009; Venema, 2003). Bakers, brewers, tanners, and brick- and tile-yards clustered around Beverwijck's streams, perhaps because they were a source of power and a place to dispose of waste (Venema, 2003; Waite & Bender, 1993). Garden lots, however, were preferentially situated along streams and the Hudson River where soils were more fertile (Gehring & Venema, 2009; Venema, 2003). Most of these streams and ravines were infilled in the nineteenth century because they inhibited north-south movement within the city (Waite & Bender, 1993).

With the exception of Fort Orange and some farms in Rensselaerswijck, upriver European settlement was slow; Native Americans were still living in the Esopus and growing corn there in 1640, for example (Murphy, 1835). In 1656 Christoffel Davids received a patent for

36 morgens of land in the Esopus “with as much marshland as shall be parceled out pro rata to the other farms.”⁵¹¹ After a visit by Director Stuyvesant to discuss ongoing troubles with local tribes—caused in large part by drunkenness—the settlers of Esopus agreed to move together into the new palisaded village of Wiltwijck to better receive protection from WIC.⁵¹² In 1667, Matthew Blanchan was deeded a house and 4 acres of land between a creek and the “meadows” at Wiltwijck.⁵¹³ The following year land at Esopus was divided for soldiers into 30 lots along the creek comprised of 30 acres of lowland each and two and a half of upland for home lots and planting land. The woodland was to be left in common.⁵¹⁴ Similarly, in the spring of 1670 an order was made that the land at Esopus and the new villages of Hurley and Marbletown should be laid out equally with “the particular Lotts be laid out as the ground falls out,” and that unless someone was assigned to a plot with a “larger proportion of vile Land or Swamps” everyone should be content.⁵¹⁵ In the fall of 1676 Wessel ten Broeck was granted 14 acres of “marsh” and one acre of “ffly” at Kingston—several other men also received acreage in this wetland, including seven acres for Matias Matison and Derricke Jonson Schapemoes.⁵¹⁶ The wetland may have been later referred to as the *Troopers Fly* because eight soldiers also received seven acres each.⁵¹⁷

In 1680 Captain Hendrick Pawlding applied to have “a vacant piece of Medow ground of about Twenty acres Lying within The bounds of Hurly in Esopus” and 40 acres of “Medows Land and unimproved woodland Lying Within The bounds of Marbleton over against Coxinck on the

511 Gehring (1980, “Patent to Christoffel Davids,” September 25, 1656, pg. 85); Fernow (1881, “Patent to Christoffel Davids for a track of land in the Esopus (Ulster Co.),” September 25, 1656).

512 Gehring (2003, “Journal of Petrus Stuyvesant’s visit to the Esopus,” May 28 to June 25, 1658 and “Agreement by the settlers of Esopus to form a village,” May 1658).

513 ALG (Vol. I, “Deed of Confirmation from Gov. Nicolls to Matthew Blanchan for a house and lot of grounds lying and being at Wiltwijck, at Esopus”).

514 Christoph & Christoph (1980, “A grant to the soldiers at Esopus,” April 6, 1668).

515 Fernow (1881, “Instructions for Captain Dudley Lovelace, Mr. Jacques Cortilleau & the rest of ye Commrs for the affaires at Esopus and the new villages adjacent,” March 24, 1669/70); Paltsits (1910a, March 24, 1669/70, pg. 284).

516 ALG (Vol. I, “Minute of a grant from the court of Kingston, to Wessel ten Broeck of a certain marsh containing 14 acres,” September 21, 1676 and “Description of a survey of about one acre of ffly lying upon ye towne of Kingston at Esopus, laid out y order of ye magistrates of Esopus for Wessel Ten Brooke,” November 13, 1676).

517 ALG (Vol. II, “Description of a survey of 830 acres of land, lying upon both sides of Rondout kill, or river, and known by the name of Moggewarsinck, in the county of Ulster, laid out for Henry Beakeman, by Phillip Welles, surveyor,” May 27, 1685).

west side of The Rondout Kill.”⁵¹⁸ It was ordered to be surveyed but the outcome may have been contentious because in 1683 he wrote to the Court of Assizes regarding his conflict with Hurley over title to some meadows (O’Callaghan, 1866, 1683). The court may have found for Hurley, because later that year a report was made regarding how much he had paid to fence the valley, likely in order to have Hurley compensate him.⁵¹⁹

Several Esopus-area wetlands were requested, surveyed, or patented in the 1680s independent of any upland. In 1686, for example, William de Meyer had two parcels of “ffly or meadow ground” surveyed north of Kingston containing a total of 89 acres; these wetlands were in addition to the 16 acres of woodland and meadow he owned near the village as well as a house lot in town (Figure 5-16).⁵²⁰ Aert Martensen also challenged Reynier van der Coelen’s claim to a cripplebush and Tierck Claessen de Wit was deeded a parcel of “bush-land” near Kingston that may have been part of the *Cline Fly* (Small Fly) surveyed in 1685 for Waldron DeMunt (Figure 5-17).⁵²¹ The survey of DeMunt’s land on the Esopus Kill indicates his 100-acre *Cline Fly* was “woodland,” suggesting it was a forested or scrub-shrub wetland.⁵²² This may have been the lot called *Creupelbush* by a “Wallerand Dumon” ten years prior when asking the Esopus court how to fence it.⁵²³

In 1686 a 38-acre “ffly or meadow ground, upon the great Binwater” northeast of Kingston was laid out for Henry Clayson and Yochum Englebert van Nauman.⁵²⁴ The associated

518 Christoph & Christoph (1991, “Grant to Henry Pawling of lands at Hurley and Marbletown,” July 9, 1680, pg. 325).

519 Christoph (1996, “Report or referees on the amount to be paid to Henry Pawlding for fencing a valley [i.e.: meadow] at Hurley. Dec. 20, 1683”); O’Callaghan (1866, December 20, 1683).

520 ALG (Vol. I, “Description of the bounds of a parcel of woodland, lying on ye south side of Kingstowne, and a small meadow, lying and being by the mill creek to ye west of a rocky hill, containing, in all, 16 acres, with a house lot in Kingstowne, granted to Wm. De Meyer, April 11, 1679 and ALG, Vol. II, “Description of a survey of two pieces of ffly or meadow ground, containing in all 89 acres, lying to the north of Kingstowne, in ye county of Ulster, laid out at the request of Wm. Demyre, by Leonard Beckwith,” December 9, 1686).

521 ALG (Vol. I, “Deed from Gov. Lovelace to Tierck Claessen de Wit, for a parcel of bush-land, together with a house, lot, orchard and calves’ pasture, lying near Kingston, in Esopus,” June 25, 1672).

522 ALG (Vol. II, “Draught of Waldron Demunt’s land, on the south side of the Esopus kill, together with the land of Tirke Claus Dewitt,” June 16, 1685).

523 Versteeg et al. (1976b, “Ordinary session,” March 15, 1674/5).

524 ALG (Vol. II, “Description of a survey of a ffly or meadow ground, upon the great Binwater, lying to the northeast of Kinstown, in the county of Ulster, containing about 38 acres, laid out for Henry Clayson and Yochum Englebert van Nauman, by Phillip Welles, surveyor,” April 9, 1686).

map (Figure 5-18) labeled this wetland “the swamp.” *Binnewater* referred to a string of five lakes in the area and the meadow referred to could have been one of the forested or scrub-shrub wetlands still present there (NWI, 2013). That same year another swamp was surveyed at Kingston for neighbors Thomas Chambers and John Tyson. Chambers requested 144 acres of land plus a “small valley or swamp of land” and Tyson’s tract was 54 acres of “valley or swamp” with a seven-acre piece of land within it (Figure 5-19).⁵²⁵ Interestingly, these references are primarily to forested or scrub-shrub wetlands and are dated many years after initial settlement. The fact that most of these records are from 1686 suggests that the men were prompted to formally stake claims to wetlands that year, and it is impossible to know if these same wetlands were seen as assets when settlement originally began.

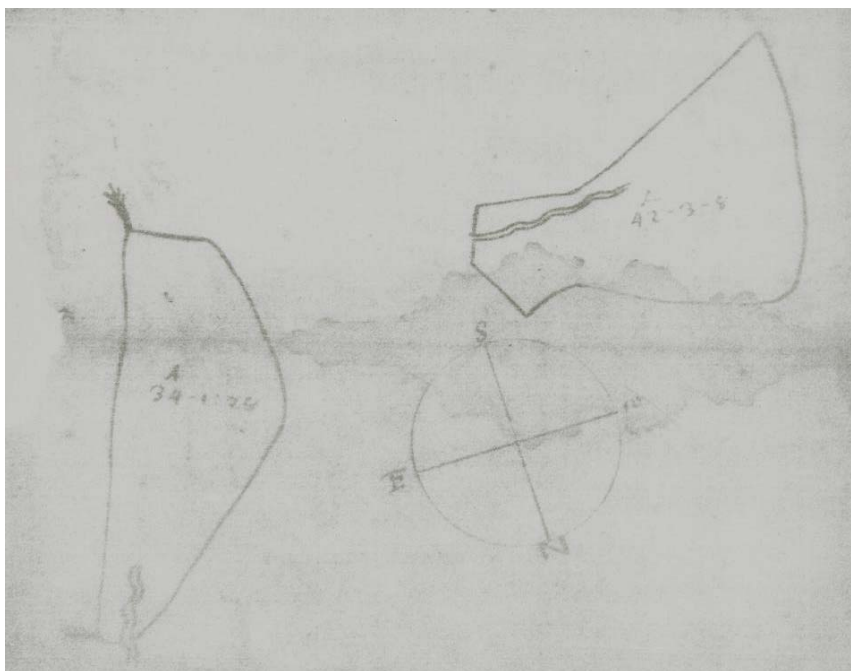


Figure 5-16. “Description of a survey of two pieces of ffly or meadow ground, containing in all 89 acres, lying to the north of Kingstowne, in ye county of Ulster, laid out at the request of Wm. Demyre, by Leonard Beckwith,” 1686 (ALG, Vol. II).

⁵²⁵ ALG (Vol. II, “Description of a survey of a certain tract of land, by the round out kill, within the limits of Kingstown, within the county of Ulster, and known by the name of ye Plain Field, together with swamp land, amount in all to 144 acres, laid out for Thomas Chambers, by Phillip Welles, surveyor,” April 27, 1686 and “Description of a survey of 54 acres of swamp, lying within the limits of Kingstown, in the county of Ulster; likewise about 7 acres of land, lying in ye valley, to the eastward of the southeast gate, in Kingstown, laid out for John Tyson, by Phillip Welles, surveyor,” May 4, 1686).

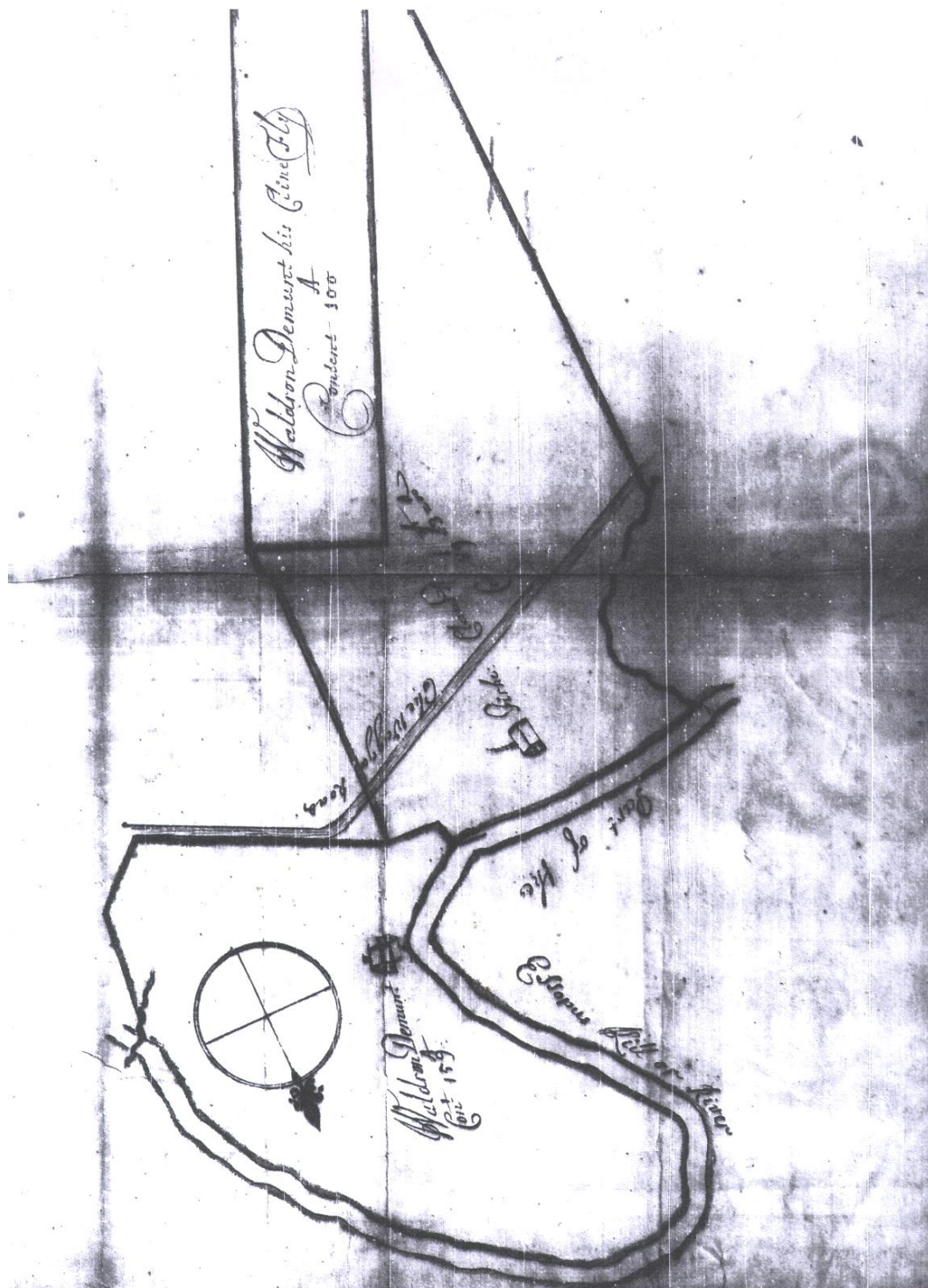


Figure 5-17. "Draught of Waldron Demunt's land, on the south side of the Esopus kill, together with the land of Tirke Claus Dewitt," June 16, 1685 (ALG, Vol. II).

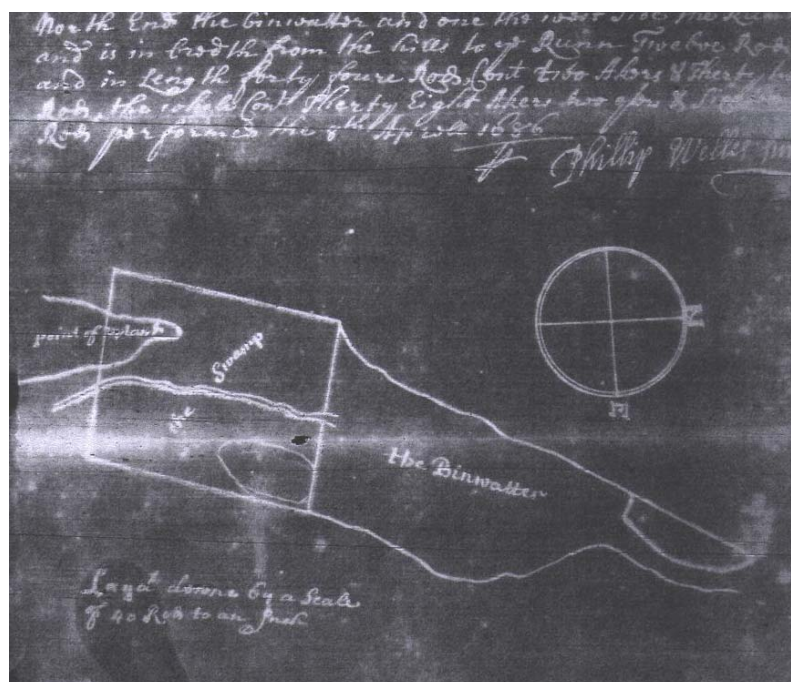


Figure 5-18. "Description of a survey of a ffly or meadow ground, upon the great Binwater, lying to the northeast of Kingstown, in the county of Ulster, containing about 38 acres, laid out for Henry Clayson and Yochum Englebert van Nauman, by Phillip Welles, surveyor" (ALG, Vol. II).

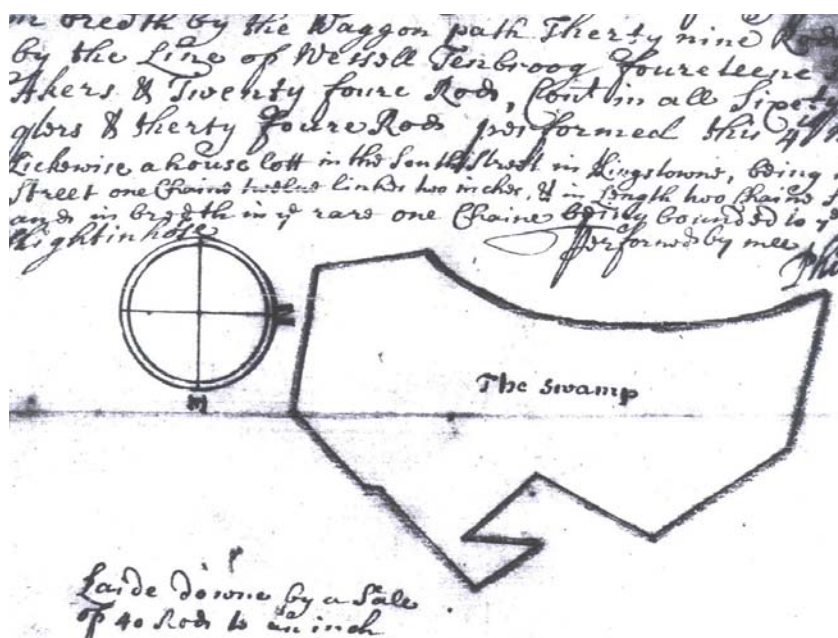


Figure 5-19. "Description of a survey of 54 acres of swamp, lying within the limits of Kingstown, in the county of Ulster; likewise about 7 acres of land, lying in ye valley, to the eastward of the southeast gate, in Kingstown, laid out for John Tyson, by Phillip Welles, surveyor" (ALG, Vol. II).

Other land in the Esopus was parceled out in the 1680s, often in very large portions. In 1685, for example, 672 acres was surveyed on the Rondout Creek for William Fisher containing eight acres of “a small peece of meddow ground in a valley upon the hills.”⁵²⁶ Similarly, 830 acres was surveyed on the Rondout Creek for Henry Beakeman (*Moggewarsinck*) that included a “Small Peece being a sixth part of the Troopers Fly” plus two house lots in Kingston.⁵²⁷ Nearly 1,000 acres was surveyed on the Rondout Creek for Jacob Rutsen (*Roasindale*) that contained woodland, marsh, and a 12-acre “island of meddow.”⁵²⁸

In 1685, 2,960 acres on the Hudson River between the Rondout and Cline Esopus creeks was surveyed for several men, including two lakes plus the *Cline Esopus ffly* (little Esopus fly) and *Sunken ffly* at the Rondout’s mouth. The *Sunken ffly* seems to have been the vegetated tidal flats now called Esopus Meadows, a nature preserve that was once grazed by cattle.⁵²⁹ In 1686 300 acres of land called “a great Fly” with some adjacent woodland was surveyed for a few men.⁵³⁰ The tract was near a small *runing swamp*, the definition of which is unknown although it might have been a forested or scrub-shrub wetland with a stream of water flowing through it.⁵³¹ Around that same time, two English men obtained a patent for the 300-acre “Big Vly” approximately 20 miles north near what is now Saugerties, though settlement did not take place until after 1712 (Brink, 1902). In 1683 Sovereyn Tenhout was granted 300 acres called *Masseecks* or *Massecks*, meaning “low wet lands, a marsh or meadow,” and nearly twenty years

526 ALG (Vol. II, “Description of a survey of 672 acres of land, lying upon both sides of Rondout kill, or river, including part of the Paules river, and known by the name of Hardick, in the county of Ulster, laid out for William Fisher, by Phillip Welles, surveyor,” May 26, 1685).

527 ALG (Vol. II, “Description of a survey of 830 acres of land, lying upon both sides of Rondout kill, or river, and known by the name of Moggewarsinck, in the county of Ulster, laid out for Henry Beakeman, by Phillip Welles, surveyor,” May 27, 1685).

528 ALG (Vol. II, “Description of a survey of 963 acres of land, lying upon the south side of Rondout kill, or river, and known by the name of Roasindale, in the county of Ulster, laid out for Jacob Rutsen, by Phillip Welles, surveyor,” April 15, 1685).

529 ALG (Vol. II, “Description of a survey of 2960 acres of land lying upon Hudson’s river betwixt the Round out kill and the Cline Esopus, and known by the name of Husey’s hill, including the Cline Esopus ffly and Sunken ffly at the mouth of the Rondout kill, with the two lakes, laid out for ffrderick Hussy and others, by Phillip Welles, surveyor,” June 12, 1685).

530 ALG (Vol. II, “Description of a survey of 300 acres of land, lying in the county of Ulster, northward from the mouth of Esopus creek, being a part of the tract called Sagiers, laid out for George Mealls and others, by Ro: Fulertown,” May 8, 1686).

531 A 1785 Virginia will also referred to a *runing swamp* and in the eighteenth and nineteenth centuries a rune was a watercourse. Virginia Wills and Estates, Southampton County, Will of Samuel Cobb, April 11, 1785, accessed online December 10, 2012, from <http://files.usgwarchives.net>), Wright (1903), and Wright (1967).

later Matthias Mott requested this same parcel (Clearwater, 1907, pg. 59). In 1719 several men requested a survey of the Great Vly at Kingston (O’Callaghan, 1866, September 15, 1719).

Conclusion

It is difficult to determine if New Netherland developed around wetlands more or less often than they did flats, islands, and trade routes because settlements were not necessarily adjacent to their traditional or allotted meadows. This was also the case in New England, where as late as 1751 people had to travel around New Haven to gather “sedge-grass to supply their want of fodder at home.” The marshes owned by farmers at New Bedford, Massachusetts were also “mostly situated several miles from their owners’ residence” in 1826.⁵³²

However, it can be said that wetlands were not a deterrent to settlement, particularly near the New York-New Jersey Harbor where some towns became known for livestock husbandry. In that area, where populations were highest, meadows were strictly administered and allotted in proportion to uplands and livestock. The sparse population of the Hudson Valley may have created a more relaxed attitude toward wetlands, which were also less abundant. That the upper Hudson River lacked sufficient natural grasslands is shown by the 1686 charter of the City of Albany that included hundreds of acres of meadows at locations 20 miles to the northeast and 35 miles to the west (described in Chapter 2).⁵³³ Nevertheless, enough settlements throughout the colony existed near wetlands for their perception to be influenced by notions of disease and danger. Chapter 6 considers these early triggers of wetland devaluation and management in New Netherland.

⁵³² Carman et al. (1934, pg. 27); 1826, May 5. *New England Farmer*, IV, 325.

⁵³³ Munsell (1865, “State of the claim of the Corporation of Albany to the lands in Tryon County, called lower Mohawk Castle or Tiononderoga,” October 5, 1779, pg. 300).

Chapter 6

Early Devaluation and Management

Some wetlands were valuable assets to farmers across the colonial Northeast—but were reasons for devaluation and management also regional in scale? What factors contributed to the perceived dangers and deficiencies of wetlands and what techniques were employed to overcome them? Within New Netherland the earliest triggers of devaluation and management were related to sanitation and a desire to stabilize hydrologic regimes to maximize soil firmness and crop production. Within northeastern North America, information available on early wetland management tends to focus on the cultural regions of New France and New England; French settlers were the most intensive managers of tidal wetlands, which along with palustrine wetlands were also managed by English, Swedish, Scottish, and German colonists through burning, irrigation, in-filling, draining, and diking.

Disease

Disease has prompted the devaluation and destruction of wetlands at the global scale. Though not indigenous to North America, malaria has been called an “American plague” (O’Brien, 1981). Prior to the acceptance of germ and contagion theories it was difficult to trace the source of this illness though it was thought to originate in the natural environment and transmit through the atmosphere (Valencius, 2002). These *miasmas* or “bad airs” were associated with wet areas, damp air, and decomposition. Just as wetlands occupied the liminal space

between land and water, miasmas were also produced from “in-between places and incomplete processes” (Valencius, 2002, citing Rush, pg. 127).

The chills and fever caused by malaria are produced by the protozoan *Plasmodium* and spread by mosquitoes breeding in stagnant water. There are four species and four types of malaria, of which two were problematic in North America: *Plasmodium vivax* was more widespread, less fatal, and infection peaked during the planting season and early summer while *P. falciparum* was most common below 35°N, associated with higher mortality, and tended to peak in late summer and fall (Valencius, 2002). On the Delmarva Peninsula, for example, a “seasonally distinct dying time” was known every year in late fall and early winter near the Great Cypress Swamp after people had been weakened by malaria in the previous months (Herman, 1992, pg. 60). Colonists also suffered from the mosquito-borne *bilious fever* (yellow fever).

“Miasmatic waters” were more common in the Midwest and southern United States than in the Northeast (Prince, 1997, pg. 121). In 1679 Daniel Denton surmised that miasmatic illnesses were uncommon on the south shore of Long Island because the fast-flowing streams

purge themselves of such stinking mud and filth, which the standing or low-paced streams of most brooks and rivers westward of this Colony leave lying, and are by the Suns exhalation dissipated, the Air corrupted, and many Fevers and other distempers occasioned, not incident to this Colony (Royster, 2006, pg. 10).

Furthermore, said Denton, “no evil fog or vapour doth no sooner appear, but a North-west or Westerly winde doth immediately dissolve it, and drive it away” (Royster, 2006, pg. 25). In 1678 the Reverend Charles Wolley visited New York and likewise commented that

it does not welcome its Guests and Strangers with the seasoning distempers of Fevers and Fluxes, like Virginia, Maryland, and other Plantations, nature kindly drains and purgeth it by Fontanels and Issues of running waters in its irriguous Valleys, and shelters it with the umbrellas of all sorts of Trees from pernicious Lakes; which Trees and Plants do undoubtedly, tho’ insensibly suck in and digest into their own growth and composition, those subterraneous Particles and Exhalations, which otherwise wou’d be attracted

by the heat of the Sun and so become matter for infections Clouds and maligu Atmospheres (O'Callaghan, 1860, pg. 25).

To the Chesapeake area Wolley could have added the Delaware as a site of “Fevers and Fluxes” because twenty years earlier that region was also characterized by a “general sickness and burning fever” and “Sickness and hot fevers” that led to many deaths.⁵³⁴

These afflictions were not unknown in New Netherland, however, and in 1661 the colony was stricken with “hot plague and unheard-of fevers, illnesses, and torments” thought to result from “unexpected rains and summer floodings... too much and too hot sunshine” (van der Linde, 1983, pg. 33). A type of malaria called the quartan ague was not uncommon and two Manhattan residents reportedly suffered from this type in the late seventeenth century, including a woman living near the Fresh Water.⁵³⁵ In October 1679 one of Danckaerts and Sluyter’s party was also stricken with the quartan ague one month after they commented on the amount of mosquitoes around what became Elizabethtown (New Jersey) (Murphy, 1867). Nearby Perth Amboy also suffered from “the fever and ague” in 1721 (O’Callaghan, 1866, September 3, 1721, pg. 464). Peter Kalm related the “swampy grounds” of the greater New York City region with fever and ague and eventually a “Death Line” was acknowledged in the Hudson Valley at the Tappan Zee, south of which malaria was common (Benson, 1937, pg. 124; O’Brien, 1981). In 1819 a regional journal published an article blaming salt marshes, bogs, and other waterlogged soils with epidemics of yellow fever, and recommended that they be in-filled, drained, and exposed to sunlight (Genet, 1819, November 20). Malaria became more widely spread in Northeast in the late-eighteenth century when the increased creation of millponds provided additional habitat and allowed the disease to penetrate to the interior of the country (Kukla, 1986; Shah, 2010). Some of

⁵³⁴ However, the illness may not have been malaria because it produced fever, chest pressure and pain, and bloody phlegm. Gehring (1981, pg. 125, August 5, 1658, September 5, 1658, and October 7, 1658); Fernow (1877, “Jacob Alrichs to Director Stuyvesant: cattle purchased on the Great Plains at Hempstead for the city’s colony on the Delaware,” June 26, 1658, pg. 218).

⁵³⁵ Fernow (1976e, March 21, 1665); Fernow (1976g, February 24, 1674).

the clearest examples of wetland devaluation and management in the colony accordingly resulted from association with illness.

Wastelands and Quagmires

Little documentation is available regarding New Netherland wetlands deemed worthless for reasons other than disease. Isaack de Rasieres characterized the tidal marshes of *Achter Kol* (Newark Bay) as “waste reedy land” in the late 1620s.⁵³⁶ In 1702 a tract laid out on Staten Island was described as nearly worthless, “being very full of hills boggs & stones.”⁵³⁷ In 1701 a group of men was licensed to buy 5,000 acres in Ulster County, *Wawayanda*, but over the next two years repeatedly requested permission to add another 5,000 acres because the original tract was found to be “altogether a swamp and hardly worth anything long not manurable.”⁵³⁸ This grant was within the Drowned Lands along the Wallkill River (Orange County) that contained an extensive inland Atlantic white cedar wetland before clearance and drainage (Karlin, 1997).

Some wetlands were a danger to livestock. In 1643, for example, a woman living near a large wetland on lower Manhattan used a stick to drive some WIC cattle into the *moras* where they sunk up to their backs; at the same time, testimony was given that “Old Jan” Selis had also driven cows and horses into the wetland.⁵³⁹ He was fined and forbidden to injure or drive other livestock into the swamp or face banishment. In the 1730s a “Raile” was in place to prevent

536 Jameson (1909, “Letter of Isaack de Rasieres to Samuel Blommaert,” pg. 103).

537 ALG (Vol. III, “Letter from S. Clowes, transmitting the above,” April 4, 1702).

538 ALG (Vol. III, “Petition of Samuel Staats and others, representing that a license was granted him on the 26th day of January last past, to purchase 5,000 acres of land, in Ulster County, called Wawayanda, from the native Indians; that they are since informed the said land is altogether a swamp and hardly worth anything, and therefore pray a license to purchase 5,000 acres adjoining thereto,” February 19, 1702, “Petition of Samuel Staats and others, praying a patent for about ten thousand acres of land, lying at Wawayanda or Woerawin,” November 23, 1702, “Petition of Samuel Staats and others, praying a patent for 10,000 acres of land at Wawayanda or Woerawin,” December 10, 1702, and “Petition of Samuel Staats and company, praying a patent for a tract of land, containing about 10,000 acres, at Wawayanda or Woerawin,” February 11, 1703).

539 O’Callaghan (1865, November 19, 1643 and November 26, 1643); van Laer et al. (1974b, “Declaration of Claes van Elslandt and others that they saw the woman residing on Old Jan’s plantation drive the Company’s cattle into the swamp,” November 1643).

cattle “from being Swamped or destroyed” there.⁵⁴⁰ Similarly, in 1662 the inhabitants of Bergen and Comunipaw asked Director Stuyvesant not to allow Nicholas Varleth to own a piece of upland because their cattle would then be limited to pasture in “a marshy underwood” where three or four had already been “smothered.”⁵⁴¹ A decade later the residents of *Breuckellen* petitioned the Council for permission to own an unfenced and vacant “swamp or meadow” (also “swamp or valley”) because many horses and cows had likewise been “smothered” there.⁵⁴²

Wetland Management

Burning

Tidal and palustrine wetlands were burned to facilitate the growth of grasses and exclude woody vegetation, a practice known from the meadows along the Concord and Sudbury rivers, New Jersey’s Hackensack Meadows (annually in August at least until 1883), marshes in Talbot County, Maryland (winter), and grasslands along the Delaware River (every spring, including March).⁵⁴³ However, evidence for wetland-burning in New Netherland is rare and in many cases probably incidental to the burning of uplands.

When describing the state of New Netherland to WIC in 1655, Adriaen van der Donck explained that Native Americans and Dutch settlers would burn “woods, plains, and those marshlands that are not too wet” (*de Bosschen Vlackten en Valleyen*) after autumn leaf-off as well as in spring if any areas were missed (Goedhuys et al., 2008, pg. 21). This was called “bush burning” and done to help hunters by eliminating obstacles and noisy sticks and leaves, and it thinned the forest, cleared dead wood, and increased game. The practice was widespread among

⁵⁴⁰ O’Callaghan (1854b, “Affidavit in support of Captain Rutger’ petition,” December 21, 1730, pg. 917).

⁵⁴¹ Fernow (1881, “Petition of inhabitants of Bergen and Comunipaw against fencing in certain lands and order thereon,” December 28, 1662, pg. 234).

⁵⁴² O’Callaghan (1866, November 17, 1671, pg. 6); Paltsits (1910b, November 17, 1671, pg. 619).

⁵⁴³ Benson (1937); Foster (1999); Nesbit (1885); *New York Times* (1883); Royster (2006).

indigenous tribes; in 1791, for example, a visitor to an area 85 miles southwest of Rensselaerswijck remarked on a tract of land there with few trees and little soil, “it having been burned over by the Indians for the purpose of hunting” (Coventry, 1978, June 13, 1791, pg. 560). Bayles (1882) explained that Native Americans would also annually burn portions of Long Island to keep them clear and that manual removal of new growth replaced fire after European settlement. Part of cowherd Zacharias Sickels’ 1681 contract was to “burn the brush,” probably to expose the ground and promote the growth of herbage, though the only time of year indicated was the “proper time.”⁵⁴⁴

Fire was also used to remove trees and brush from newly cleared farms and the practice was sufficiently common to include in property transactions. In 1640, for example, a farmer in Rensselaerswijck “set fire to the brush in the field” on his farm (van Laer, 1908, pg. 520). Seven years later Cornelis van Tienhoven leased his land at Breuckelen with the caveat that the lessee clear the land by removing stones and burning trees, though stumps could remain.⁵⁴⁵ In 1655 Dirck Jansen Cuyper leased a farm at Midwout with the understanding that he was to “cut off and burn down, like the neighbors, all the trees standing on the land.”⁵⁴⁶ In 1736 two men were granted 3,000 acres of the Mohawk flats called *Onawedaghe* or *Anawedaghe* on the condition that they cultivate three of every 50 arable acres and pay rent; furthermore, nothing should prevent them “from such burning of the woods” and otherwise clearing the land.⁵⁴⁷ In June 1786 a resident of Claverack commented that a man recently cleared a few acres and “burned all the brush and timber, so that the ground is covered with ashes” and in April 1788 he did the same on his own ground (Coventry, 1978, June 1, 1786, 106 and April 24, 1788.). He also set fire to a stand of oak saplings on his property, perhaps to discourage competition and allow these fire-

544 Pearson & van Laer (1918, “Terms upon which Zacharias Sickels agrees to herd cattle Albany,” March 26, 1681, pg. 511).

545 van Laer et al. (1974b, “Lease from Cornelis van Tienhoven to Crigier Pisker and Gerrit Serdts of a parcel of land at Breuckelen, Long Island,” January 26, 1647).

546 van Laer et al. (1974c, “Lease from Cornelis van Ruyven to Dirck Jansen Cuyper of his farm at Midwout, L. I.,” July 12, 1655, pg. 408).

547 ALG (Vol. XII, “Draft of a patent, to John Lyndesay and Philip Livingston, for the patent last above described,” June 21, 1736).

tolerant trees to grow with less competition (Coventry, 1978, March 24, 1786). In 1791 he reported that many people burned their fallow fields and saved the ashes for later use (Coventry, 1978, March 25, 1791).

These fires were not always contained and van der Donck noted that in areas with a lot of pine, like in Rensselaerswijck, trees were destroyed when fires reached into the crown (Goedhuys et al., 2008). In November 1673 the Schout and Magistrates of *After Coll* (Newark Bay) announced that fires should no longer be set “in the woods ffields and meadows” because they caused too much damage to buildings and hay.⁵⁴⁸ Before setting fires the cowherd Zacharias Sickels was instructed to “forewarn the farmers in order that no one may receive harm.”⁵⁴⁹ Fires were also set out of spite, as was the case in June 1675 when a conflict over meadow between Mashpeth Kills and Flatbush culminated in “firing the Meadows and burning their stacks of Hay: severall times. Once in January fired, scorched their cattle and spoyl’d them.”⁵⁵⁰ In October 1726 an act banned “the Setting on Fire or burning the Old grass on Hempstead Plains” but no reason was given. It was renewed in June 1740.⁵⁵¹

Despite evidence for the use of fire on uplands, only two examples specify wetland-burning: a wet meadow in Orange County was described as being “burnt” in 1730 before being sown with grass and in the 1740s Jacob Bruin of New Paltz (Ulster County) owned the *Gerbrande Vly* (Burned Meadow) that was burned to clear away bushes and coarse grass (Clearwater, 1907; Haley, 1989, pg. 23). Alexander Coventry added ashes to some “mossy ground” at Claverack in May 1786, but their source is unknown (Coventry, 1978, May 6, 1786).

548 O’Callaghan (1868, “Laws and Ordinances Enacted by the Schout and Magistrates of After Coll Assembly held at Elisabeth Towne,” November 18, 1673, pg. 501).

549 Pearson & van Laer (1918, “Terms upon which Zacharias Sickels agrees to herd cattle at Albany,” March 26, 1681, pg. 511).

550 Christoph & Christoph (1989, “Calendar of the court of sessions at Gravesend,” June 16, 1675, pg. 169).

551 O’Callaghan (1854b, “Governor Burnet to the Lords of Trade,” October 14, 1726, pg. 782); O’Callaghan (1855a, “Lieutenant-Governor Clarke to the Lords of Trade,” June 14, 1740).

Irrigation

Some wetlands presenting a danger to livestock were intentionally flooded to create ponds but most additions of water were done to promote ley cultures (Carman et al., 1934). Grasslands would be irrigated by directing water through a series of channels throughout a field; these types of irrigated areas were sometimes called “leat grounds,” with a *leat* being a channel used to control meadow flooding or drainage (Donahue, 2004). During the Middle Ages in England these “water meadows” were commonly created to increase soil temperature and lengthen the grazing season for sheep as well as increase hay production (Cook et al., 2003). Hay meadows were flooded to restore soil fertility in Denmark as early as the year 1600 and the practice was common elsewhere in Scandinavia; a school formed in Germany for the express purpose of teaching methods of flooding (Emanuelsson & Moller, 1990; Vasari & Vaananen, 1986). Some areas of continental Europe still practiced meadow flooding in the late-twentieth century. One method, known from Wales and Sweden, involved directing water over *Sphagnum*-dominated bogs in order to transform them into *Carex*-supporting fens (Emanuelsson & Moller, 1990; Segerstrom & Emanuelsson, 2002). Another type from England and Sweden was called “drowning” or “floating”; a similar method is known from New England where the resulting fields were called “floated watermeadows” (Cook et al., 2003; Donahue, 2004).

Irrigation may have begun along the Delaware River by early Swedish settlers and was most extensive in the southeastern Pennsylvania counties of Lancaster and York (Fletcher, 1950). In 1748, for example, Peter Kalm observed how some Pennsylvania farmers made use of wooden gutters to ensure adequate water supply and others created ditches to reroute water where it was needed, writing that

One that has not seen it himself, cannot believe how great a quantity of grass there is in such meadows, especially near the little channels; while others, which have not been thus managed, look wretched. The meadows commonly lie in the valleys, and one or more of their sides have declivity,

so that the water can easily be brought to run down them. These meadows which are so carefully watered, are usually mowed three times every summer...The inhabitants seldom fail to use a brook or stream in this manner, if it is not too far from the meadows (Benson, 1937, pg. 162-163).

Kalm noted that the long growing season in Pennsylvania meant meadows managed in this way could be mown three times per summer. That same year the agriculturalist Jared Eliot explained that many New England farmers flooded their wetlands in winter “to enrich them” (Carman et al., 1934, pg. 17). In the early 1780s the Marquis de Chastellux saw several meadows near the Blackstone River by Grafton, Massachusetts that were “in general intersected and watered by trenches cut on purpose” (Hall, 1828, pg. 306). In New England the purpose was to fertilize fields and exclude woody vegetation. Irrigation may have been transferred to North Carolina in the mid-eighteenth century by Pennsylvania German farmers but appears to have fallen out of favor in Pennsylvania by 1810 (Fletcher, 1950; Gerhke, 1935). The following year, however, the editor of *The Agricultural Museum* wrote that some farmers along the Mohawk River allowed well-water to flow from the pump over the road and into their meadows.⁵⁵² No other examples of irrigating or floating are known in the greater Dutch-administered area, however, and wetland management was primarily based on hydrologic stabilization to remove excess water. Indeed, during his visit, Kalm also described a method for draining too-wet meadows.

Reclamation

Reclamation aimed to lower the water table, remove excess surface water, or exclude tides. To make yields more reliable and the land more accessible, meadows had to be protected from extended flooding near harvest time; in-filling, draining, and diking permitted some degree

⁵⁵² 1811, July. Irrigation, &c. *The Agricultural Museum*, II, 1-6.

of control for riparian meadows. Controlling floods and the water table ensured that wetland soils supported the weight of mowers during haying and stock during grazing, and converted marshes to productive meadows by promoting the growth of grasses and other desired plants (Donahue, 2004). Perhaps the first record of draining a tidal marsh was prior to 1610 when Samuel de Champlain created gardens within the marsh adjacent to the first French compound in Acadia (Butzer, 2002). Although colonial drainage efforts like de Champlain's were probably limited to small, open ditches, management often required community-wide or governmental oversight and regulation (Anderson, 2004; Donahue, 2004; Valencius, 2002; Whitney, 1994). In colonial New England, for example, the dual private-communal operation of some meadows was because they "called for close cooperation in how they were drained, fenced, accessed, and grazed" (Donahue, 2004, pg. 121). New Jersey created a drainage law in 1788 to facilitate the cooperative draining and maintenance of marshes in that state and some other eastern states did the same (Vileisis, 1997).

Large-scale wetland reclamation is known from northwestern medieval Europe where it was primarily financed and engineered by the Dutch beginning in the 1580s; the same Dutch engineer arranged for the drainage of England's Fenlands and wetlands in France, for example (Butzer, 2002; Morera, 2010). Embankments with tide gates were common in the Low Countries in the tenth century (Lambert, 1971) and environmental historian Petra van Dam (2001) believed reclamation in the Dutch Republic constituted an "ecological revolution" (*sensu* Merchant, 1989). Wetlands in England and France were somewhat drained beginning in the twelfth century—largely by monasteries—but these systems had fallen into disrepair before the wave of seventeenth-century reclamation (Morera, 2010). The extensive diking projects found in northeastern North America's salt marshes are direct descendants of this tradition (Butzer, 2002; Morera, 2010).

In 1708 an Acadian resident explained that the persistent lure of the *prairie* stemmed from the infertility of forested uplands (Butzer, 2002, citing de Diereville). Reclamation of tidal marshes occurred quickly in Acadia because many of the first settlers originated from the coastal area of west-central France where marshes were already being managed for salt works and crop-production (Butzer, 2002). Diking became a defining characteristic of New France and the process didn't change significantly after the mid-eighteenth century English takeover: marsh sod was cut, stacked to a height of about five feet tapered upward from a ten-foot-wide base, and stabilized with grass (Butzer, 2002; Smith et al., 1989). Clappervale gates (*aboiteaux*) within these berms, similar to those invented in the Dutch Republic, were typically placed where creeks descended from the upland to exclude salt water but allow freshwater to flow out (Clark, 1968). These creeks were often canalized and together with drainage ditches served as property markers as they did in Europe's Low Countries and sometimes in New England's freshwater meadows (Clark, 1968; Cohen, 1992; Donahue, 2004).

Some diked marshlands along the Bay of Fundy were used for natural hay and pasture for two to three years until the soil was sufficiently desalinized to support other crops and had a reputation for being exceedingly fertile (Clark, 1968; MacNeil, 1989). Marshland was easy to plow because it lacked rocks and large roots and the Acadians also grew wheat, peas, grains, pulses, and vegetables (Clark, 1968). Clark (1968) estimated that there was once ten times as much diked marsh around the Bay of Fundy as there was on the entire Atlantic coast of the United States—in 1750, for example, there were only 500 acres of cleared upland for 13,000 acres of diked marshland in Acadia. Diking in New Brunswick and Prince Edward Island occurred later, in the eighteenth and nineteenth centuries (Hatvany, 2001; 2004).

Projects of this size were not possible on the New England coast where tidal marshes are smaller and more fragmented.⁵⁵³ Smith and others (1989) also attributed the lack of diking in New England to poor planning, different concepts of private property rights, and lack of funding. Nesbit (1885, pg. 17) added that ownership of small parcels by independent owners who were “frugal and thrifty” and wave action was too high and tidal range too low in some areas like the Atlantic coast of New Jersey. Furthermore, in contrast to the Bay of Fundy’s firm “blue clay,” “fine clay,” and “rich fat mud,” the “peaty,” “loose and spongy,” “vegetable fibres” of New England marshes tended to make poor soil and subsided after exposure to air.⁵⁵⁴ Many New England dikes were ultimately breached because farmers no longer desired to cooperate on maintenance and to allow tides to restore fertility.⁵⁵⁵

Diking on the New England coast was known by 1740 and increased after the Revolution, primarily after the emerging agricultural press began providing recommendations and instructions for reclamation (often based on examples from Acadia) (Smith & Bridges, 1982). A 1790 treatise on New England agriculture described dikes as made of marsh sod seven- to eight-foot wide at the base and three feet at the top, with sluices, and vegetation planted for stability (Deane, 1822). By 1870 the largest tracts of reclaimed land in New England were located in Maine and Massachusetts (Nesbit, 1885; Smith & Bridges, 1982).

In-filling

Upland material and refuse were often added to wetlands in organized attempts to depress the water table, but wet sites have also long been used as casual dumping grounds. Manhattan’s tanyards were primarily located on wetlands in the seventeenth and eighteenth centuries,

⁵⁵³ Morgan et al. (2009); Nesbit (1885); Sebold (1992); Smith et al. (1989).

⁵⁵⁴ Nesbit (1885); 1827, February 2. *New England Farmer*, V, 28; 1827, March 2. *New England Farmer*, V, 32.

⁵⁵⁵ Sebold (1992); 1827, February 2. *New England Farmer*, V, 28; 1831, January 1. *New England Farmer*, IX, 28.

presumably because they provided a disposal site for waste. In the 1600s the tanyards first lined the *Prince Graft*, a stream through a salt marsh near what is now Beaver Street. In response to the city's northward expansion the yards then moved to Maiden Lane where a rivulet emptied into the East River at a small marsh called *Smit's Vly* (Hill & Waring, 1899). In the 1670s the yards, along with slaughterhouses, relocated to *Bestevaer's Cripplebush* (Beekman's Swamp or the Leather Swamp). This wetland was used for disposal of tannery waste until the yards were destroyed by fire in the 1720s and 1740s; formal in-filling occurred in the later part of the century.⁵⁵⁶ The yards moved to the Fresh Water and nearby Little Collect ponds that were also used for disposal of waste until after 1803 when in-filling began there. The resulting quagmire was ordered drained in 1805 and filled with clean soil (Hill & Waring, 1899). In-filling on Manhattan in the last decade of the eighteenth century was also prompted by a belief that yellow fever originated in "putrid matter" (Weld, 1807, pg. 176).

Drainage

Subterranean drainage was not common until after the turn of the nineteenth century; until then, surface drainage systems were created by digging ditches, the largest of which were sometimes called canals. In 1655 Adriaen van der Donck commented that "drawing off the water in spring at a suitable opportunity" would make palustrine wetlands suitable for hay-making, and a decade later the Commissioners and Directors of the New Amstel colony reported that the land there had "exceedingly fruitful valleys, which, being drained at a small expense, then return 30-40 fold for what's sown, besides producing two crops a year."⁵⁵⁷ Early optimism aside, not many crops were known to thrive on wet organic soils aside from hay and hemp. Hemp was being

⁵⁵⁶ Hill & Waring (1899); O'Callaghan (1866, October 18, 1722 and March 16, 1742); van Laer et al. (1974a, "Lease from Director Kieft to Thomas Broen and others of a tract of land on Manhattan Island, near Bestevaer's cripplebush," December 15, 1640).

⁵⁵⁷ Goedhuys et al. (2008); O'Callaghan (1858a, "Report on the Colonie on the Delaware River," August 10, 1663, pg. 211).

grown in Canada and New York by the 1720s and was known in New Jersey and Philadelphia within two decades.⁵⁵⁸ However, even the moderate drainage required by the plant proved too expensive for its widespread cultivation.⁵⁵⁹

Crops aside, drainage was also done in wetlands viewed as unhealthy, dangerous, or waste land. In September 1668, for example, Governor Lovelace gave the inhabitants of Esopus instructions to install a “sufficient Draine” the following spring in the “Swamp lying under th[e] Towne” so that it would be “made dry and consequently healthy” for use by the Town of Esopus.⁵⁶⁰ This order was clarified as “The Morasse that lyes under the Towne you are to t[ake] care that it be dray’nd whereby the place will not onely be improved to be better but it will Contribu[te] much to the health of the place.” A November 1668 deadline was given for draining this “Swampish or Morasse.”⁵⁶¹ The “valley” was still undrained in September 1669 because of a labor shortage after many people relocated from Wiltwijck to the new villages of Hurley and Marlborough.⁵⁶² A fine of 100 skipples of wheat was to be levied against the town if it was not drained within two months because it was “almost useless.”⁵⁶³ It was decided that fall to hold a meeting to discuss “draining the valley” and keep it for the community.⁵⁶⁴ Similarly, during a 1675 court session at New Castle it was decided that a “small piece of Low Ground or Swampe” north of town was a nuisance. The owners were “ordered to bee dit[ched] within one month in order to its draining” or the town would do it and take ownership.⁵⁶⁵

558 Carman et al. (1934); Fabend (1991); Haley (1989); O’Callaghan (1855b, “Census of Canada. 1719,” November 14, 1719, “Census of Canada. 1720,” October 26, 1720, and “Census of Canada. 1734”).

559 Nicholas (1811, November); O’Callaghan (1854b, “Governor Hunter to the Lords of Trade,” November 12, 1716, pg. 460); O’Callaghan (1851, “Observations on the Situation, Soil, Climate, Water Communications, Boundaries, &c. of the Province of New York,” 1738, pg. 174 and, “Mr. Colden’s answers to the queries of the Lords of Trade,” February 14, 1738); O’Callaghan (1855a, “Lieutenant-Governor Clarke to the Lords of Trade,” February 17, 1737/8, pg. 116).

560 Christoph & Christoph (1980, “An answer to the desires of the inhabitants of the Esopus tendred to me 24th of September 1668,” September 24, 1668, pg. 174); Fernow (1881, “An answer to the desires of the inhabitants of the Esopus tendred to me,” September 24, 1668); Paltsits (1910a, September 26, 1668).

561 Christoph & Christoph (1980, “Instruccions to the schout and the rest of the comissaryes at Esopus,” 1668, pg. 175).

562 Versteeg et al. (1976b, “Extraordinary session,” September 23, 1669).

563 Fernow (1881, “An Ordr for ye Drayning ye Swampish or Morasse Ground adjoining to ye towne of Kingston,” September 23, 1669, pg. 433); Paltsits (1910a, September 17-29, 1669, pg. 270).

564 Versteeg et al. (1976b, “Extraordinary session,” October 20/30, 1669).

565 Gehring (1977, “At a speciall Court held by the Go: at New Castle in Delaware River, the 13th and 14th dayes of May 1675,” pg. 78).

In the late-1660s an issue arose between Gravesend and Francis Brown over a piece of “Meadow ground or Valley” that was not included in either original patent when it was “esteemed as drowned and waste Land.”⁵⁶⁶ Brown opposed Gravesend’s desire to fence or ditch the meadow in 1668, but it was given permission and Governor Lovelace sent a surveyor to assess the situation.⁵⁶⁷ Surveyor Jacques Cortelyou concluded that Brown did have a greater claim to the meadow and recommended that he be allotted the portion “directly before his doore” and another portion be given to Gravesend as compensation, with the final portion at the disposal of the court or governor.⁵⁶⁸ It was ultimately decided that two-thirds of the meadow would go to Gravesend and the remainder to Brown because both parties had “strove to make use of it,” and Brown was to compensate Gravesend for the work they had done.⁵⁶⁹ The drying-out of this marsh could also have resulted from rapid accretion following sediment influx from upland activities like farming and deforestation; tidal marshes in Maine, Boston, and California probably formed in this way (Anderson, 1992; Josselyn, 1983; Kirwan et al., 2011). Drainage or natural in-filling may have been the reason a “low Place of ground, w^h. formerly has been a Swamp” at Schenectady was requested a few years later by Josias Teunissen Swart.⁵⁷⁰

In April 1677 Brooklyn complained to Governor Lovelace about “a certain piece of swampy marshland which annually caused great damage to its inhabitants through the loss of horses and cows that wander in there and perish.” They asked that the land be given to some of the inhabitants “who would ditch the aforesaid swampy marshland and thereby dry it in order to

566 Christoph & Christoph (1980, “Minutes of a hearing into a land dispute between Francis Browne and the town of Gravesend,” June 21, 1669, pg. 268); Fernow 1883, “Court proceedings: land near Coney Island in dispute,” June 21, 1669, and “The report of Captn manning & Jaques Cortilleau about ye meadow in dispute betweene ye towne of Grauesend & Francis Browne”).

567 Christoph & Christoph (1980, “Liberty graunted to the inhabitants of Gravesend to goe on with their fence or ditching,” November 21, 1668 and “An order about Gravesend and Francis Browne,” May 1, 1669).

568 Christoph & Christoph (1980, “The report of Captain Manning and Jaques Cortileau about the meadow in dispute between the Towne of Gravesend and Francis Browne”).

569 Fernow (1883, “Trials in the Court of Assizes of L. I. land titles,” November 3, 1669).

570 Pearson & van Laer (1916 “Jacobus Meesen Vrooman and his wife to Josias Teunissen Swart for part of farm no. 10 at Schenectady,” 1685/6, pg. 300).

prevent communal losses.” The residents were awarded the piece and “incurred heavy expenses having a ditch dug through the aforesaid swampy marshland from one end to the other.”⁵⁷¹

Other records of ditching were less specific. In 1680, for example, a controversy over meadows between Amesfoort and Midwout was settled with the understanding that Midwout would continue to own the meadows lying between “the draine or Ditch” and the forest. It would also retain a piece of upland “beginning at the Ditch Line that Runneth away East half a point North at Canarisea” (Fernow, 1883, September 1680, pg. 754). That decade a dispute arose over meadow between Stony Island and Stony Point on the Bronx mainland because a ditch dug through the meadow ten years prior was the only separation of the island from the point. The purpose of this ditch would seem to be drainage, but witnesses testified that the neck was firm enough to support horses and carts before its excavation (Riker, 1904).

References to wetlands being cultivated and inhabited may be indications that they were drained. In 1647 a man was granted one morgen of land “in the little marsh beyond Wolphert Gerritsz’s marsh for a house and garden, and a carpenter’s yard” and a decade later Johannes de Laet was given a patent for land in Esopus containing 500 morgens of “arable marsh and woodland.”⁵⁷² In 1671 Sweer Teunesen van Vessen’s garden was located “in the valley” and four years later Jacob Elberts and Johannes Jurriaesen leased Brabander’s Thicket in Esopus “for the purpose of tilling” (Versteeg et al., 1976b, February 7, 1671 and November 23, 1675).

The location of early ditches in WIC’s “salt meadows” north of Corlaer’s Hook are shown in Figures 6-1, 6-2, 6-3, and 6-4. One of several nineteenth-century drainage plans for this marsh included three canals twenty feet wide with wooden bottoms and stone sides decorated with railings and trees—this was rejected in favor of an underground drainage plan that would facilitate creation of the island’s gridded street pattern (Hill & Waring, 1899).

⁵⁷¹ Christoph & Christoph (1990, “Declaration of Brooklyn officials concerning marshland granted to Dirck Jansz, Jeronimus de Rapelje, and Michel Hainelle. Translation,” April 24, 1677, pg. 54-55).

⁵⁷² Gehring (1980, “Patent to Daniel,” May 15, 1647 and “Patent to Johanne de Laet,” March 27, 1657, pg. 87).



Figure 6-1. Detail of "Plan of the City of New York [The Ratzen Plan]," ca. 1766 (Stokes, 1998).



Figure 6-2. Detail of "[Map] Plan of the city of New York, in North-America [View] A SouthWest View of the City of New York, Taken from the Governours Island at * [The Ratzer Map]," ca. 1766 (Stokes, 1998).



Figure 6-3. Detail of “[British Headquarters MS. Map of New York and Environs],” ca. 1782 (Stokes, 1998).

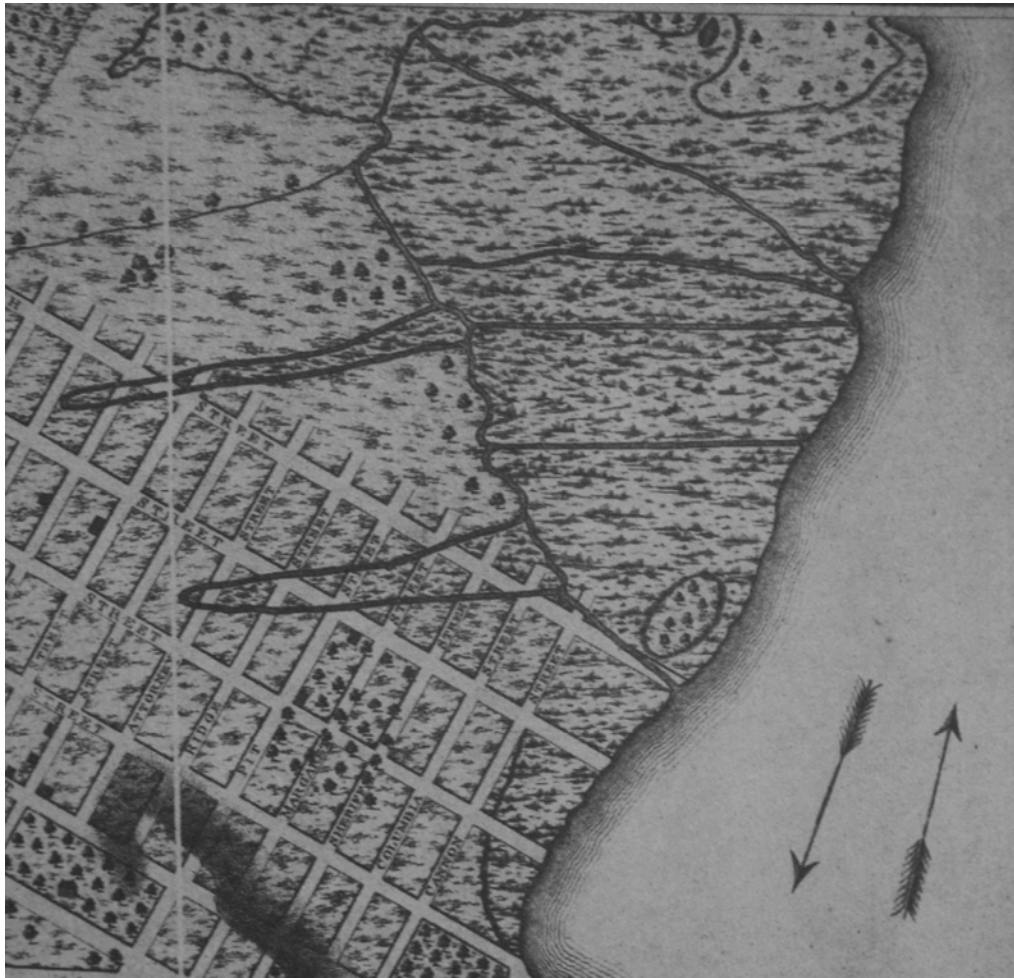


Figure 6-4. Detail of “A New & Accurate Plan of the City of New York in the State of New York in North America. Published in 1797. [The Taylor-Roberts Plan],” 1796 (Stokes, 1998).

Another sizeable ditch system was constructed in the 1730s to drain a string of wetlands across the breadth of Manhattan where City Hall stands today. These wetlands connected the East and Hudson rivers through the Fresh Water (Figure 6-5).⁵⁷³



Figure 6-5. Detail of “The Vile Map 1864.” Shaded areas represent wetlands (Stokes, 1998).

573 O’Callaghan (1854b, “Affidavit in support of Captain Rutger’ petition,” December 21, 1730, pg. 917).

The idea to drain these wetlands may have originated as early as the late-1620s to create shelter for boats docking at New Amsterdam, but no action was taken.⁵⁷⁴ In 1694 Captain John Evans petitioned for ownership of this “certain swamp” and four years later it was sold to him.⁵⁷⁵ However, because Evans was also granted 4,000 acres Ulster and Orange Counties this Manhattan grant was deemed “extravagant” and the land reverted to Crown ownership. Immediately thereafter, in 1699, a bill was enacted to prohibit the sale of the Fresh Water stipulating that the area was never to be held in private ownership and no governor could lease it out for a term longer than his time in office.⁵⁷⁶ Administrations were prevented from clearing and draining the site themselves because of the cost.⁵⁷⁷

Because it was not a desirable place to live, only manumitted WIC slaves and “poor laboring people” settled lots by the Fresh Water during the seventeenth and early eighteenth centuries.⁵⁷⁸ The Lutheran Church even rejected a gift of six acres in the wetland because it wasn’t worth the cost of fencing (Hill & Waring, 1899). Hill and Waring (1899) remarked that this “continuous swamp” was also “long famous for its malaria and mosquitoes.” In 1733 a complaint was made that since the 1699 act went into effect

the said swamp has layon undrained and of no use to the governours of this Colony for the time being and all along been a nuisance to the inhabitants of the City of New York by the noisome vapours that arise therout for want of clearing and draining.

⁵⁷⁴ Jameson (1909, “Description of the Towne of Mannadens, 1661” and “Letter of Isaack de Rasieres to Samuel Blommaert”).

⁵⁷⁵ O’Callaghan (1854a, “Report of the Board of Trade on the Affairs of the Province of New-York,” October 19, 1698); O’Callaghan (1854b, “Answer of the agent of New-York to a memorial against the act vacating certain grants of land,” October 26, 1700); O’Callaghan (1866, March 1, 1694).

⁵⁷⁶ ALG (Vol. X, “Description of a survey of four several tracts of land, being part of the lands formerly granted to Capt. John Evans, three lying in the county of Ulster, containing together 3,000 acres, and the other in the county of Orange, containing 1,000 acres, laid out for Richard Bradley and William Jamison, by John Alsop, deputy surveyor [Plattekill, Ulster Co., Newburgh and Monroe, Orange Co. and Haverstraw, Rockland Co.], May 12, 1729 and Vol. XI, “Copy of an act to repeal so much of a clause, in the act entitled a bill for the vacating, breaking and annulling several extravagant lands, made Col. Benjamin Fletcher, late governour of this province, as concerns a certain swamp and fresh pond, called the Fresh water, and adjacent to the King’s farm, formerly called the Due’s farm, on the Island Manhattens,” October 29, 1733); O’Callaghan (1854b, “Petition of Captain Anthony Rutger to the King,” December 1730).

⁵⁷⁷ ALG (Vol. XI, “Copy of an act to repeal so much of a clause, in the act entitled a bill for the vacating, breaking and annulling several extravagant lands, made Col. Benjamin Fletcher, late governour of this province, as concerns a certain swamp and fresh pond, called the Fresh water, and adjacent to the King’s farm, formerly called the Due’s farm, on the Island Manhattens,” October 29, 1733).

⁵⁷⁸ Gehring (n.d.); Murphy (1867); O’Callaghan (1854b, “Petition of Captain Anthony Rutger to the King,” December 1730, 915, pg. 917).

The wetland was leased by Leonard Lispenard until the 1730s when Anthony Rutger offered to drain it in exchange for title. He made his request because the city of New York was expanding northward and the swamp was a “publick nuzance” with no foreseeable benefit unless it was cleared and drained. In 1730 Rutger described the 70-acre “swamp” as

filled constantly with standing water for which there is no natural vent and being covered with bushes and small Trees, is by the stagnation and rottenness of it, said water become exceedingly dangerous and of fatal consequence to all the inhabitants of the north part of this City bordering near the same, they being subject to very many deceases and distempers, which by all Physicians and by long experience are imputed to those unwholesome vapours occasioned thereby and as the said Swamp is upon a levell with the Waters of Hudsons and the South Rivers, no person has ever yet attempted to clear the same.⁵⁷⁹

Several men, including physicians, supported his request and described the swamp as being “very narrow and very long, and being covered with Breaks and bushes and small trees” as well as being unhealthy, with several nearby residents suffering from “agues and fevers” caused by “unwholesome Damps and vapours.” In the dry season the area made good pasture but otherwise a fence was needed to prevent cattle “from being Swamped or destroyed in the said Swamp.”⁵⁸⁰ The 1699 act had to be repealed prior to Rutger taking possession and in August 1731 the Council empowered the Governor to grant a patent to Rutger for 70 acres of this “swamp and fresh pond.”⁵⁸¹ The Lords of Trade agreed that Rutger should be granted the swamp, which was transferred to him by Governor Cosby in 1733 after Rutger had “already been at a very great expence in draining it.”⁵⁸²

⁵⁷⁹ O’Callaghan (1854b, “Petition of Captain Anthony Rutger to the King, December 1730, pg. 915).

⁵⁸⁰ Hill & Waring (1899); O’Callaghan (1854b, “Affidavit in support of Captain Rutger’ petition,” December 21, 1730, pg. 917).

⁵⁸¹ ALG (Vol. X, “Order in council, empowering the governor to grant a patent to Anthony Rutger, for a certain swamp and fresh pond, called the Fresh water, adjacent to the Duke’s farm, upon New York Island, containing in all 70 acres,” August 12, 1731, “Exemplification of an order of the king in council, empowering the governor to grant the fee simple and inheritance of a certain swamp and fresh pond called the Fresh Water, adjacent to the Duke’s Farm on the Island of Manhattan, now called New York, to Anthony Rutger, the same containing about 70 acres,” September 1732, and and “Warrant for a patent to Anthony Rutger, for the land last described,” September 16, 1732).

⁵⁸² O’Callaghan (1854b, “Order in council referring Captain Rutger’ petition to the Lords of Trade,” January 28, 1731 and “Governor Cosby to the Lords of Trade,” December 15, 1733, pg. 962).

The main stream was straightened, deepened, and sheeted, and a drain through the wetland was lined with stone and eventually measured fourteen feet wide and six feet deep. This primary canal was later determined to be a threat to public health and in 1805 ordered to be filled; Canal Street now runs atop the channel (Hill & Waring, 1899). Figures 6-6 through 6-13 show various aspects of this drainage system during the eighteenth and early nineteenth centuries. The drained land was initially called Rutger's Farm but after Leonard Lispenard married Rutger's daughter the area became known as Lispenard's Meadows (Hill & Waring, 1899).



Figure 6-6. Detail of “A Plan of the city and Environs of New York [Grim’s General Plan],” ca. 1743 (Stokes, 1998).



Figure 6-7. Detail of “A Plan of the city of new-York & its Environs to Greenwich, on the North or Hudsons River, (etc.) [The Montresor Plan],” 1766 (New York Public Library).



Figure 6-8. Detail of “Plan of the City of New York [The Ratzen Plan],” 1766 (Stokes, 1998).



Figure 6-9. Detail of "A Plan and Regulation of the City of New-York (etc.) [The Goerck-Mangin Plan]," 1799 (Stokes, 1998).



Figure 6-10. "A South East View of the city of New York in North America [The Howdell-Canot South East View]," ca. 1763 (Stokes, 1998).



Figure 6-11. "Lispenard's Meadows. Taken from the N.E. cor of the present Broadway & Spring St.," by A. Anderson, 1785 (New York Public Library).



Figure 6-12. "Sketch of Lispenard's Meadows," ca. 1799, by Alexander Anderson (Stokes, 1998).



Figure 6-13. "Stone Bridge, Tavern and Garden, Canal and Broadway, 1812" (Stokes, 1998).

At first Rutger only drained wetlands west of the Fresh Water, though at the turn of the century his attention turned to the low-lying areas on either side of the “Old Kill” or “Old Wreck Brook” draining east into the East River (between the Manhattan and Brooklyn bridges). A broad wetland identified as tidal salt marsh surrounded this stream in the seventeenth century and a mill stood at its mouth where Jasper Danckaerts described a “sandy beach” (Hill & Waring, 1899; Stokes, 1998, pg. 225; Welikia, 2013; Figure 6-14). The area was first called Wolfert’s Marsh or Wolfer Webber’s Meadows; a 1690 map labeled the area a “salt marsh or meadow” and two 1730s maps called it a “swamp meadow” (Figures 6-15, 6-16, and 6-17) (Hill & Waring, 1899; Wikoff, 1924). By the 1740s the outlet was controlled and twenty years later it was being in-filled; the Fresh Water itself was ordered filled in 1790 (Hill & Waring, 1790; Figures 6-18 and 6-19).

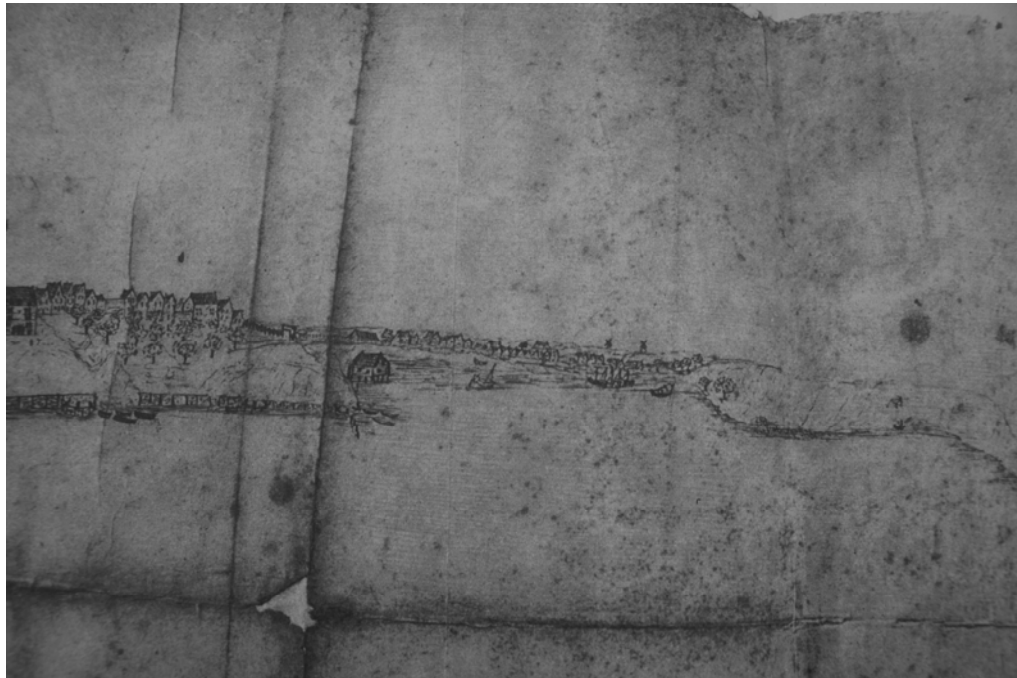


Figure 6-14. Detail of “The Labadist General View,” 1679 (Stokes, 1998).

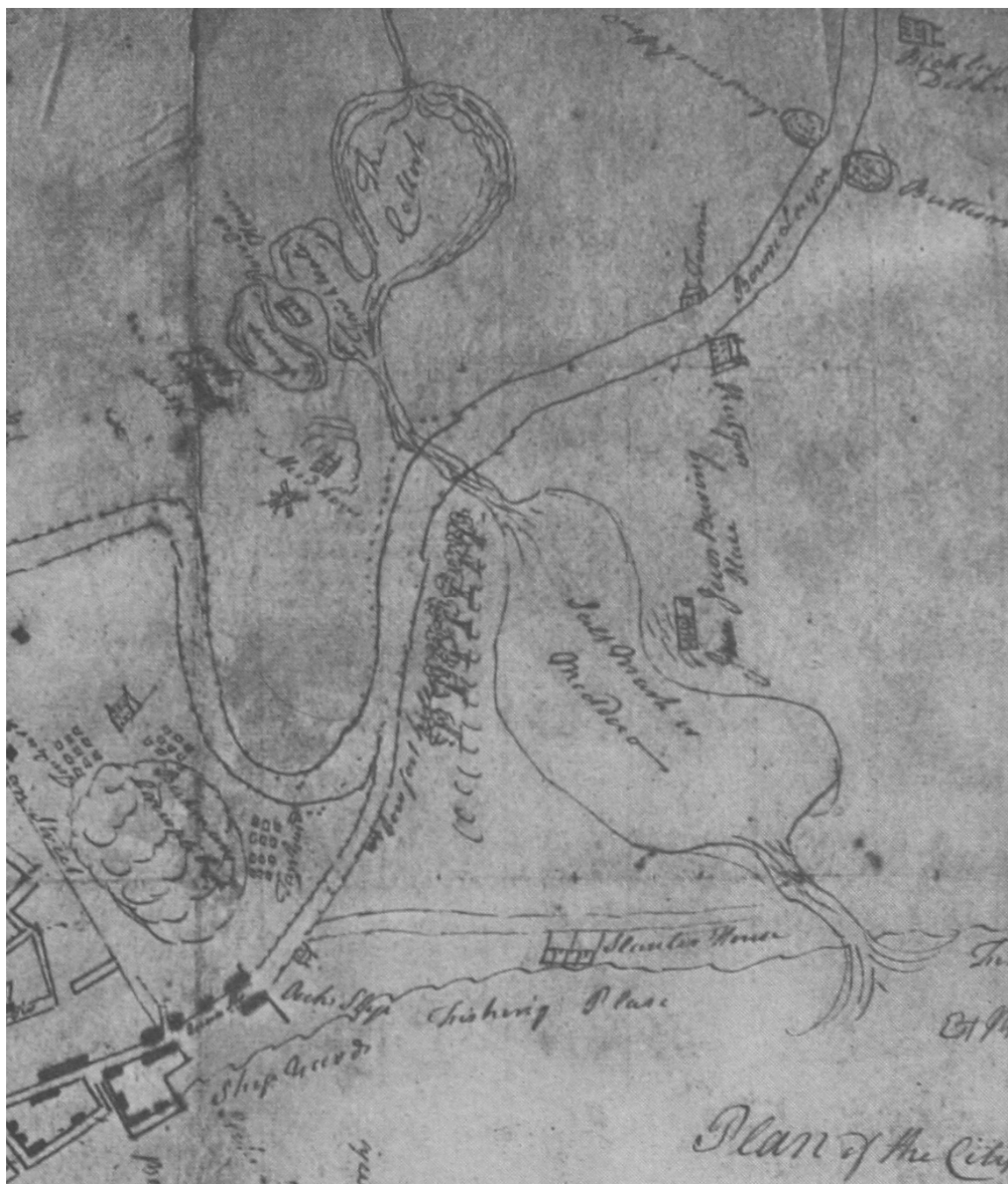


Figure 6-15. Detail of "New Yorke" [The Miller Plan], 1695 (Stokes, 1998).



Figure 6-16. Detail of "A Plan of the city of New York," ca. 1730 (Stokes, 1998).



Figure 6-17. Detail of “A Plan of the city of New York from an actual Survey Made by James Lyne [The Bradford Map or the Lyne Survey],” ca. 1730 (Stokes, 1998).



Figure 6-18. Detail of “A Plan of the city and Environs of New York [Grim’s General Plan],” ca. 1743 (Stokes, 1998).

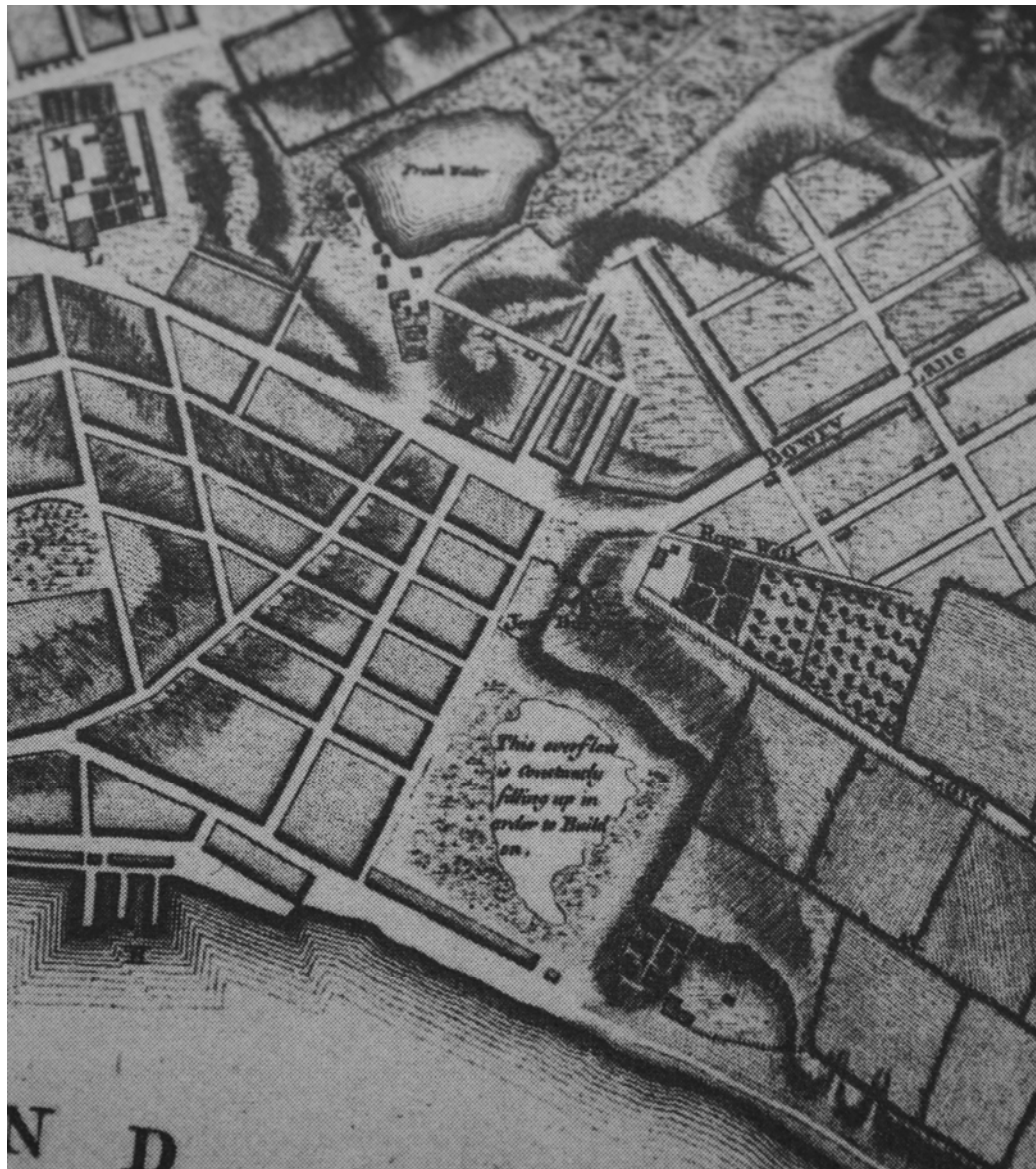


Figure 6-19. Detail of “A Plan of the city of New-York & its Environs to Greenwich, on the North or Hudsons River, (etc.)” [The Montresor Plan], ca. 1766 (Stokes, 1998). The label reads, “This overflow is constantly filling up in order to build on.”

The city of New Amsterdam had one *graft* (a ditch or canal) at what became Broad Street, originally called *Straet van de Graft*. It was also known as the *Heeren Gracht*, or main ditch. This area was a salt marsh in the early seventeenth century and called the Company’s Vly or Blommaert’s Vly (Hill & Waring, 1899; Welikia, 2013). The area just north of the *Heeren Gracht* was described as “marsh” and “thicket” and the smaller *Prince Graft* was built in an

existing streambed in that location.⁵⁸³ The *Heeren Gracht* was constructed in the 1640s by sheet-planking; anyone with a lot fronting the canal was obligated to line their section with wood and boats were able to enter during high-tide.⁵⁸⁴ The New Amsterdam sherriff was commissioned to oversee the construction of a new *gracht* in 1659 financed by adjacent property owners.⁵⁸⁵ However, the waterway ultimately became a common dump and in 1675 the Mayor's Court of New York appointed men to oversee the cleaning of the "great Graft or Ditch"; it was ordered to be filled-in the following year.⁵⁸⁶ In 1683 residents with land abutting the Rutten Kill in Beverwijck were similarly ordered to sheet the stream and clear out the garbage and branches; that stream was also in-filled in 1847.⁵⁸⁷ Figures 6-20 and 6-21 depict the *Heeren Gracht* around 1660, at sixteen-feet wide and lined with roadways twenty-eight feet wide (Hill & Waring, 1899).



Figure 6-20. "The Heere Graft (Canal), 1659; present Broad Street, showing opening into East River" (Pound, 1935).

583 Gehring (1980, "Patent to Pieter van der Linden," March 12, 1647 and "Patent to Jan Monfoort," March 16, 1647); Hill & Waring (1899).

584 Fernow (1976a, November 9, 1654); Fernow (1976g, June 26, 1657); Jameson (1909, "Description of the Towne of Mannadens, 1661").

585 Fernow (1976g, January 31, 1659, March 7, 1659, February 17, 1660, and June 28, 1660); Hill & Waring (1899).

586 Scott (1983, June 1, 1675 and June 24, 1675, pg. 44); Hill & Waring (1899).

587 van Laer (1932a, May 3, 1683); Waite & Bender (1993).

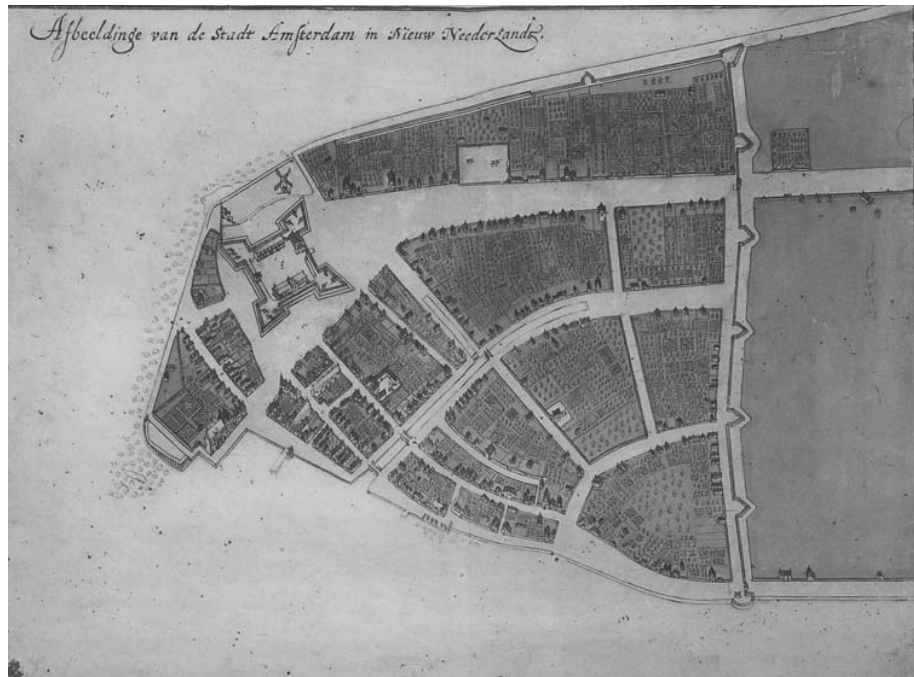


Figure 6-21. “Afbeeldinge van de Stadt Amsterdam in Nieuw Nederlandt [The Castello Plan],” 1660 (Stokes, 1998).

Sheeting with wood was also done along the East River (stone was not permitted) (Fernow, 1976b, January 1657). In that location lots were also raised with infill and the City Burgomasters asserted “it being custom here and elsewhere, that neighbours do as neighbours and make the common sheeting among each other, or help to bear the expences.”⁵⁸⁸ In 1658 Director Stuyvesant himself fenced some lots by the river that he had “recovered and raised from the water and morass” with over 8,000 loads of sand (Fernow, 1976g, February 14, 1658, pg. 171). Landowners on the East River beach were ordered to raise the height of their sheet-piling by the end of the spring of 1660 or be fined (Fernow 1976g, February 17, 1660). Around that time everyone along the Hudson River was also instructed to “level their bank and lay it off” (Fernow, 1976g, April 11, 1658, pg. 183). Figure 6-22 shows how the lower Manhattan shoreline was modified between the 1650s and 1670s with the addition of sheeting and in-fill.

⁵⁸⁸ Fernow (1976b, February 14, 1658, pg. 331); Fernow (1976c, February 8, 1661).

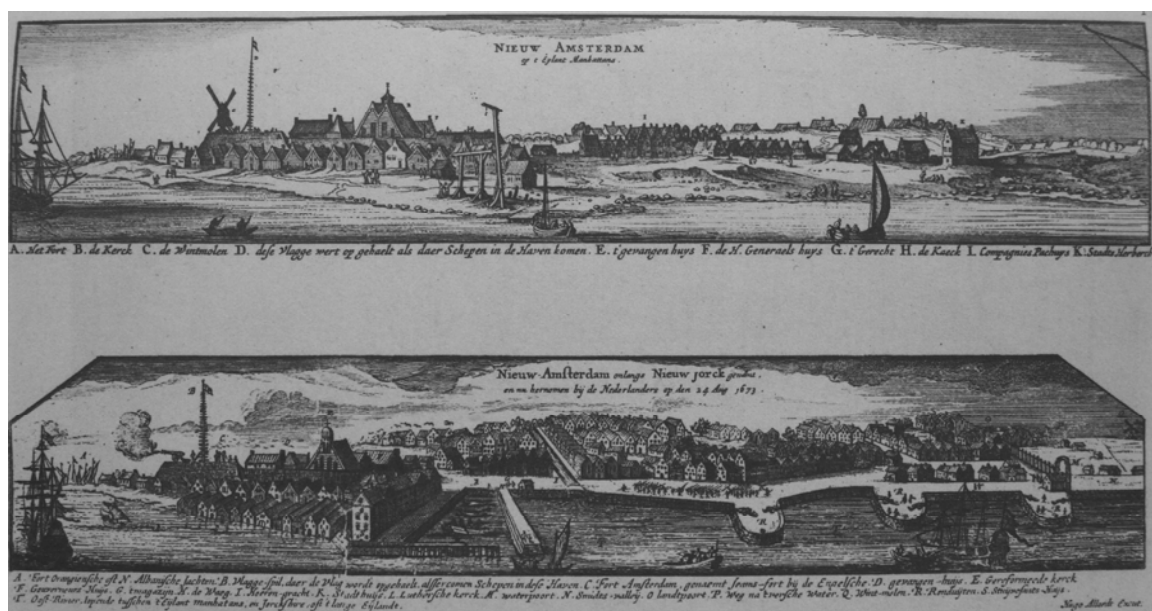


Figure 3-22. Top: Detail from “Nieuw Amsterdam op t Eylant Manhattans” [The Visscher View], 1651-1653. Bottom: “Nieuw-Amsterdam onlangs Nieuw Jorck genaemt, en nu Hernomen by de Nederlanders op den 24 Aug 1673 [The Restitutio View],” 1673 (Stokes, 1998).

Between 92nd and 104th streets along the East River a large tidal marsh was fed by several streams, one of which ran through *Martje Davit's Vlei* or *Moertje Davids' Vly* (Mother David's Meadow, or Round Meadow) (Hill & Waring, 1899; Riker, 1904). In 1827 a plan was made to construct the Harlem Canal through this waterway from the East River to the Hudson River; it was to be sixty-feet wide and made of stone but no action was taken (Hill & Wang, 1899). The construction of another large canal was discussed in 1803 by a group of Hudson and Athens residents who wanted to create a ferry passage between their towns “through the flats” in the Hudson River, but it was not done until 1816 (Miller, 1862, 21). The wetland was called the “Middle Ground” and in 1822 a Catskill resident referred to it as one of many “large tracts of useless marsh” on the Hudson River; it is now forested (Pierce, 1822; Figures 6-23 and 6-24).

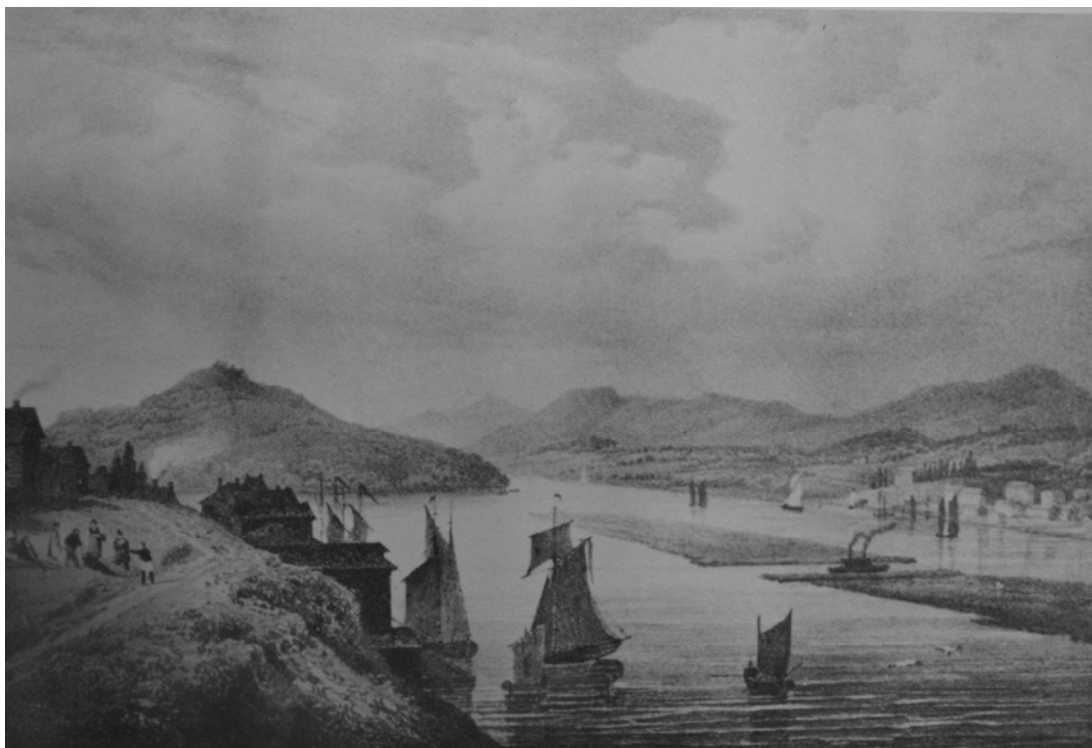


Figure 6-23. “View of Hudson and the Catskills,” by Jacques Gerard Milbert and engraved by Louis Bichebois (Piwonka, 1977).



Figure 6-24. View of the Middle Ground in 2009 (photo by C. Teale).

*Diking*⁵⁸⁹

The only clear example of diking within the New York-New Jersey Harbor and Estuary was on Manhattan on the East River at what is now Clinton Avenue, where Anthony Rutger also owned a house and brewery in the 1750s (he was one of a long line of brewers originating in Schoonderwoert, South Holland) (Stokes, 1998; Figure 6-25). This parcel was initially part of WIC Bouwery No. 6 described in Chapter 5. By the mid-1760s Rutger had constructed a berm or dike across the mouth of the stream topped with a post-and-rail fence (clearly shown in Figure 6-26). Two contemporary maps show that a path ran along the top of this berm and a single outlet ran through it (Figures 6-27 and 6-28).

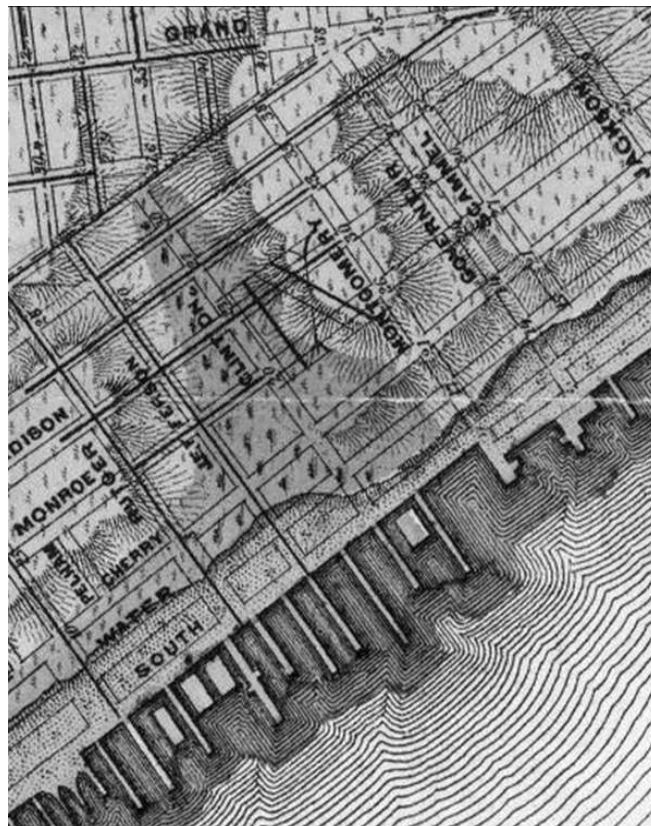


Figure 6-25. Detail from “The Viele Map 1864.” Shaded areas represent wetlands (Stokes, 1998).

⁵⁸⁹ *Dyke* and *dike* were both used in original English documents.

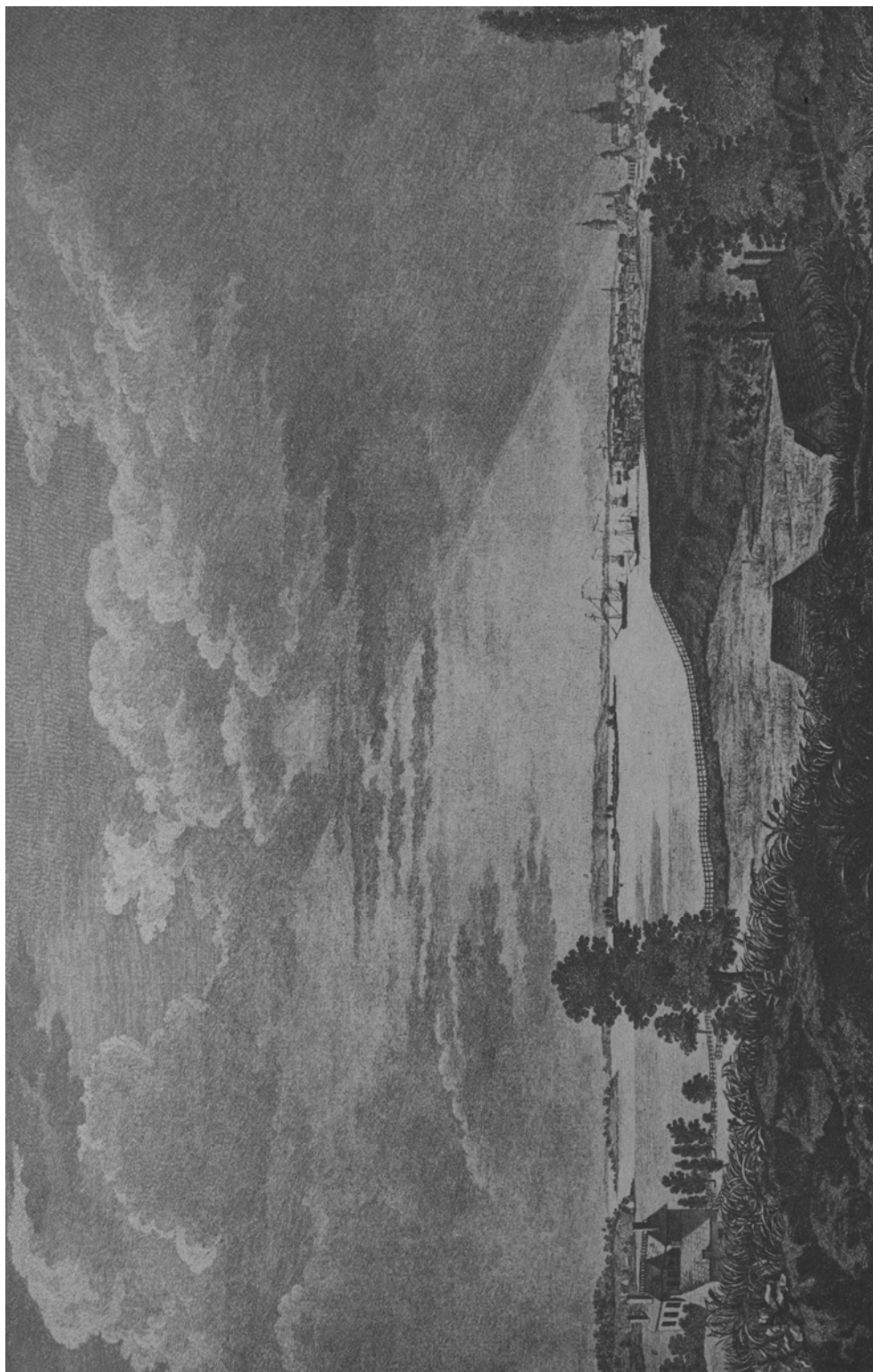


Figure 6-26. "A South West view of the City of New York, in North America" [The Howdell-Canot South West View], ca. 1763 (Stokes, 1998).

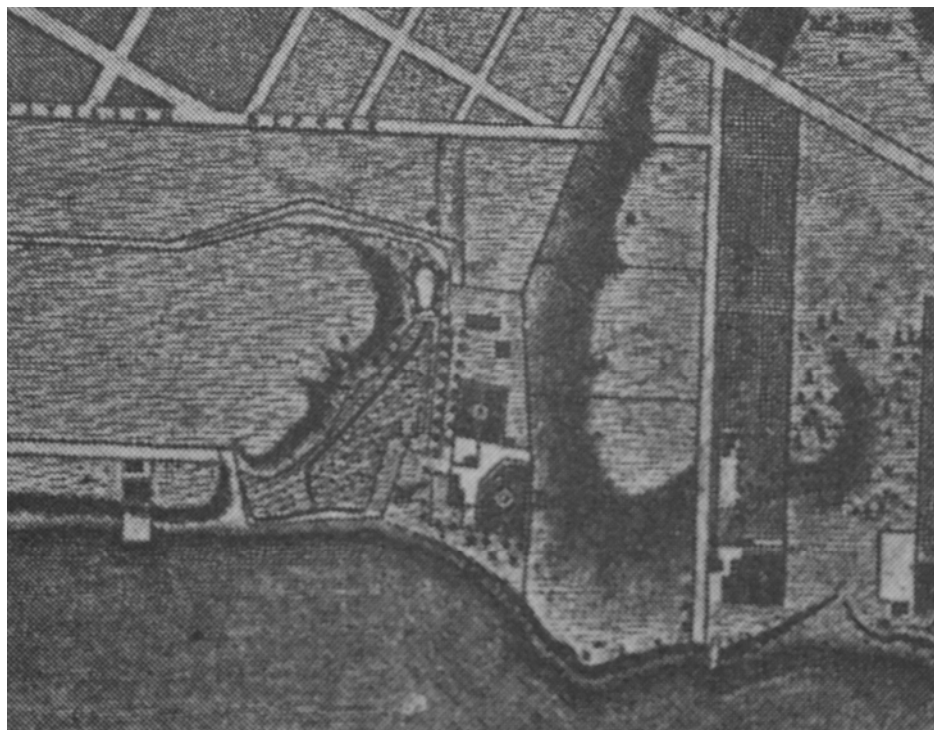


Figure 6-27. Detail of “A Plan of the city of new-York & its Environs to Greenwich, on the North or Hudsons River, (etc.) [The Montresor Plan],” ca. 1766 (Stokes, 1998).



Figure 6-28. Detail of “Plan of the City of New York [The Ratzen Plan],” ca. 1766 (Stokes, 1998).

No wetlands on the Hudson River were diked. In 1642 Kiliaen van Rensselaer himself acknowledged “the smallness or absence of dike or mill charges” for his patroonship and over the next two centuries travelers to the area also failed to comment on dikes (van Laer, 1908, February 12, 1642). The lack of observations by Peter Kalm is particularly telling because his journal contains meticulous notes on the presence, management, and use of meadows and marshes for most areas visited before and after his voyage up the Hudson River. Two decades later Richard Smith made the same journey and likewise commented on meadows elsewhere in his travels except the immediate Hudson River corridor. At Schodack he noted that “More low, bottom Land is discovered as we pass up, generall covered with Trees; being cleared might be made good Meadow by Banking an Improvement to which the Inhabitants are altogether Strangers” (Halsey, 1906, pg. 14).

Diking was mentioned only once on Long Island, although the tidal range of Wallabout Bay appears suitable for it. In May 1680, for example, Danckaerts and Sluyter described it as being “tolerably wide where the water rises and falls much, and at low water, is very shallow and much of it dry” (Murphy, 1867, pg. 341). The only colonial-era example is from 1644 when Laurens Cornelissen agreed to build a dike in front of Frederick Lubbersen’s house fronting the Gowanus Creek in Brooklyn, but the structure may not have been an embankment because the simple sheeting of other waterways using wooden planks has been romanticized in later publications as “diking.”⁵⁹⁰ Later, in 1885, a 550-acre marsh at Jamaica produced corn and vegetables (Nesbit, 1885). It may be that the tidal marshes in New Netherland are similar to those of New England by being underlain with a highly organic peat that was prone to subsidence after drainage and diking (Nesbit [1885] did characterize the marshes of metropolitan New York City as “peaty”). Diking was not thought possible on Staten Island for this reason and because

⁵⁹⁰ Hill & Waring (1899, pg. 196) went so far as to say, “a Dutchman without a canal was like gingerbread without ginger.” See also Holland Society of America (1916b) and Merwick (1990).

they were “generally owned in small tracts” (Nesbit, 1885, pg. 134). The best example of subsidence was in the Swartwout Meadows in what is now New Jersey, which were known as the Newark Meadows (today’s Meadowlands).

These tidal wetlands between the Passaic and Hackensack rivers were purchased in 1813 by three Swartwout brothers who began improving them within two years even though “Few or no attempts had been made in this section of the union, to reclaim salt-marshes of any extent.” In 1819 they asked New York City for financing to finish the project and the following year the editor of *The Plough Boy* reported that the New-Jersey Salt Marsh Company had been incorporated by the state legislature to reclaim and cultivate the marshes in Bergen County. The Swartwouts were members and by the end of the decade they had diked 2,000 acres with a five-foot-tall embankment five and a half miles long and sixteen feet wide at the base. In 1823 an article ran in the *New England Farmer* touting the benefits of diking these wetlands, saying

The practicability and economy of embanking and draining lands which are usually over flowed by tide water has been evinced by many successful experiments. Holland consists mostly of land reclaimed from the sea; and in England, many hundreds of thousands of acres have been acquired by means of embanking. There is no doubt but valuable tracts might in the same manner be reclaimed along the sea coast of Massachusetts and other maritime parts of the United States. In the Southern states draining and embanking have been successfully undertaken; and the Messrs. Swartwout and their associates of New York, have distinguished themselves by a similar enterprise in the vicinity of that city.⁵⁹¹

In 1827, however, two journals reported that the land only produced good crops of grain and “English hay” for one or two years after reclamation before

the soil becomes loose and light, so that it scarcely produces weeds to conceal its barren surface. Public opinion is here certainly strong against the feasibility of rendering such marshes either fit for cultivation or valuable for grass (Welles, 1827, February 2, pg. 217-218).

By 1883 these marshes were once again producing salt hay (*New York Times*, 1883).

591 *American Farmer* II: 154; Fessenden (1820, June 17); 1823, March 1. *New England Farmer*, I, 241-243; 1819, July 31. *The Plough Boy*, I, 78.

In contrast, the Swedish- and Dutch-settled portion of the Delaware River was widely diked from an early date. David Pietersen de Vries did not mention any dikes on the Delaware during his 1640 visit (Murphy, 1835) but three years later the oldest settlement in Pennsylvania was founded by Swedes who were able to “begin their cultivation at once” near the Tinicum Marsh (today used to filter municipal sewage) (City History Society of Philadelphia, 1917, pg. 138; Fletcher, 1950; Tiner, 1998). Early Swedish settlers began drainage efforts in order to mow native grasses and pasture livestock; some planted wheat, corn, and/or tobacco, but reclaimed riparian meadows were usually kept in grass (Fletcher, 1950). The director of the New Amstel colony “diked in a considerable amount of marshland” on the Apoquenamin Kill during the 1650s and 1660s and suggested that his commissary employ five or six laborers to “take on some marshland” near New Amstel (Gehring, 1981, December 28, 1663, pg. 340). Commissary Beeckman declined to do so in 1663, and wrote to Director Stuyvesant explaining that cultivating the marshland on the Delaware River was uneconomical

because the expenses for constructing dikes, drainage ditches and sluices, and the cutting of poles run too high; most of all, it requires at least two or three pairs of oxen for each plow in order to break everything up well. Therefore, I say that it is not advisable for either common or poor people to work up marshlands; I prefer good woodland for a quick result.⁵⁹²

Beeckman may have been speaking from experience because he earlier petitioned for six morgens of wooded upland and its adjacent marshland west of Fort Altena that “he would inclose with a dike... and turn it into arable land.”⁵⁹³

In May 1675 the court at New Castle decided that a meadow belonging to Captain John Carr, at the north end of town, was a nuisance because it lacked a bridge or road over it. It was ordered appraised and the town given first refusal with the caveat that the new owner must

⁵⁹² Gehring (1981, December 28, 1663, pg. 340); Fernow (1877, “Letter. William Beeckman to Director Stuyvesant; declines to remain at Altena under d’Hinoyossa; repeats the intention of moving to Maryland, if the government require not his services,” December 28, 1663).

⁵⁹³ Fernow (1877, “Petition of William Beekman, commissary on the South River, for a piece of land,” pg. 429).

maintain a route through it.⁵⁹⁴ Four men sent to appraise the meadow determined that it had no value in its present state, so it was ordered that every male in the district would begin constructing “an outer-dike with sluices” in order to put a pathway on top. They would each work for two days or pay for a replacement.⁵⁹⁵ The people of New Castle would then maintain the dike that would be five feet tall, ten feet wide at the base and three feet at the top. To this assignment was added the repair of Hans Block’s adjacent dike, which was to be maintained by Block and his heirs.⁵⁹⁶

A riot ensued when several men, including a minister, announced that they would not build the dikes.⁵⁹⁷ Residents of nearby settlements—represented by the men who started the riot—petitioned the court saying they would build the dike and road over Carr’s meadow but not Block’s “morash or flye” because it would not be used by them and was his responsibility.⁵⁹⁸ They were willing to build a sluice to drain the marsh, build the road, and construct a foot passage in exchange for “the privelige of the Comonage” but had no desire to “be slaves to Hans Blocks particular intrest” because the issue regarding his *flye* was “nott a publique, but a privet Concerne.”⁵⁹⁹

The magistrates countered that the Lord General had ordered them to build roads connecting villages and in order to do so they had to make dikes and sluices—they assured the protesters they would be paid 30-40 guilders per day and would not lose more than six hours each working on either dike. Without the shortcut provided by a dike people had to walk over five

594 Gehring (1977, “At a speciall Court held by the Go: at New Castle in Delaware River, the 13th and 14th dayes of May 1675”); Fernow (1877, “At a speciall Cort held by Gor at New Castle in Delaware River, the 13th & 14th dayes of May 1675”).

595 Gehring (1977, “Order to construct dikes at New Castle,” June 4, 1675, pg. 85); Fernow (1877, “Order to construct two dykes or highways along certain marshy lands at New Castle,” June 4, 1675).

596 Gehring (1977, “Order to construct dikes at New Castle,” June 4, 1675); Fernow (1877, “Order to construct two dykes or highways along certain marshy lands at New Castle,” June 4, 1675).

597 Gehring (1977, “Declaration of the magistrates of New Castle concerning a riot over the construction of the dikes,” June 4, 1675); Fernow (1877, “Order summoning Dome Jacobus Fabricius and John Ogle before the governor to answer the charge of having been implicated in the riot in Delaware,” July 24, 1675 and and “Declaration of H. Block, John Moll and Derick Alberts, magistrates of New castle, respecting the opposition manifested in the church by John Ogle and Rev. Jacobus Fabricius, to the above order”).

598 Gehring (1977, “Petition of the inhabitants of New Castle about the construction of dikes,” June 1675, pg. 88 and “William Tom to Gov. Andros concerning the opposition of the inhabitants to the construction of the dikes,” June 8, 1675).

599 Fernow (1877, “Petition of the inhabitants of the district of New Castle relative to making two dikes or highways through the marsh belonging to Mr. Carr,” pg. 532).

miles through the woods to reach *Zwaenwijck* (Swanwijck) from New Castle, a distance that would be reduced to one mile with the new roadway. The long way also involved traveling through a dangerous “mire.”⁶⁰⁰ This “mire” was described in an earlier, unrelated court case as being a *Creuple* that could not support a path “by Reason of the Rottenness of the ground, being a Quaking more which hath noe foundation for a way.”⁶⁰¹ Furthermore, argued the Magistrates, Block “could have made his hay as is done in other marshes which have no dikes around them” but he chose to spend the money to build a dike and sluices. Furthermore, several people had already/previously offered to work on his dike because it had fallen into disrepair and they wanted the shortcut.⁶⁰²

The protesters refused to work without express order by the Lord General and restated their position that they would construct the dike on Carr’s meadow “on the condition that we shall have a hereditary right to use a portion of the marshland and we will keep our part in repair.” They were ordered to work or face a fine but continued to argue that Captain Carr had not purchased the land from the Indians or enclosed and improved it, and therefore it should be owned by the Crown and used as a common.⁶⁰³ The request for the lot to be a common appears to have been granted because in February 1677 a petition was made to turn it into a stinted common:

the Valley above the Towne Lately belonging to Capt. Carr, and by your honor Given to the Towne for a Common; may bee a Stinted common to bee shut up the first of May, and opened againe [the] Last of July; and that Every Individuall Burger have his Equall Sheare therein, and their parts being Laid out by the Surveigor, then to draw Lotts for theire Sheares, and no man to put in more then one other; Lykewyse that all persons who shall bee concerned in the said Common, bee obleidged to maintaine the dyke and

600 Gehring (1977, “Magistrates’ justification for constructing dikes,” 1675, and “William Tom to Gov. Andros concerning the opposition of the inhabitants to the construction of the dikes,” June 8, 1675).

601 Gehring (1977, “Copy of a declaration by Martin Gerretson concerning Mrs. Block’s right of way through Capt. Cantwell’s pasture,” September 4, 1676, pg. 114).

602 Gehring (1977, “Magistrates’ justification for constructing dikes,” 1675, pg. 89); Fernow (1877, “Reasons which led the magistrates to make the order about the two dykes,” 1675).

603 Gehring (1977, “Protest of the inhabitants of New Castle against the building of Hans Block’s dike,” June 5, 1675); Fernow (1877, “Remonstrance of inhabitants of New Castle against being compelled to repair one of the above dikes, it being private property; order thereupon, parties to obey the directions of the court on pain of paying double the expense of the work,” June 5, 1675 and “Council minute. Order suspending Magister Fabricius from ministerial functions; Delaware land matters; order for the removal of the blockhouse at New Castle,” September 15, 1675).

fence with the sluice in Keepeing itt in Repayre, and if any openly Refuse, them to Lose their said Commonadge.⁶⁰⁴

A stinted pasture was one where the animals allowed on the common by each farmer was limited by either number or time, and the right of each farmer to access the pasture was his “stint” or “cattle-gate.” The “lots” drawn by New Castle residents were therefore not physical plots of ground but the number of cattle each farmer could put on it (Rapalje & Lawrence, 1888). Stinted pastures were usually on non-arable land and closed at certain points of the year for better growth, in this case from May 1st to July 31st. The following year, however, the Court of New Castle asked Governor Andros for permission to sell Captain Carr’s land that “was formerly Kept up in the vendu, for [the] Towns use.”⁶⁰⁵

Diking had become a common practice on the Delaware and its tributaries by 1680 and near Upland (Pennsylvania) Danckaerts and Sluyter saw “a piece of meadow or marsh, which a Dutch woman had diked in, and which they assured us had yielded an hundred for one, of wheat, notwithstanding the hogs had done it great damage” (Murphy, 1867, pg. 234). Farther upriver they also noted the structures on or near *Matinakonk* (Burlington) Island where the Dutch governor had “dyked and cultivated a large piece of meadow or marsh, from which he gathered more grain than from any land which had been made from woodland into tillable land” (Murphy, 1867, pg. 174). At that time it belonged to the English governor and was rented to a group of Quakers. In 1711 an act was proposed to allow the owners of meadows and marshes around that island “to stop out the tide from overflowing them.”⁶⁰⁶ In 1748 on the Delaware River at Raccoon (Swedesboro, New Jersey), Peter Kalm also described abundant diked land. In particular, he explained that

604 Gehring (1977, “The magistrates of New Castle to Gov. Andros about municipal affairs,” February 8, 1676/7, pg. 174).

605 A vendu or vendue is a public auction or sale. Gehring (1977, “Minutes of the Court of New Castle concerning matters to be laid before Gov. Andros upon his return from England,” July 17, 1678, pg. 191).

606 O’Callaghan (1854b, “Lords of Trade to Governor Hunter,” April 10, 1711, pg. 206).

The country there was very low in some places. The plains on the banks of the river were flooded at every high water or flowing of the tide, and at the ebbing they were left dry again. However the inhabitants of the country hereabouts met this situation, for they had in several places thrown up walls or dykes of earth near the river to prevent its overflowing the land which they made use of as meadows. On them the water-beeches (*Platanus occidentalis* L.) were planted in great numbers on both sides of the road, quite close together. These in summer afforded a pleasant shade, on account of the abundance and the size of their leaves, and made the road extremely delightful, as it resembled a fine shady avenue.

Again, a few days later, he wrote

we passed several kills, or small rivulets, which flowed out of the country into the Delaware with a gentle descent and rapidity. When the tide came up in the Delaware, it also rose in some of these rivulets a good way. Formerly they must have spread to a considerable breadth by the flowing of the tide, but at present there were meadows on their banks, formed by throwing up strong dikes as close as possible to the water, to keep it from overflowing. Such dikes were made along all rivers here to confine their water, and therefore when the tide was highest the water in the rivers was much higher than the meadows. In the dikes were gates through which the water could be drawn off or led into the meadows. They were sometimes placed on the outward side of the wall, in such a way that the water in the meadows would force them open while the river water would shut them (Benson, 1937, pg. 174-175).

A 1784 farm assessment for Tinicum recorded 1,579 acres of drained marsh and 533 of upland and eventually “Thousands of acres of swamp and marsh land along the Delaware and its tributaries were reclaimed by the use of dikes, flood-gates and ditches” (Fletcher, 1950, pg. 155). The first drainage district in North America was organized along the Delaware River a decade later to coordinate these efforts (Fletcher, 1950). Tidegates on these reclaimed marshes were opened periodically to restore soil fertility, just as on the Fundy salt marshes (Benson, 1937). By 1885 Delaware had “more diked lands in proportion to its area than any other” state, with at least 15,000 reclaimed acres (Nesbit, 1885, pg. 8). Like in Acadia, this was made possible by the large and continuous stretches of marshes that stood in contrast to the smaller fragmented marshes between Maine and New Jersey (Morgan et al., 2009; Nesbit, 1885; Sebold, 1992; Smith et al.,

1989). By 1885 almost all the marshes in New Castle County had been embanked and were controlled by marsh companies with the power to levy taxes for maintenance (Nesbit, 1885). At that time it was said that “The greatest benefit of the *low marshes* is gained by using them in connection with upland. They cannot be cropped, but will support cattle, and the cattle will support the upland” (Nesbit, 1885, pg. 145, citing Colburn). Farther south, at Kent County, a company was organized in 1859 to reclaim marshes on Bombay Hook using sod dikes three feet high with a base between eight and ten feet. Otherwise, individual property owners in that county were “opposed to innovation” and did not cooperate (Nesbit, 1885, pg. 150).

Conclusion

Wetland use was linked to agriculture but their value was largely determined by their “healthfulness” and productivity. To overcome the dangers related to disease and livestock entrapment, and deficiencies caused by an excess of water or woody vegetation, several management techniques were used throughout the Northeast. Curiously, disease sometimes resulted from attempts to in-fill and drain; following reclamation in the 1870s some portions of Manhattan’s Upper East Side became known as a hotbed of “typhoid fevers” and malaria (Hill & Waring, 1899). Nevertheless, burning, in-filling, and draining were known from every portion of the Northeast and only diking seems to have been spatially restricted. Ironically, New Netherland proper is the one area of the northeastern United States and Canada that is not known to have seriously attempted diking. The final chapter looks at the post-1800 acceleration of wetland across the Northeast when the agricultural press largely erased regional differences in wetland use, value, and management by popularizing reclamation techniques.

Chapter 7

“The Country hath out-grown the meadows”:

Reclamation, Artificial Grasses, and the Agricultural Press

When Daniel Turner of Harlem was granted permission to mow hay from meadows on the Bronx mainland in 1669 it was called “an Improvement.”⁶⁰⁷ A century later, “improvements” to wetlands tended to take the form of reclamation and projects became larger and more effective over time. The reason for this was two-fold: new techniques were popularized and wetland vegetation was increasingly replaced by introduced European forage species. Both phenomena accelerated at the turn of the nineteenth century as the growth of market economies expanded during the “capitalist ecological revolution” promoted by the North American agricultural press.

Agricultural Societies and Journals in the Northeast

The second half of the eighteenth century saw the organization of agricultural societies in Europe followed closely by those in the new United States. The first was organized by Benjamin Franklin in 1743 and the second by New Yorkers in 1766, followed by the New Jersey Society for Promoting Agriculture, Commerce, and Arts in 1781 and equivalents in South Carolina, Philadelphia, Maryland, and Kentucky. Northeastern states lagged behind and most societies there organized after 1780, including New York’s second society in 1791 (the Society for the Promotion of Agriculture, Arts, and Manufacturing). The organizers of such societies were typically wealthy landowners, politicians, doctors, and scientists whose aims were supported by the State to varying degrees. However, only after the 1819 formation of the State Board of

607 Christoph & Christoph (1980, “Daniell Turner permitted to cut hay upon Broncks land,” July 27, 1669, pg. 286).

Agriculture was government funding supplied to county-based agricultural societies in New York.

The agricultural societies of Massachusetts and New York were the most influential in the Northeast during the nineteenth century and their members operated out of Boston, Albany, the Hudson Valley, and New York City. Agricultural improvement in America was an intellectual pursuit based on experimentation, communication of methods and results, and eventually the establishment of agricultural schools. Because only the landed elite had the spare money, time, and land necessary for experimentation, and schools could not be funded immediately, the most important aspect of early improvement efforts was communication. Jared Eliot recognized this in 1748 when he suggested that annual publications might be useful for

giving a faithful Account of the Success of all the Experiments and Trials that may be made on various Sorts of Land, and of divers Sorts of Grains, Roots, Grass and Fruits, not only such as we have in Use, as also what we have not as yet introduced among us.

The New York Society periodically published reports between 1792 and 1804 and the Board of Agriculture sporadically released its *Memoirs* between 1819 and 1825. Beginning in 1795 the Massachusetts Society published pamphlets comprised of essays by farmers and Society members. Owing to the lack of domestic authors, however, most early series relied heavily on British material and previously-published American essays like those of Jared Eliot that appeared nearly four decades earlier. In response, the Massachusetts Society encouraged the collection of information on farming conditions and practices unique to New England; the main outlet was *The Massachusetts Agricultural Journal*, published on a quarterly basis from 1813 to 1832 (Carman et al., 1934, pg. 23; Marti, 1979).

Peace following the War of 1812 re-focused attention on issues close to home and agricultural improvers worked to fulfill visions of a more self-sufficient America.⁶⁰⁸ Localized agricultural societies were increasingly active in Massachusetts and New York soon thereafter. Chief among their organizers was Elkanah Watson of Berkshire County, Massachusetts who developed the “Modern Berkshire System” of local agricultural societies aimed at engaging typical farmers in both states. Like his predecessors Watson was a gentleman of some means, well-traveled, and friendly with major political figures of the time. He lived in Albany from 1789 to 1807 and retired to Berkshire County where he ran a farm inspired by the merino sheep he encountered at Robert Livingston’s estate in adjacent Columbia County. It was at Pittsfield (Berkshire County) that he held the first agricultural fair in America in 1811. He returned to Albany in 1816 to facilitate the organization of county agricultural societies in New York and was called an “agricultural missionary” for his efforts communicating with American and European agricultural authorities, soliciting seed imports, and organizing fairs and agricultural societies (Marti, 1979; Watson, 1856).

The proliferation of agricultural societies across the Northeast resulted in an explosion of journal publication and in 1841 the editor of Albany’s *The Cultivator* remarked that it had only been “a few short years” since agricultural journals were deemed a risky venture and few circulated; by the time of that publication there were twice as many journals (30) as six years prior.⁶⁰⁹ The first true agricultural journals in the United States were *The Agricultural Museum* of Washington, D.C. (1810-1812), followed by the *Massachusetts Agricultural Journal* (1813-1832) and Baltimore’s *The American Farmer* (1819-1834). This last publication was intended to be national in scope but was perceived as a more southern publication; its northern counterpart was Albany’s *Plough Boy*, also introduced in 1819 that served as the official journal of the New York

608 Ford (1822, September 3); 1810, July 4. *The Agricultural Museum*, 1.

609 1834, May. *The Cultivator*, 1; 1841, February. Agricultural Journals. *The Cultivator*, 8, 27.

State Board of Agriculture until publication ceased in 1823. Its content contributions were made by the leading authorities and the editor, Solomon Southwick, although he had no agricultural experience himself.

The *New England Farmer* was the first widely-circulated agricultural journal in the Northeast and published in Boston from 1822 to 1846 by Thomas Fessenden who had worked on farms as a child. It began as a sort of advertising publication for the Boston-based New England Warehouse and Seed Store but also included the proceedings of agricultural societies and its contributors were many and highly-regarded. Fessenden preached temperance, morality, frugality, and seemed to target a more elite class of farmers than did Southwick (Marti 1979). The *New-York Farmer and Horticultural Repository* (1828-1839) was relatively expensive and didn't have the circulation of the *New England Farmer* but was its sole regional competitor for several years. The most widely circulated agricultural journal in the country was Albany's *The Cultivator*, edited by Jesse Buel from its founding in 1834 to his death in 1839 when it merged with the Rochester-based *The Genesee Farmer*. It continued under the name of *The Cultivator* edited by Luther Tucker until it became *The Country Gentleman* in 1853 (published in Albany, New York City, and Philadelphia).

The Cultivator had nearly 7,000 subscribers in New York State by 1837 when it first reported these figures, followed by Virginia (964) and Connecticut (835).⁶¹⁰ Every state had subscribers that year and several hundred also lived in Upper Canada (Ontario), Lower Canada (Québec), New Brunswick, and Nova Scotia; it was mailed as far afield as Scotland. Despite being an Albany-based publication mainly serving New Yorkers, the journal's main areas of subscription aligned with "New England extended": New England proper, the Erie Canal corridor, and lower Great Lakes region. *The Cultivator* did not shy from expanding readership and coverage despite the potential uselessness of material, and to appeal to a diverse audience it

610 1837, March. *The Cultivator*, 4, 5.

focused more on “the general principles of agriculture, adapted to all, than of local practices, serviceable only to a few.”⁶¹¹ The relevance of material in most journals was inconsistent, because aside from some publication-specific editorials and reader submissions agricultural journals largely used each other’s articles and excerpts from books (often verbatim). Many early issues took reprinted material from works published as early as 1748, including essays by Jared Eliot, John Armstrong, and Samuel Deane. This resulted in the dissemination of nearly-identical material across a wide area. *The Cultivator* was also popular because subscription and postage were cheap.⁶¹²

The Cultivator greatly increased its circulation in Canada after 1838 but the earliest publication in Nova Scotia was John Young’s *The Letters of Agricola on the Principles of Vegetation and Tillage* in 1822, a collection of letters that ran in *The Acadian Reporter* over the previous four years. The province apparently lacked any other publications because as late as 1840 a resident asked *The Cultivator* advice on diking (Fairbanks, 1840, November). The agricultural press came to Lower Canada in the early 1820s when the Earl of Dalhousie encouraged farmers in Québec and Montréal to subscribe to the Albany-based *Plough Boy* (Southwick, 1822, April 20). The area’s own publications emerged in 1836 with publication of the *Journal d’agriculture* (Montréal) and the *Farmer’s Advocate* (Sherbrooke); most other eastern Canadian publications came out in the mid-nineteenth century.⁶¹³ Agricultural journals for the Midwestern states did not appear until the 1840s. Regional publications like the *American Farmer* served the South by the 1820s but the region was not well-represented for another two decades.

Most consumers of these journals were educated, well-to-do landowners with an interest in agriculture and the ability to experiment. However, farmers of above-average income, and

611 Fisher (2008); 1841, January. Circulation of *The Cultivator*. *The Cultivator*, 8, 24.

612 Fisher (2008); 1834, January. *The Cultivator*; 1834, March. *The Cultivator*, 1.

613 1840, December. Agriculture in Canada. *The Cultivator*, 7, 183; Stuntz (1941).

non-farmers with business interests in agriculture, also subscribed; many were likely motivated by friends and family members who had begun “book farming” (Demaree, 1941; Fisher, 2008; Gates, 1960; McMurtry, 1989).

Agricultural Societies and Journals in New York

New York was among the more forward-thinking states in terms of attention paid to agriculture, the need for experimentation, and communication of methods and results. As the president of the Society for the Promotion of Agriculture, Arts and Manufactures, Robert Livingston gave a speech the year of its formation (1791) stating that the lack of agricultural improvement in America was partially due to a lack of experimentation and loss of young people to industry. Livingston was the landlord of *Clermont* in what became Columbia County and experimented with new forage species, manuring with gypsum, and introduced the Merino breed of sheep to New York. Similarly, the Society’s vice president—Ezra L’Hommedieu—conducted experiments on manuring and livestock on his Long Island estate. The Society was renamed the Society for the Promotion of Useful Arts in 1804 and defunct by 1825 owing to dwindling membership and financial distress (Marti, 1979).

Another vice president, Stephen van Rensselaer III (landlord of Rensselaerswijck) formed the Albany County Agricultural Society in 1806. In an address to that group he attributed the success of agriculture in Britain “to the attention that gentlemen of fortune and leisure have paid to its improvements, and the institution of societies, to foster and encourage ingenious individuals, and to bring to light new discoveries.” He urged “enterprising individuals” to “set the example, heedless of the ridicule that not infrequently accompanies them in their attempts.”⁶¹⁴ Frustrated by the lack of State interest in funding an agricultural school, van Rensselaer began

614 1819, October 23. *The Plough Boy*, I, 162-163.

one himself at Troy in 1824 based on experimentation, technology, and science that later became Rensselaer Polytechnic Institute. A relative, Jacob Rutzen van Rensselaer, won the 1821 premium for best farm in Columbia County (Fessenden, 1822, January 12).

Overlapping with the Society was the State Board of Agriculture from 1819 to 1825, which partially funded the growing number of county societies (an estimated 41 by 1820) (Marti, 1979). Additional funding by the State drew criticism from those who felt the societies did not sufficiently engage “ordinary farmers. Specifically, premiums were typically awarded to wealthy farmers who had the ability to produce the highest yields at great experimental expense. Van Rensselaer believed that the Board succeeded in improving the morale of farmers and perception of agriculture by non-farmers, and that the prizes given for best livestock had encouraged importation of better stock, but New York did not renew the Board’s mandate in 1825 (Marti, 1979). Government funding was also thought to be central to large-scale improvement projects that could not be achieved by private effort alone; for example, many believed the reclamation of tidal wetlands like Swartwout’s Meadows would only succeed if sponsored by the government as similar projects in Denmark and England.⁶¹⁵

The Board of Agriculture was replaced in 1832 by the New York State Agricultural Society, founded to improve “the condition of agriculture, horticulture and the household arts.”⁶¹⁶ In contrast to the Board, this new society considered all presidents of local societies as members and therefore expanded its influence and membership. It also collected and published various materials but the output was irregular and typically too large and expensive to reach many farmers (Marti, 1979). Jesse Buel became president of the Agricultural Society in 1833 and editor of *The Cultivator* the following year—he was the most influential agricultural writer and publisher in the region and supported the establishment of an agricultural school (Wright, 1958).

615 Cauldwell (1902); *New York Times* (1883); 1823, March 1. *New England Farmer*, 1; 1819, July 31. *The Plough Boy*, 1, 78; 1819, August 14. *The Plough Boy*, 1, 82-83.

616 1839, November 20. Constitution of the New-York State Agricultural Society. *The Cultivator*, 6, 177.

Agricultural Improvement in New York

In 1749 Peter Kalm noted the “careless” and “very bad state” of agriculture in the middle colonies where farmers rotated between fields until they were exhausted; one of the chief reasons for a lack of soil fertility was that cattle were allowed to run at-large so their dung could not be collected (Benson, 1937, pg. 97, 307). He did not observe any manuring and observed that farmers merely plowed and planted fresh fields when their old ones wore out, often turning them into pastures that were also poor. The best lands he saw in North America were in Québec where fields were left fallow and unplowed every two years and cattle were enclosed in summer (Benson, 1937, pg. 459). The cause of such agricultural “backwardness” was an apparent adherence to traditional methods. In 1810 the editor of *The Agricultural Museum* wrote in the first issue that “The mass of the common Farmers are slow in changing their mode of agriculture” (Wiley, 1810, July 4). Butler (1819, pg. 72) echoed this sentiment at the end of the decade when he said

It is a common reflection of our country, upon the general system of bad farming, now in common practice, that we run over a great deal of land, half fenced, half ploughed and half tilled, at great labour, toil and expense, without order, calculation, or method; and finally, without profit; and that we obstinately persist in this, because our *fathers did so before us*.

The emerging agricultural press did much to advance agriculture but as late as 1835 a man from Massachusetts wrote to *The Cultivator* that he had “seen the man, who, when told by his more enlightened brother farmer, his method of raising corn, would sneer at him for getting his opinions from the newspapers” (J. A. B., 1835, August, pg. 92).

Such reluctance might have been particularly pronounced in parts of New Jersey and New York where Dutch farmers lived in relatively isolated communities. When James Stuart visited New Jersey in 1833 he noted that although “Americans of Dutch extraction” were honest and upright they were “not reckoned so enterprising as the other classes of the inhabitants”

(Stuart, 1833, pg. 28). A half-century prior Alexander Coventry described the difference between Dutch and English farming in the mid-Hudson Valley as

[The Dutch raise] large crops of wheat, plowing sometimes 200 acres, using no manure, which, until of late they rode out to the river, in the winter, so that it might go off in the spring, with the ice. The quantity of land plowed, makes up for the present poverty of the soil, which, however, after frequent plowing, becomes incapable of producing more. This obliges them to move, and they not being compelled to raise their own bread must sell. Often the purchaser is a New England man, who being used to employ every known art to make his native, barren soil produce a good subsistence, generally gets rich, lives well, and even his hogs have more pleasure in the appetite than the former Dutch family on the same farm, whose chief subsistence was butter-milk pop, salmagundi, dock leaves in the spring and kail-kroun in Autumn. (Coventry, 1978, pg. 123)

A resident of Schuyler Flats also remembered that manure was “often driven down the river” and numerous other contemporaries also reported that manure was not used in the area (Grant, 1903, pg. 175; Buel, 1835, October). In 1791 when traveling through the Mohawk Valley Elkanah Watson similarly noted that

Thus far the German and Dutch farmers have been, in a manner, totally remiss in cultivating the first rudiments of literature, totally remiss in cultivating the first rudiments of literature, while the descendants of the English in New-England have cherished it as a primary duty (Watson, 1856, pg. 292).

Over four decades later a contributor to *The Cultivator* wrote to say that “Suggestions about *improved farming* are regarded with distrust” in the Mohawk Valley but hoped increasing circulation of the journal would make a difference (Frey, 1835, September, pg. 107). A look at *The Cultivator*’s statewide circulation in 1840 provides some insight as to the participation of Dutch farmers in agricultural innovation (Table 7-1; Figure 7-1). A diverse assortment of towns were represented by agents serving at least five subscribers: the original Huguenot-settled towns of New Paltz and New Rochelle, German enclaves at West Camp and Newburgh, and Dutch areas including New Utrecht, Esopus, Kingston, Albany, Kinderhook, and Valatie. In parts of New York that were settled as patroonships or manors, tenant farmers would undoubtedly have

been affected by the movement because landlords like Stephen van Rensselaer and Robert Livingston who were avid improvers themselves.⁶¹⁷

Dutchess County had a particularly large number of agents, probably due to Livingston's influence as well as that of Dr. David Hosack of nearby Hyde Park, a horticulturist who founded the New York Horticultural Society. This county was identified in the 1790s as "the best cultivated in the state, if not in the union" and forty years later Jesse Buel recognized that it had been particularly successful in focusing on sheep husbandry as a way to obtain manure to support their grain fields and produce meat, dairy, and fiber products (Buel, 1835, October). He later listed intelligent farmers, social comforts, and the good health of "public morals" as reasons for the county's quadrupling of agricultural profits since 1800 (Buell, 1863a, May). Albany, Columbia, Rensselaer, and New York counties also had organized agricultural societies by 1833.⁶¹⁸

Topography seems to be the main variable corresponding to agent location, with the Rensselaer Plateau, Hudson Highlands, Catskills, and Shawangunks represented by few agents and the Hudson and Wallkill valleys by several. Interestingly, however, the Taconic Mountains along the Massachusetts and Connecticut borders are well-represented. This may be due to the concentration of New Englanders in that region or the post-1811 development of agricultural societies there by Elkanah Watson. Other areas with high concentrations of New England settlers include western Greene County and the West Manor of Rensselaerswijck (Albany County). Western Long Island (Nassau, Queens, and Kings counties) had a total of 12 agents, in contrast to Suffolk County's 21; the difference may be that the population of eastern Long Island was derived from New England, particularly Connecticut, as well as the urbanizing character of western Long Island and possibility that each agent there supplied many subscribers. New York

⁶¹⁷ Barnard (1839); 1819, October 23. *The Plough Boy*, I, 163-164.

⁶¹⁸ 1834, March. *The Cultivator*, I.

County's six agents likely served a large number of market-oriented subscribers and the county's agricultural society had formed with a focus on the economic aspects of farming like buying and selling livestock (Marti, 1979).

Contrary to contemporary observations on the reluctance of Dutch farmers to adopt new agricultural methods, many were active improvers. Some contributed articles to *The Cultivator* to describe their experiences with crop-rotation and other innovations and one farmer from a long-established Dutch family in Cocksackie reported his observations during an "agricultural tour" of Britain in 1836 (Harder, 1834, March; Spoor, 1837, April). Farmers interested in agricultural improvement were found in towns of all ethnic derivations, on privately-owned land, on tenant farms, and in urban areas. With topography the only obvious correlating variable, it appears that agricultural improvement was strongly-rooted throughout in eastern New York by the mid-nineteenth century when the movement—as well as *The Cultivator*—had adopted a nationalistic and patriotic mission that blurred regional boundaries and catered to no particular group or area.

County	Town
Albany	Albany, Coeymans, New Scotland, Rensselaerville, South Westerlo, Westerlo
Columbia	Austerlitz, Canaan Centre, Canaan Four Corners, Claverack, Columbia Hall, Gallatinville, Harlemville, Hillsdale, Hoffman's Gate, Hudson, Kinderhook, Livingston, Malden Bridge, Mellenville, New Lebanon, Red Rock, Smoky Hollow, Spencertown, Stockport, Stuyvesant, Valatie
Dutchess	Amenia, Amenia Union, Chestnut Ridge, Clinton Hollow, Crum Elbow, Dover, Fishkill, Fishkill Landing, Hart's Village, Hull's Mills, Leedsville, Lithgow, Mabbettsville, New Hamburg, North Amenia, North East, Pawlings, Pleasant Valley, Poughkeepsie, Poughquog, Quaker, Red Hook, Rhinebeck, Rock City, Schultzville, Tivoli, Upper Red Hook, Verbank, Washington, Washington Hollow
Greene	Athens, Catskill, Coxsackie, Durham, East Kill, Gayhead, Greenville, Leeds, Lexington Heights, Oak Hill, Prattsville, South Cairo, Tannersville, Windham Centre
Orange	Blooming Grove, Canterbury, Chester, Craigsville, Cuddebackville, Goshen, Hamptonburgh, Middle Hope, Minisink, Monroe, Montgomery, New Windsor, Newburgh, Otisville, Port Jervis, Salisbury Mills, Scotchtown, Slate Hill, South Middletown, Walden, West Point
Putnam	Carmel, Cold Spring, South East, Towner's, Doansburgh
Rensselaer	Berlin, Hosick, Lansingburgh, Nassau, Petersburg, Pittstown, Sand Lake, Schaghticoke, Troy, West Sand Lake, Wynantskill, Richmond
Rockland	Clarkstown, Nyack Turnpike, Tappantown
Ulster	Accord, Bruynswick, Ellensville, Esopus, Glasco, Kingston, Marlboro, Milton, Modena, New Paltz, Plattekill, Saugerties, Shawangunk, Stone Ridge, Ulsterville, Wawarsing, West Camp
Schenectady	Schenectady, Duanesburgh, Braman's Corners
Kings, Queens, Nassau, New York, Richmond	Brooklyn, Flatbush, Fort Hamilton, New Utrecht, Williamsburgh, Manhasset, Astoria, Flushing, Newtown, Glen Cove, Hempstead, Jericho, New York, Richmond

Table 7-1. List of Cultivator agents in the study area with at least five subscribers in 1840. Names are as appear in the original list although some have changed.⁶¹⁹

619 1840, December. List of Agents for The Cultivator. *The Cultivator*, 7, 199-201.

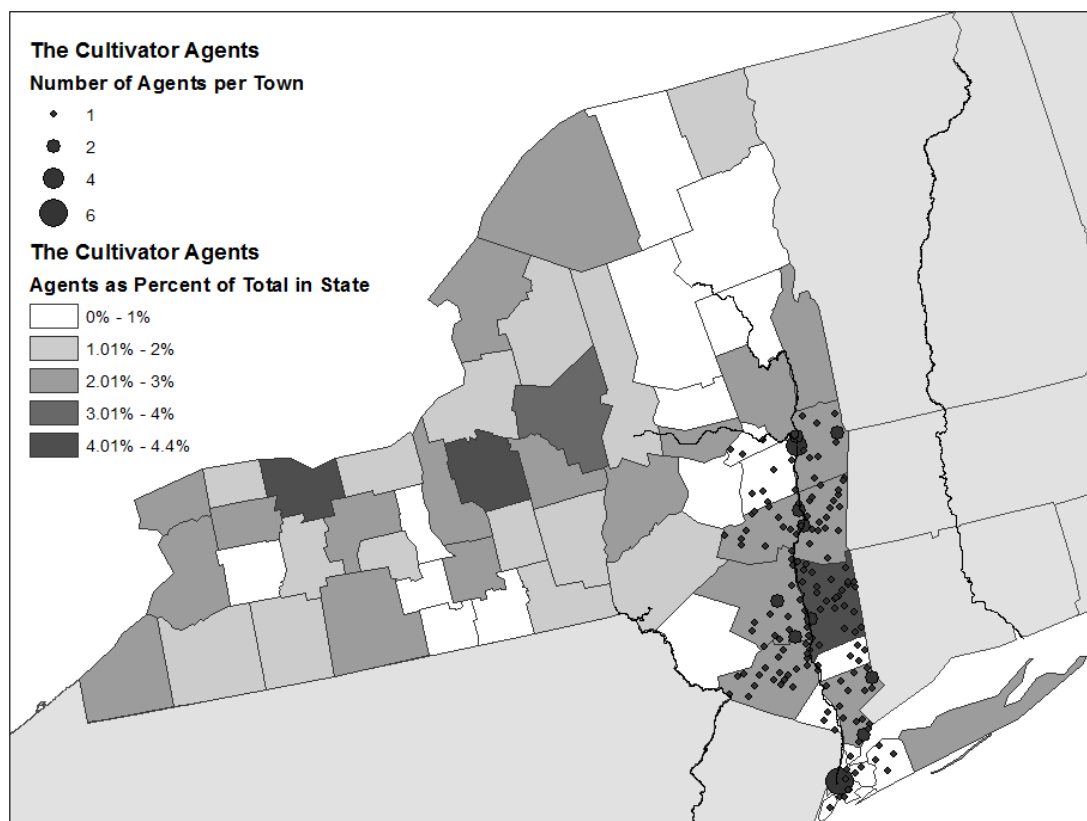


Figure 7-1. Percent of total New York State agents for *The Cultivator* by county, with locations of agents in the study-area listed in Table 7-1 (cartography by C. Hanchett).

The Agricultural Press Addresses the Northeastern Hay Shortage

Among the topics routinely addressed by the agricultural press were wetland management and adoption of European forage species because as early as the mid-eighteenth century it was recognized that livestock numbers were being limited by the produce of natural meadows. In 1749 Jared Eliot described this scarcity as

gradually increasing upon us for sundry Years past. It is evident that the necessary stock of the Country hath out-grown the meadows, so that there is not hay for such a stock as the present increased number of people really need: such a high price of hay, takes off much from the profit of raising & keeping stocks. (Carman et al., 1934, pg. 27)

The following year he wrote that people were feeding corn to their animals instead of eating it themselves. Nearly two decades later George Washington remarked that the number of cattle raised in the new country was limited by wetland forage and cornstalks and attributed this to the fact that “very few persons have attended to growing grasses, and connecting cattle with their crops” (Hedrick, 1933, pg. 74). Eliot advocated an increase in the extent of meadows as well as the “use of all practicable additional forage crops.” In particular, he suggested that “clearing and dreining Swamps, Cran-berry and Bog Meadows”—as many farmers in his area were already doing—would provide a solution (Carman et al., 1934, pg. xlvi, xlvii, 41).

Eliot’s observations and suggestions were ahead of their time, however, and widespread acknowledgement of a need to increase forage production would not come for over a half-century. As late as 1835 a geologist from just north of Albany wrote to *The Cultivator* to express his frustration with the slow pace of meadow improvement, saying

Perhaps no kind of land has been more eagerly sought for, or more highly prized as an appendage to the farm, by the most of our farmers, than what is usually termed “*natural meadow*,” and yet probably no part of the farm is so *unprofitable*. The object is to secure a crop of hay, which it seldom fails to produce; but, it should be remembered, that the quantity is always much less than what might be produced from the same quantity of land by cultivation; its quality is vastly inferior, and the land is totally lost to the production of any other crop. I have frequently counted ten and twelve different species of grass within the compass of few rods square, and no more than one or two of them that has ever been noticed as furnishing food suitable for the sustenance of stock, to say nothing of the great variety of ferns, rushes and mosses growing upon the same spot, which every farmer would be pleased to have annihilated. Every farmer should calculate upon the cultivation of his grass, as he does upon that of his grain; he will then be sure always to have a supply, that of a quality agreeable to his choice, while the system, if properly pursued, will have the effect to increase the quantity and quality of all his other crops to a degree, that those who are not acquainted with the acts, can hardly believe. The question has often been asked, What shall we do with the field? it is too wet to plough. The answer is, *drain it*. I have seldom seen a field of this description but what might be drained for a sum considerably less than what the first crop would amount to, and the effects of draining, if properly executed, is permanent (Steele, 1835, November, pg. 142).

Journals had been advocating new management practices and crops for over a decade but adoption was slow despite publication of figures detailing the increased yields of drained wetlands sown with European species. The hay output of two Massachusetts tidal marshes tripled after reclamation (following diking: one ton of salt hay per acre to three of upland hay; following drainage: 33 tons per 50 acres to 100 tons for the same area).⁶²⁰ Values for palustrine meadows were less dramatic but those with native hay tended to produce two to three tons per acre and those with upland hay produced around four.⁶²¹ Irrigated meadows produced less than cultivated uplands but probably more than unmanaged wetlands, and the yield was probably influenced by the season and duration of flooding.⁶²²

Wetland Management Recommendations

Nineteenth-century wetland management involved colonial-era techniques but also drew from contemporary European examples. Drainage, for example, had dramatically advanced in Scotland in the late-seventeenth century. The agricultural press reported on methods ranging from simple ditching to complex sequences of improvement: in 1823, for example, the editor of the *New England Farmer* recommended drainage of a shrubby wetland followed by burning and then winter flooding.⁶²³ The importance of wetland management to the economy of Massachusetts was shared in *The Plough Boy* in 1822 by the vice president of the Massachusetts Agricultural Society who believed the only way his state would be competitive with New York after the opening of the Erie Canal would be through irrigation, drainage, and meadow-creation (Pomeroy, 1822, July 9).

620 Deane (1822); 1831, January 28. *New England Farmer*, IX, 220.

621 1834, March. *The Cultivator*, I, 6; 1834, October. *The Cultivator*, I; 1823, August 16. *New England Farmer*, II, 17-18; 1824, January 17. *New England Farmer*, II, 197; 1824, March 6. *New England Farmer*, II, 252-253.

622 1836, April. *The Cultivator*, 3, 17-18; 1836, June. *The Cultivator*, 3, 49-50; 1831, January 28. *New England Farmer*, IX, 219.

623 1823, August 9. *New England Farmer*, II, 2.

Burning

Paring and burning were common in Scotland and Ireland by the 1830s⁶²⁴ and not uncommon on American uplands where the surface sod was shaved away, burned, and ashes spread on the ground as fertilizer. This method was also recommended for wetlands, including by *The Plough Boy* in 1819 that described the practice and noted its popularity in Ireland and Holland. Taking cues from Samuel Deane and Jared Eliot, the *New England Farmer* also recommended burning drained wetlands to encourage the growth of grass, particularly if the ground was mossy. Paring and burning of peat meadows supposedly resulted in good hay crops because ashes were a fertilizer for “low and moist soils” but *The Plough Boy* reported that the amount of ashes did not replace the organic matter lost.⁶²⁵ Nevertheless, at a later date that journal still recommended burning wetlands after drainage.⁶²⁶ *The Cultivator* also recommended burning “bushes and bogs” to fertilize the soil.⁶²⁷ The *New England Farmer* reported that fire was used in at least one New England diked marsh to eliminate weeds before planting grass.⁶²⁸

Irrigation

The Agricultural Museum ran an article in 1811 outlining methods of irrigating meadows to promote soil moisture, fertilization, and “the growth of grass by its warmth.”⁶²⁹ Eight years later John Armstrong’s *Treatise on Agriculture* described methods of temporary and permanent irrigation (where water pooled behind a dam to control release) and total submersion (where the reservoir was maintained until decomposition occurred). Journal contributors continued to differ

624 1834, September. *The Cultivator*, I, 106-107.

625 1823, August 16. *New England Farmer*, II; 1831, February 4. *New England Farmer*, IX, 29; 1819, October 30. *The Plough Boy*, I, 172-173; 1822, September 10. *The Plough Boy*, IV, 120.

626 Davy (1820, February 26); 1822, March 16. Ashes for Manure. *The Plough Boy*, III, 331.

627 1834, September. *The Cultivator*, I, 106-107.

628 1827, February 2. *New England Farmer*, V, 28.

629 1811, July. Irrigation, &c. *The Agricultural Museum*, II, 1-6.

on methods and offered advice either for allowing water to sit on one area at a time or simply allowing it to “pass over, and not remain on” the land.⁶³⁰ In either case the water speed must be slow to prevent erosion.⁶³¹ Frederick Butler’s *Farmer’s Manual* recommended irrigation with dammed streams as well as running the “wash” from highways onto adjacent mowing grounds. Trenches could be dug throughout sloping fields to allow water to run over them and the method was cheap and profitable: “No manuring will give such profits upon mowing grounds as irrigation, and the expense, generally, may be considered cheaper than plaster” (Butler, 1819, pg. 51). Animals were to be kept off these “watered meadows.”

Over the following decades irrigation was also recommended by the wider agricultural press. To protect and produce grass the *New England Farmer* and *The Cultivator* recommended letting water sit on fields during winter and allowing water run over meadows before dressing them with ashes or lime. Water was thought to contain “manure” and irrigation was a cheaper and easier way to lay it on a meadow than carting and spreading solid material. The goal was to “make use of water as a *carrier*, to convey certain substances to the soil, which may have a tendency to enrich it.” Naturally flooded swales benefitted from this process and farmers were given instructions to try it with upland fields, particularly in spring by using runoff from muddy streams or roads.⁶³² Clayey and calcareous soils required less watering, as did areas farther to the north, and muddy water was particularly valued as natural fertilizer. Channels leading from ponds and windmills drawing on ground water could also be used.⁶³³ *The Plough Boy* recommended irrigating meadows in May.⁶³⁴

Irrigation was known in the Hudson Valley by the 1820s. Stephen van Rensselaer advocated flooding meadows for three or four weeks twice a year, once in October and again in

630 1823, August 16. *New England Farmer*, II, 3; 1823, November 29. *New England Farmer*, II, 129.

631 1824, April 3. *New England Farmer*, II, 36.

632 1822, November 9. *New England Farmer*, I, 15; 1823, November 22. *New England Farmer*, II, 1824, April 3. *New England Farmer*, II, 286; 1825, January 14. *New England Farmer*, III, 25; 1834, March. *The Cultivator*, I, 1.

633 1825, April 29. *New England Farmer*, III, 40; 1825, May 20. *New England Farmer*, III, 43; Pierce (1822, August 6).

634 1823, May 20. May. *The Plough Boy*, IV, 333-334.

the spring, and other Hudson Valley-based improvers published their recommendations in local papers and journals. In 1822, for example, James Pierce wrote in the *Catskill Recorder* that irrigation was commonly used in Europe and elsewhere to stabilize moisture conditions and should be used in the Hudson Valley because precipitation had been unpredictable. He noted that flooded meadows along the Connecticut River produced three cuttings per year, flooding swamps eliminated “bogs and bushes,” and winter inundation protected grass from frost (Pierce 1822, August 6). The highest yield reported for an irrigated meadow reported by the *New England Farmer* was two to three acres of native hay on a winter-flooded meadow.⁶³⁵

Within 15 years, however, *The Cultivator* reported that irrigation was no longer a frequent topic because it was not recommended for the northeastern climate, was too expensive, produced “coarse and innutritious herbage” that included rushes and other hydrophytes, and caused disease in both humans and livestock. In contrast to Peter Kalm’s admiration of Pennsylvania’s irrigated meadows a century before the journal now reported that “watered meadows” near Philadelphia produced less hay per acre than new upland meadows managed in the alternating system. The journal found that water removal was far more important.⁶³⁶

Drainage

Planting crops on tall, wide ridges to prevent waterlogging in the root-zone was a common practice in Britain by the time of colonization and in some places the intervening furrows had become so deep that a man could not see over the ridge.⁶³⁷ Regardless of reported damage to plants, soil desiccation, and increased erosion, ridging and the related hilling and

⁶³⁵ 1831, January 28. *New England Farmer*, IX, 219.

⁶³⁶ Buel (1836a, April); 1836, January. Irrigation. *The Cultivator*, 2, 166.

⁶³⁷ 1835, September. *The Cultivator*, 2, 101-102.

moulding were still applied in the nineteenth century.⁶³⁸ A Hyde Park (Dutchess County) farmer wrote to *The Cultivator* in 1835 that he had great success growing root vegetables and cabbages on ridges (Midford, 1835, September). Two years later the journal published a reprinted article from New York City's *Farmer's Library* explaining that fewer drains would be needed if more attention was paid to the development of ridges and furrows (Stephens, 1837, December).

These practices began to be replaced by advances in drainage techniques and technology in eighteenth-century Scotland. Drainage (with paring and burning) was common in Scotland and Ireland by the 1830s and some immigrants documented the value of peat soils and reclamation in New York.⁶³⁹ In 1727, for example, Surveyor General Cadwallader Colden described how the center of his wheat field in Orange County was “very rich being a dry swamp” and over the next few years often described his meadows as being ditched (Haley, 1989, pg. 10). In 1786 Alexander Coventry met a man who showed him

a piece of meadow, which he had drained, where the water stood three feet deep before draining. It resembles very much the moor or peat land in Scotland, consisting of decayed vegetables, trees &c., and the wash of the neighboring hill. This substance is 6 feet deep on a clay bottom, and would make good fuel. It was planted with maize and potatoes, which though planted late, look well. He values it very highly and indeed it is excellent, being from its nature inexhaustible (Coventry, 1978, June 11, 1786, pg. 109).

Coventry also hired a boy to make “water furrows” on his own farm that year, which were in use in Scotland at the time.⁶⁴⁰ At Catskill in 1787 he saw “a low swamp of very rich soil” just beginning to be cleared of trees (Coventry, 1978, pg. 177). Earlier evidence for drainage in New England is provided by Jared Eliot in 1750 and it was also known in Nova Scotia.

In 1791 the vice-president of New York's *Society for the Promotion of Agriculture, Arts, and Manufactures* wrote that he had seen grass, turnips, and other vegetables growing in drained

638 Buel (1835, July); 1835, September. *The Cultivator*, 2, 101-102.

639 1834, September. *The Cultivator*, 1, 106-107.

640 Coventry (1978, September 1, 1786, pg. 126); 1835, January. On under-ground drainage. *The Cultivator*, 1, 11.

wetlands, but that same year the president explained that drainage was not pursued in America owing to the abundance of cheap land and lack of capital (L’Hommedieu, 1792; Livingston, 1792). The editor of the *New England Farmer* likewise wrote in 1823 that drainage was “an operation of great importance in agriculture, though comparatively speaking, it has not so strong claims to attention in the United States, where labor is dear, and land is cheap.” Moreover, until the benefits of drainage were better-known, farmers didn’t want to stop working their other lands to improve wet areas. When Jesse Buel addressed the Albany County Agricultural Society he also noted that a “point of primary importance in good farming, but in which our county is defective, is the draining of wet and marshy grounds.” He believed such lands were useless and unhealthy and farmers should spend a few days after the annual harvest to ditching and removing brush.⁶⁴¹ Nevertheless, a decade later *The Cultivator* published a speech by Buel where he again declared drainage to be “a branch of labor which as had a very limited practice among us.”⁶⁴²

The editor of the *New England Farmer* recommended evaluating the soil before undertaking drainage: it was clayey it would make a good soil after topping with black soil or mud, but if it was gravelly or sandy this surface layer must be very deepg. Mossy “swamps” might be damaged by too much drainage so the water level should be maintained three feet or less from surface and periodically flooded. To drain a wetland, an outlet should first be created, enlarged, or cleared before the basin was ditched around its circumference to intercept runoff. If no surface outlet is available a deep, stone-filled hole could be made to accept ditch effluent.⁶⁴³ Ditches, also called drains in New England, could be dug with ox-drawn scrapers or shovels although by 1834 a special spade was developed for digging by hand; a suggestion was also made

641 1822, March 16. An Address. *The Plough Boy*, III, 332-333.

642 1834, March. *The Cultivator*, I, 1; 1835, January. *The Cultivator*, I, 11.

643 1823, August 9. *New England Farmer*, II, 9; 1824, January 17. *New England Farmer*, II, 25.

in *The Cultivator* that money be raised to fund a premium to whoever invented the best “drain-plough.”⁶⁴⁴

Ditches were of two types: open or surface drains were better in fields with standing water and closed or under-drains were suited to fields with high water tables (Buel, 1835, March; Low, 1835, March.). Open ditches were also recommended by *The Cultivator* for use in “bogs or moss.” They could be used to enclose fields but were thought “hazardous and inconvenient” without a hedge, railing, or bank alongside. According to the *New England Farmer* and *The Cultivator* their surface width should generally be three times that of the base, e.g., four-feet wide at top and one-foot or less at bottom. *The Cultivator* also recommended main drains between six and twenty feet wide at the surface tapered down to between two and eight feet fed by secondary drains not less than four feet wide. Another suggestion called for drains three-feet wide at the top, eight to twenty inches at the bottom, and two feet deep. The ditch should be angled so water flowed fast enough to prevent stagnation but not enough to cause erosion. These systems could be designed successfully by ordinary farmers because the primary strategy was simply to discover the water source and intercept it.⁶⁴⁵ A variation on the open ditch was the creation of “water furrows” or “furrow-drains,” which were shallow troughs ploughed into fields to collect water. “Cross-drains” or “water gaas” were created by digging a main ditch fed by perpendicular drains.⁶⁴⁶

According to Samuel Deane and repeated in the *New England Farmer*, closed ditches were more in use in Europe at the time; they didn’t waste soil, there was no need for cleaning, and plows and vehicles could travel overtop. Contributors to *The Cultivator* added that they were cheaper in the long-run, were not unsightly, and did not cave in. These were usually two-and-a-half to three feet wide at top, half a foot at bottom, and three feet deep according to the

644 1823, August 9. *New England Farmer*, II; 1834, March. *The Cultivator*, I, 1; 1834, May. *The Cultivator*, I, 3.

645 Buel (1835, March); Low (1835, March); 1835, January. On under-ground draining. *The Cultivator*, I, 11; Stephens (1837a; 1837, December; 1838, January).

646 Stephens (1837, December); 1835, January. On under-ground draining. *The Cultivator*, I, 11; Low (1835, April).

New England Farmer; *The Cultivator* published David Low's recommendation of no less than four feet deep and George Stephen's recommendation of five feet or less. A farmer in Skaneateles reported drains fourteen inches wide and two feet deep and another in Sing-Sing reported three feet wide at top, less than one foot wide at the bottom, and three feet deep. A Hoosick Falls man drained his field with ditches two feet wide and three-and-a-half feet deep.⁶⁴⁷ Small stones or bundles of long sticks should line the bottom length-wise and the entire ditch covered with straw, leaves, twigs, and topped with soil. They could also be topped with flat stones or turf. The soil removed while excavating ditches should be spread on the surface to make it level and act as a manure and if the hardpan was reached during excavation it should be broken through and also spread on top.⁶⁴⁸ The use of wetland peat or muck as fertilizer expanded after the 1820s, either wet, burned into ash, or mixed with dung.⁶⁴⁹

The *New England Farmer* advocated plowing drained wetlands in spring before planting with fallow crops like potatoes and turnips. "Bogging" was the act of turning over peat with a plow or hoe after drainage; a bogged wetland was then typically rolled, covered with loam and compost, then sown with grass seed.⁶⁵⁰ Some drained tidal and palustrine wetlands were made firmer and native vegetation discouraged with the addition of gravel or sand, though results were mixed and the cost could be prohibitive. *The Cultivator* recommended adding manure, sand, or lime to wetlands to help the peat decompose.⁶⁵¹ Also following Samuel Deane, the *New England Farmer* recommended letting wetland vegetation and peat rot after drainage, either by letting the site lie fallow during the summer after drainage or flooding throughout the winter and emptied in

647 Buel (1835, March); Low (1835, April); Chandler (1837, January); Ryder (1835, June); Willet (1834, September); Stephens (1838, January).

648 Chandler (1837, January); Ryder (1835, June); Low (1835, April); 1823, August 9. *New England Farmer*, II; 1834, March. *The Cultivator*, I; 1834, May. *The Cultivator*, I; 1834, September. *The Cultivator*, I, 106-107, 110; Willet (1834, September).

649 Buel (1834, November); Muir (2002); 1822, March 8. An address. *The Plough Boy*, III, 321-323.

650 1831, February 4. *New England Farmer*, IX.

651 Davy (1820, February 26); 1834, September. *The Cultivator*, I, 106-107; 1824, January 17. *New England Farmer*, II; 1831, February 4. *New England Farmer*, IX; 1827, February 2. *New England Farmer*, V.

spring.⁶⁵² *The Cultivator* also recommended drainage in order to decompose peat so that crops could access the released material.⁶⁵³ One man from Plymouth County, Massachusetts had success growing potatoes, corn, oats, and grass on a wetland he had modified by creating 30-foot-wide beds, separated by ditches, with the excavated soil used to dome the beds to prevent water accumulation.⁶⁵⁴ Tidal wetlands were also made more productive by ditching to straighten creeks and drain ponds because it allowed artificial grasses to become established.⁶⁵⁵

It wasn't until tiling was developed in England in the early nineteenth century, and later popularized in western New York in the 1830s, that North American drainage efforts moved beyond simple ditching (Whitney, 1994). Jesse Buel was inspired by Scottish estates that had installed subsurface drains and in 1835 *The Cultivator* ran an article by an Edinburgh specialist in underdraining who said the process required professional consultation because of soil variation. He said drains filled with stones or other debris ("rubble drains") inhibited drainage and the depth should be limited to an inch lining the bottom; ideally, flat stones or tiles should be used to line the ditch.⁶⁵⁶ In 1834 a resident of Ballston (Saratoga County) wrote to *The Cultivator* that he had installed stone-lined underdrains. Tiles were introduced to North America that year by a Geneva, New York farmer (Delavan, 1834, March; Prince, 1997). They were first advertised in *The Cultivator* in 1837; these Albany-manufactured tiles were one-foot long, four inches square, and cost \$15 per one thousand (Buel, 1837b, December). Mechanized ditch-digging was similarly pioneered by a farmer from Canandaigua, New York in 1854 but it would take until the 1860s for increasing demand for agricultural products, mechanized ditching machines, and mass-production of clay tiles to make this mode of sub-surface drainage financially feasible for most American

652 1823, August 16. *New England Farmer*, II.

653 1834, September. *The Cultivator*, I, 97-99.

654 1824, January 17. *New England Farmer*, II.

655 1827, January 26. *New England Farmer*, V; 1831, January 28. *New England Farmer*, IX.

656 1834, March. *The Cultivator*, I; 1835, January. On under-ground draining. *The Cultivator*, I.

farmers (Prince, 1997; Whitney, 1994). Figure 7-2 shows a schematic for wetland drainage in 1837 that included variations on open and closed drains.

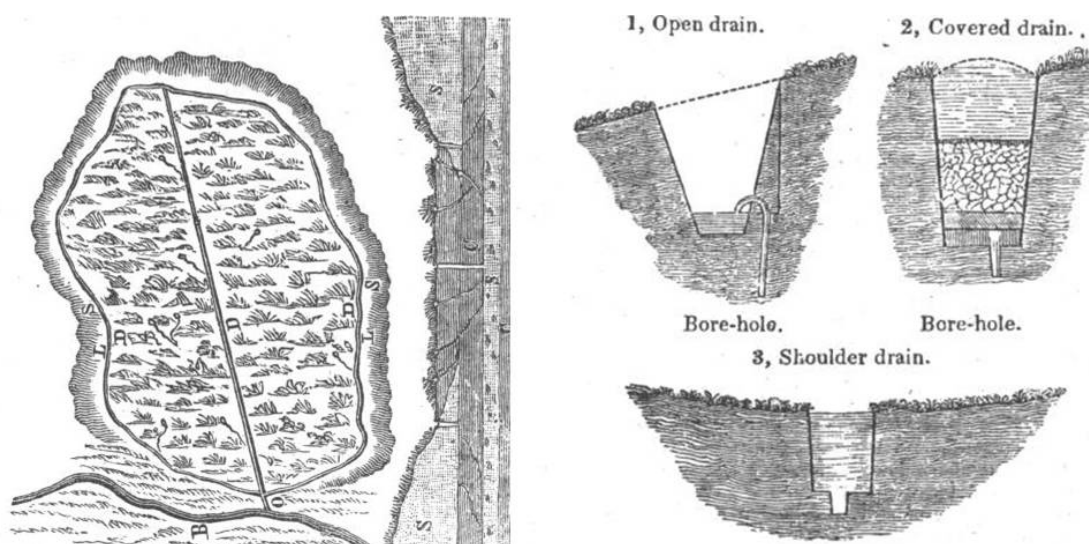


Figure 7-2. A drainage plan and types of drains published by *The Cultivator* in 1837.⁶⁵⁷

Drainage in the former Dutch colony was fully embraced in some areas, namely Orange and Dutchess counties, where in 1881 Ruttenber and Clark described the residents as having taken full advantage of a 1860 Drainage Act “until any bog meadow or wet lowlands were thoroughly reclaimed” (pg. 402). Reclamation of the Orange County Drowned Lands was well underway by the 1880s, primarily through expansion of an earlier ditch, and onions became a chief product of the Chester Meadows and Gray-court Meadows. No less than a dozen other named areas in this “black dirt” region were also prized for their fertility (Ruttenber & Clark, 1881). The spirit of improvement may have begun at an early date in these counties because Cadwallader Colden and Alexander Coventry reported small drainage projects there in the 1720s and 1780s (Coventry, 1978, October 13, 1785; Haley, 1989). Some journals touted the benefit of drainage to public health but the primary goal was to increase access to arable land; by 1840 it

⁶⁵⁷ 1837, December. *The Cultivator*, 4, 167-170.

was called the “mother of all other improvements in land” (Buel, 1836, September; Stephens, 1837, November, pg. 151).

Diking

Nineteenth-century northeastern diking varied little from the colonial era as described in the previous chapter, with the exception of a few design modifications in New England. The agricultural press published rationales for and against this type of reclamation, but the general recommendation was to adopt the method. In 1820 an article in *The Plough Boy* advocated draining and diking “Salt Marshes, Pacosons, and Swamps” because it would eliminate their “noxious exhalations” and open their “inexhaustible” soils for cultivation.⁶⁵⁸ The author referenced British and Dutch marshes reclaimed in this way. Three years later the editor of the *New England Farmer* wrote that

The practicability and economy of embanking and draining lands which are usually over flowed by tide water has been evinced by many successful experiments. Holland consists mostly of land reclaimed from the sea; and in England, many hundreds of thousands of acres have been acquired by means of embanking. There is no doubt but valuable tracts might in the same manner be reclaimed along the sea coast of Massachusetts and other maritime parts of the United States. In the Southern states draining and embanking have been successfully undertaken; and the Messrs. Swartwout’s and their associates of New York, have distinguished themselves by a similar enterprise in the vicinity of that city.⁶⁵⁹

Articles were published in the *New England Farmer* during the 1820s and 1830s highlighting the drawbacks of maintaining salt marshes, including the distance between marshes and their owners, the cost and time involved in harvesting and boating, the vagaries of sea and sun, the low price of salt hay, and reduced milk-production of cows fed on it. Submissions in

⁶⁵⁸ 1820, December 2. The Draining of Marshes. *The Plough Boy*, II, 210-213.

⁶⁵⁹ 1823, March 1. *New England Farmer*, I, 243.

favor of diking listed the increased reliability and value of produce even if the meadows were left in grass; in particular, using improved marshes to fatten beef cattle would make New England more self-sufficient.⁶⁶⁰

Dike dimensions depended on orientation and sediment type but the *New England Farmer* recommended berms at least two feet higher than the high-tide level constructed of turf with a “backcut” ditch running along the landward side and faced with stone or planks on the seaward side. The dike should otherwise be pinned and sown with grass or surfaced with brush, gravel, small stones, broken brick, etc. Sluices should be like those of Acadia—designed to exclude sea water but allow the exit of freshwater—but the design often differed. “Tide trunks,” for example, were a new invention by 1820 and recommended for use in tidal marshes from the Chesapeake to New England over the following decades; these gates were made of long, wooden boxes with a floating plug.⁶⁶¹

Joint stock companies were recommended to organize reclamation and maintenance projects in Massachusetts. The difficulty in convincing landowners to surrender their parcel for one in a diked meadow might be overcome by explaining that all lots would be uniform following completion of the project. These organizations were incorporated by the state and operated by committees with stakeholders owning as much stock as their lot had value. Theoretically, cooperation cut costs because mowing and grazing could be done by fewer people but with the same, or greater, output. At Dartmouth and Westport, Massachusetts, marshes were divided into lots of one to twenty acres and marked by stakes in 1826; all owners agreed on a harvest time so that everyone was out at once unmown lots were not damaged.⁶⁶²

660 1826, May 5. *New England Farmer*, IV, 325; 1827, March 2. *New England Farmer*, V, 1831, February 9. *New England Farmer*, IX.

661 1823, March 1. *New England Farmer*, I, 1824, March 6. *New England Farmer*, II, 1824, July 10. *New England Farmer*, II, 1820, December 2. Draining of Marshes. *The Plough Boy*, II, 210-213.

662 1826, June 23. *New England Farmer*, IV.

Only one article was published in *The Cultivator* between 1834 and 1840 on diking—it was a letter to the editor by a resident of Nova Scotia who inquired about the best ways to ditch, manure, and cultivate a 400-acre marsh. The new editor, Luther Tucker, responded by saying he “had no experience in the reclamation of salt marshes” and solicited input from readers (Fairbanks, 1840, November, pg. 178).

Forage Species Recommendations

The practice of intentionally sowing grasses for hay and pasture was not yet established in Europe at the time of North American colonization and Jared Eliot believed they were generally introduced in Britain after 1640. Red clover (*Trifolium pretense*) may have been introduced in 1633, yellow clover (*T. procumbens*) in 1659, white clover (or Dutch clover, *T. repens*) in 1700, sainfoin (*Onobrychis* spp.) in 1651, and perennial rye (or ryegrass, *Lolium perenne*) in 1677. English farmers were improving their methods for cultivating clover as late as 1779 and perennial rye was still the most widely planted grass in Britain in the 1820s.⁶⁶³ France’s agricultural revolution was relatively late and clover was not widely planted until after 1700 even in northern areas (Zeven, 1991). However, John Armstrong’s 1819 *Treatise on Agriculture* stated that France was the first to develop upland meadows (Armstrong, 1819; Jones, 1990).

The introduction of these species was underway in North America by 1749 when Peter Kalm remarked that although native grasses were insufficient to support large amounts of cattle, “foresighted farmers have procured seeds of perennial grasses from England and other European states, and sowed them in their meadows, where they seem to thrive exceedingly well” (Benson, 1937, pg. 180-181). However, in 1820 *The Plough Boy* reported that “Grass and Root Crops...are just beginning to become the subject of conversation” and with regard to grass culture

663 Beddows (1968); Bradley (1822, March 30); Brown (1948); Carman et al. (1934); W.E. (1812, March); Curtis (1792).

“It is in this branch of husbandry more than in any other, that our present practice is unskillful and defective.”⁶⁶⁴

Kalm’s “grasses” (like Eliot’s “forage crops”) were a combination of Eurasian legumes and grasses. Wetlands were no longer a main source of hay and pasture after these species were introduced and established in North America, and *meadow* was then used to refer to grasslands of all types.⁶⁶⁵ Meadows were then divided according to vegetation, being “either natural or artificial: the former, containing only plants of spontaneous growth; the latter, those selected, sown and cultivated by man” (Armstrong, 1819, pg. 284). Likewise, introduced forage species were commonly termed *artificial grasses*. Many artificial grasses would have been intentionally introduced but others were transported in livestock feed, bedding, and dung; the Northeast has a particularly long history of species introductions owing to its long settlement history, high concentration of ports, dense transportation networks, and extensive commercial and landscaping activities (Beddow, 1968; Mack, 2003; Pauchard & Shea, 2006). The upper Hudson Valley was undoubtedly one of the first introduction sites for several species because livestock (and settlers) have been transported 150 miles inland to Beverwijck/Albany since the 1620s.

Editorial offices of journals became distribution centers for exotic seeds collected and sent from around the world (Demaree, 1941, pg. 56-57). Seeds, and sometimes cuttings, were given to American farmers willing and able to experiment with their cultivation and report back to the office with methods and results. In 1819, for example, Elkanah Watson received over 60 varieties of garden seeds from the American consul in Italy and 48 types of wheat and barley from Spain; half of the garden seeds were taken by the Niskayuna Shakers to grow with the understanding that they would give half the produce to the state Board of Agriculture, and the

⁶⁶⁴ 1820, May 13. Superior Live Stock. *The Plough Boy*, I, 399.

⁶⁶⁵ Anderson (2004); Cronon (1983); Donahue (2004); Foster (1999); Hudson (1889); O’Callaghan (1856); Valencius (2002).

wheat and barley were to be distributed to presidents of agricultural societies.⁶⁶⁶ A letter to the editor of *The American Farmer* (reprinted in *The Plough Boy*) expressed approval of the journal's format and mission to provide native seeds to "our distant neighbors" and

collect, preserve and diffuse useful information: to bring into general notice and use the best agricultural implements and machinery; and to introduce valuable seeds and plants not hitherto cultivated among us, and the best kinds of those that have been.⁶⁶⁷

Forage species were not only transferred from Europe but from elsewhere in North America. In 1835, for example, *The Cultivator* reported that grasses from the American Midwest would probably prove useful and seeds had been obtained from Illinois.⁶⁶⁸ Seeds were also sent from North America to Europe, the prime example being Timothy (*Phleum pratense*) that was described to the London Society of Arts, Manufactures and Commerce in 1761 by Jared Eliot as being the only native grass used in American agriculture (Beddows, 1968). Eliot also believed "fowl meadow grass" was native but each of the three species with that common name has since been found to be Eurasian (i.e., *Poa palustris*, *Agrostis capillaris*, and *A. gigantea*).

European species were increasingly introduced and established in Pennsylvania and the Northeast after 1750 but "English grasses" were largely unknown south of Virginia at that time (Carman et al., 1934). The introduction record is less clear in New France though some species were present by 1820 (Young, 1822). *The Plough Boy* reported that only four species were cultivated from seed in the United States in 1822: red clover, white clover, Timothy, and redtop (or one of many other names, *Agrostis* spp.).⁶⁶⁹ In 1835 *The Cultivator* reported that the "most respectable seed shops" had only added three additional species, lucern (or alfalfa, *Medicago*

⁶⁶⁶ 1819, October 2. Agricultural Notice. *The Plough Boy*, I, 150; 1819, June 5. Notice to Agriculturists. *The Plough Boy*, I, 6.

⁶⁶⁷ 1820, February 19. From the American Farmer. *The Plough Boy*, 38, 301.

⁶⁶⁸ 1835, August. Remarks of the Conductor. *The Cultivator*, 2, 88.

⁶⁶⁹ 1822, May 25. Grasses. *The Plough Boy*, III, 410.

sativa), orchard grass (*Dactylis glomerata*), and tall oat grass (*Arrhenatherum elatius*).⁶⁷⁰ Two years later Jesse Buel told a farmer that he didn't know where many seeds could be obtained, but that at least lucern could be bought in Albany and others could be purchased in New York City (Finch, 1837, May). By the end of the nineteenth century, however, at least 20 Eurasian legumes and grasses had been successfully introduced to the United States for forage (Appendix C). Most of these species were thought to be native by eighteenth- and nineteenth-century agriculturalists, probably because they were brought from Europe in early shipments of colonists and livestock and spread naturally through the movement of animals and manure. Of special interest are clover and Timothy: clover was probably the first European legume to become intentionally established in the Northeast and Timothy seems to have been the only native grass cultivated for forage in America. Together these plants comprised the most common hay and pasture mixture in the Northeast by the 1820s.

Clover

William Strickland reported to the British Board of Agriculture that the intentional cultivation of clover began in New York in the mid-1790s and was effectively replacing fallow fields with hay and pasture land. Jesse Buel marked the year 1800 as the start of clover culture in the United States, though adoption was slow over the following three decades. *The Cultivator* also reported that the legume was introduced to Dutchess County around the turn of the century.⁶⁷¹ These sources may have only meant the use of clover in crop-rotation because clover is known from the Northeast since the onset of colonization. William Pynchon sold “Flanders grass seed” in Springfield, Massachusetts by 1650, which was most likely white clover because

⁶⁷⁰ 1835, August. Remarks of the Conductor. *The Cultivator*, 2, 88.

⁶⁷¹ Breugel (1994); 1834, June. *The Cultivator*, 1; Buel (1835, October).

that species was cultivated in the Low Countries by the end of the previous century and exported to Britain from Flanders; it was called “Flanders grass” in the early days of its adoption (Carman et al., 1934; Zeven, 1991). Farmers elsewhere in western Massachusetts bought clover seed from Boston and it was also grown in Connecticut. References to this legume increased following John Josselyn’s 1663 statement that “English Clover-grass” was doing well in New England (Russell, 1976, pg. 130). The *New England Farmer* noted that red clover was probably the most popular type in New England.⁶⁷²

Perhaps the earliest reference, however, was from 1634 in New Netherland when Kiliaen van Rensselaer responded to Director van Twiller’s request for clover seed in the colony by saying,

As to clover seed, I would have sent some to your honor, but mine is on the way from Italy, shipped from Venice, and here there is little for sale and it is extremely dear besides being good for nothing since very little has come up from the last at Craloo. If another ship follows, and *den Walvis* has lain ready for seven months, I shall provide your honor with it.⁶⁷³

Apparently the van Rensselaer estate in Gooiland had not produced its own crop of seed that year and because it was generally rare that year he had to obtain it from Italy. In 1658 his son Jeremias ordered two or three pounds of “white stone clover seed” from Holland for use in Rensselaerswijck and the following spring a bag of “white clover seed” was sent to him by his brother Jan Baptist.⁶⁷⁴ In 1670 the English visitor Daniel Denton said livestock on Long Island were in

no place in the North of America better, which they can both raise and maintain, by reason of the large and spacious Meadows or Marches wherewith it is furnished, the Island likewise producing excellent English grass, the seed of which was brought out of England, which they sometime mow twice a year (Royster, 2006, pg. 10-11).

⁶⁷² 1822, December 14. *New England Farmer*, I.

⁶⁷³ van Laer (1908, April 23, 1634, pg. 283-284).

⁶⁷⁴ van Laer (1932b, “Memorandum,” July 11, 1658, pg. 105 and “From Jan Baptist van Rensselaer,” April 25, 1659, pg. 151).

What these grasses were, however, is unknown and a life-long resident of nearby Babylon, Long Island wrote in 1882 that “English grasses were but little cultivated on Long Island until about 1800” (Cooper, 1882, pg. 83). Despite being a legume, clover was often referred to as a grass; and although its culture actually originated in the Low Countries in the sixteenth century before spreading to Britain it is possible that this English visitor would identify it as an “English grass” (Bidwell & Falconer, 1925; Jones, 1990). “English grass” also referred to blue grass or redtop (*Poa pratensis*) (Bidwell & Falconer, 1925).

In 1675 a “pasture was to be sown” in the Esopus, but with what is also unknown.⁶⁷⁵ It may have been with clover because by 1644 a clover pasture was present on lower Manhattan and in 1673 a “little clover meadow” was granted to the Magistrates of Harlem for use as a common pasture.⁶⁷⁶ At the end of the decade Danckaerts and Sluyter observed that some of the cornfields near Jamaica Bay were “entirely covered with clover in blossom” (Murphy, 1867, pg. 131). In 1738 when Surveyor General Cadwallader Colden described the condition of the province he mentioned that “The soil is likewise more fit for pasture running naturally, as soon as it is clear’d of the woods into clover and other good grass & is almost every where intermixed with good meadow grounds.”⁶⁷⁷

Some references to clover may have been to the red variety, which also originated in the Low Countries but was adapted for agriculture at a later date. Upon his arrival in New York in June 1749 Peter Kalm observed that “Red clover was sown in a few places on the hills outside” but he only noted white clover near Québec (Benson, 1937, pg. 324). In 1822, however, the Québec Agricultural Society announced a prize to whoever produced the best and cleanest red

675 Versteeg et al. (1976b, “Ordinary session,” February 9, 1674/5).

676 O’Callaghan (1858a, “At a Council,” October 23, 1673, pg. 643); Riker (1904); Ullmann (1931).

677 O’Callaghan (1851, “Observations on the Situation, Soil, Climate, Water Communications, Boundaries, &c. of the Province of New York,” 1738, pg. 174 and “Mr. Colden’s answers to the queries of the Lords of Trade,” February 14, 1738).

clover seed.⁶⁷⁸ The commonness of white clover in the Northeast by 1800 is illustrated by the Englishman John Maude's comment on the fragrance of red clover in the upper Hudson Valley: "White clover is a native of this country; the red is, I believe, an exotic, though it is now to be found in a wild state all over this part of the country, even in the woods" (Munsell, 1852, pg. 121-122). Demand for white clover in North America was sufficiently high in the late-1780s that it caused an increase in European seed prices (Zeven, 1991).

Timothy

In 1754 the London Society of Arts, Manufactures and Commerce was founded with goals similar to agricultural societies in America, and six years later the Society's Committee on Agriculture agreed to investigate types of foreign forage species to feed British stock in winter. In November 1760 the Committee wrote to Jared Eliot requesting information on American forage species and in December Benjamin Franklin discussed Timothy during a visit to London. The following spring Eliot's response reached the Committee with a description of this "natural grass." Eliot explained that the grass was called "Herd's grass" after the man who discovered it in a Pennsylvania "swamp or morass," but other accounts indicate it was found in a New Hampshire "swamp" by Mr. Herd. The name "Timothy" arose after its supposed introduction to the Carolinas by a Timothy Hansen and may be a more appropriate name because Herd's grass/herdsgrass was also commonly used for species of *Agrostis*. Although Timothy had been planted in Britain in 1743 the first serious effort to introduce the plant to that nation was in 1763 when seeds were sent to the Committee and planted near London. It was known in Ireland soon thereafter, as meadow fox-tail and Ohio grass, but was not common in British fields until the 1920s.⁶⁷⁹

678 1822, April 13. Québec Agricultural Society. *The Plough Boy, III*, 361-363.

679 Beddows (1968); Beddows (1969); Carman et al. (1934); Kerr (1964); Stoddart (1886); 1822, May 25. Grasses. *The Plough Boy, III*, 410.

Timothy was sowed on wet ground in Orange County the late-1720s by Cadwallader Colden as well as with wheat, oats, rye, and in an orchard (Haley, 1989). It was known in Pennsylvania by 1740 but in 1836 Jesse Buel reported that it was not grown in the Susquehanna Valley (Buel, 1836, November; Lemon, 1972). A few years later Benjamin Franklin planted the grass on a drained New Jersey pond along with Salem grass (or feather grass, *Holcus lanatus*) and burden grass (or blue bent, *Agrostis capillaris*); in 1749 he also planted Timothy in a ditched meadow in New Jersey that was frequently flooded (Carman et al., 1934). That same decade it was planted by Jared Eliot on a drained pond in Connecticut with fowl meadow grass and English spear grass (*Poa*) (Carman et al., 1934). In the 1780s Alexander Coventry sowed it with clover in Claverack (Coventry, 1978). Timothy was a valuable hay-grass in New England by 1790 and its combination with clover was proclaimed the best mixture within two decades; it was known in Québec by 1822 and experiments were reported from Upper Canada by 1836. Both English and Dutch farmers in what was New Netherland planted it by the 1780s: Richard Alsop lost six tons of clover and Timothy hay at Newtown, Long Island in 1776 and the seeds used by Coventry ten years later were obtained from a long-established Dutch neighbor at Kinderhook.⁶⁸⁰ New York State was producing clover seed for sale by the first decade of the nineteenth century with the aid of seed mills designed in Herkimer County and elsewhere.⁶⁸¹

By 1816 Timothy was the "chief constituent... of 'English grass'" in the United States and the most common hay species in the Northeast (Beddows, 1969; Deane, 1822). Over the next decade it remained one of only a few cultivated species in America along with white clover, red clover, and red top/English grass (*Agrostis vulgaris*).⁶⁸² Some improvers called for development of new combinations, however, including those who wrote to *The Cultivator* in the mid-1830s

680 Coventry (1978, March 26, 1786); Deane (1822); Foulke (1811, October); Riker (1852); 1822, April 13. Québec Agricultural Society. *The Plough Boy*, III, 361-363; Wilson (1822, May 25); 1836, October. Experiments with plaster of Paris. *The Cultivator*, 3, 108-109.

681 Bolton (1822, March 23); Bolton (1823, February 18); Buel (1836b); Logan (1811, October); 1835, November. Report of the Committee on Farm Implements, &c. *The Cultivator*, 2, 130.

682 1822, May 25. Grasses. *The Plough Boy*, III, 410.

saying that the new livestock-based economy required more “durable” species.⁶⁸³ Regardless, Timothy remained the most widely cultivated hay grass in the United States into the mid-twentieth century (Kerr, 1964).

Continued Use of Wetlands

Wetlands were not immediately and consistently devalued despite the availability of reclamation advice, introduction of artificial grasses, and the characterization of wetland forage as “bad hay” (Carman et al., 1934, pg. 8). In the mid-1780s Peter and William Kouwenhoven of Flatlands purchased the “Bog Meadows” between two pieces of upland and that same decade, while sowing and harvesting at least three different artificial grass combinations on his upland fields, Alexander Coventry was also mowing clover hay from a “low meadow” and sowing grass seed over his “swamp meadow lot.” This “low meadow” may have been very wet because in July 1788 he used a sleigh when stacking hay there. The swamp was cleared of bushes only two years prior.⁶⁸⁴ In 1790 he also commented on the hay near Albany being of “low, meadow grass” because there was no “upland meadow” on the area’s sandy, gravelly soil (Coventry, 1978, November 5, 1790, pg. 489). He also hired men to harvest marsh hay on his new farm in central New York just a few months after he “sowed some hay seed” there, and inquired about leasing a portion of the marsh for three years.⁶⁸⁵ In spite of the promotion of artificial grasses done by the agricultural press in the early nineteenth century, contributors still referred to “meadow hay” and “natural meadows” in 1835. The diversity of plants in these meadows, so reviled by *The*

683 1834, October. On Laying Down Permanent Pastures. *The Cultivator*, 1, 117-118; 1836, April. On the Management of Pasture Grounds. *The Cultivator*, 3, 28-29.

684 Coventry (1978, November 10, 1785, March 26, 1786, April 20, 1786, May 13, 1786, June 14, 1786, June 15, 1786, June 16, 1786, June 21, 1786, June 24, 1786, June 26, 1786, June 29, 1786, August 22, 1786, September 1, 1786, March 23, 1787, June 2, 1787, June 3, 1787, October 24, 1787, June 5, 1788, pg. 200, July 12, 1788, May 31, 1789, and June 6, 1790); van Wyck (1924).

685 Coventry (1978, March 14, 1792, pg. 660, October 5, 1792, pg. 695, October 9, 1792, October 16, 1792, and November 10, 1792).

Cultivator that year, was still valued twenty years later by farmers.⁶⁸⁶ Even as new fodder crops were adopted, including root vegetables and early types of silage, some farmers mixed chopped straw and “coarse marsh or meadow hay” with grain (Allen, 1836, January, pg. 168).

The importance of natural meadows to new settlers was also not lost on Richard Smith, a Quaker lawyer in Philadelphia and New Jersey state assemblyman who participated in the first Continental Congress. In 1769 when tasked with surveying his father’s newly-acquired Otego Patent in central New York, Smith traveled from Burlington, New Jersey to New York City, sailed up the Hudson to the Mohawk, then by foot and canoe moved down the Susquehanna to the Delaware. Although he noted the presence of the exotic forage species during his journey he made innumerable references to the natural meadows along each river (Hansley, 1906). Similarly, although the upper Midwest was settled during and after the introduction of artificial grasses, early farmers in that region still relied on native wetland grasses for hay (Prince, 1997, pg. 65).

Grass yields on wet soils were known to exceed those of dry soils so many wetlands continued to produce hay even after the species composition changed from natural to artificial.⁶⁸⁷ Timothy grass itself was supposedly first found in a New Hampshire wetland and *The Cultivator* reported on another grass discovered in that state with great promise as hay and pasture in “wet boggy grounds” (ribbongrass, *Phalaris caroliniana*). It was later described to have provided two cuttings of hay from a bog in Connecticut as well as made that wetland firm enough for pasture.⁶⁸⁸ The commonly cultivated “fowl meadow grass,” although referencing one or more species of *Agrostis* or *Poa*, was traditionally claimed to have been brought to meadows on the Neponset River at Dedham, Massachusetts by a flock of wild birds and to meadows at Hartford,

686 Carbender (1835, August); Foster (1999); Steele (1835, November).

687 1822, December 14. *New England Farmer*, I; 1823, December 27. *New England Farmer*, II.

688 Harris (1834, October); Pickering (1820, February 26); 1834, August. *The Cultivator*, I, 81.

Connecticut by floods.⁶⁸⁹ In 1836 Jesse Buel published a list of artificial grasses in *The Cultivator* that included the wetland obligate floating fescue grass (or water mannagrass, *Glyceria fluitans*) and water meadow grass (or reed meadowgrass, *G. maxima*). These were sporadically present in America and were recommended for cultivation in wet soils (Buel, 1836b, May).

In the late-1720s Cadwallader Colden sowed Timothy in a meadow on or next to a “Bever dam” as well as a meadow with “hassocks” (probably tussock sedge), clover in “ye swamp,” a meadow where the “hassocks” had been removed, “Wet ground about ye Spring,” and white cap/feather grass on a piece of “wet ground.” Some of his grass seed was also “gather’d out of ye swamp” (Haley, 1989, pg. 11, 12, 18, 23). In the fall of 1787 Alexander Coventry visited a Hudson Valley farm with “clayey and cold soil” that grew good grass and hay, and four years later described “stony, and springy” land as being “better for grass than for grain.” He attributed the “verdure or thickness” of his pastures at Claverack to the clay soil there, in contrast to the “very thin” pasture on the stoney and gravelly soils of towns in the eastern hills. Indeed, the “stoney, uneven” land across the river at the hill-town of Freehold caused farmers anxiety because it did “not answer their expectations for grasses.”⁶⁹⁰ Coventry himself sowed grass in his “swamp meadow lot” in the late-1780s (Coventry, 1978, June 5, 1788 and May 31, 1789). Approximately half of the species listed in Appendix C were recommended for wet soils or reclaimed wetlands and nearly a third for “watered” meadows; 60% are currently found in Columbia County wet meadows like the Vly.

Some salt marshes were still used for hay into the nineteenth and twentieth centuries (e.g., Casagrande, 1997; Greenbaum & Gilbin, 2000; Nixon, 1982). A resident of New Bedford, Massachusetts commented in 1823 that many farmers kept their marshes in a natural state

689 Carman et al. (1934); Russell (1976); 1826, June 9. On Grasses, No. II. *New England Farmer*, IV, 361-362.

690 Coventry (1978, October 7, 1787, pg. 170, June 2, 1791, pg. 542, September 4, 1791, pg. 619, and October 16, 1791, pg. 750).

because they believed they should have “a little salt hay.”⁶⁹¹ Likewise, while Nesbit (1885, pg. 124) lamented the failure of New Englanders to dike their salt marshes he also acknowledged that at least in Norfolk County, Massachusetts

much of the meadow is owned by the descendants of the old families in Braintree, Holbrook, Randolph, Canton, and Milton, and salt haying is a feature of their life. They would neither sell the marsh at any price nor reclaim it.

The value of unreclaimed tidal marshes was frequently stated in agricultural journals and included reader-submitted accounts of the labor, cost involved in diking, and the time that elapsed before results were shown. Furthermore, in some areas salt marshes were more valuable than uplands and they were still in demand in the 1830s because they could produce almost as much hay as uplands, particularly in times of drought. Salt hay reportedly made better manure than upland or “fresh meadow hay,” better hay than “the best river fresh meadow hay,” and didn’t require additional effort to make. Their productivity had already been greatly improved by draining, they did not require manuring or much fencing, and other products were available like seaweed, muck, and peat. In the late-1830s, for example, a man on Staten Island drained several wetlands in order to access their peat for composting into usable manure (Buel, 1837a, December).

Some farmers preferred giving salt hay to their animals because it made a good quantity of well-flavored milk.⁶⁹² A man from Plymouth added that the majority of livestock at Duxbury, Massachusetts over-wintered on salt hay and more than half the cash earned by farmers there came from salt hay. It was easier to transport and store than upland or fresh meadow hay because it could be left on marshes for up to a week after harvest. Salt marshes were also less affected by

⁶⁹¹ 1826, May 5. *New England Farmer*, IV, 325.

⁶⁹² 1826, May 5. *New England Farmer*, IV; 1827, January 26. *New England Farmer*, V; 1831, January 28. *New England Farmer*, IX; 1831, February 4. *New England Farmer*, IX; 1831, March 16, *New England Farmer*, IX.

extremes in temperature or precipitation and the hay crop was more uniform. A Boston man wrote to the *New England Farmer* in 1831 singing the praises of salt marshes, explaining that

When salt marsh or fresh meadow is attached to a farm, it enriches the farm; these want no manure and they help to manure the upland. If there are the same number of acres of marsh that there are of upland, more than double the quantity of stock can be kept, which will more than double the manure, all of which will be fore the benefit of the upland.⁶⁹³

Even as federal agencies worked to drain northeastern marshes in the 1930s, ditches were often re-filled by farmers who desired salt hay more than a mosquito-free existence (Britton, 1916; Whitney, 1994).

Still, the economic value of wetlands was decreased as artificial grasses were adopted. By 1790 the price of upland hay on Staten Island was two shillings more per hundredweight than salt hay and in 1831 the agricultural improver Samuel Deane remarked that “salt meadow has fallen in value more than fifty per cent. within the past twenty years, owing principally to the better cultivation of the uplands” (pg. 29). Although some Long Island marshes were still hayed in 1882, a resident of Babylon noted their value had decreased owing to “attention to the growing of domestic grasses” and the price of salt hay from near Flatlands depended on the output of upland hay (Bayles, 1887; Bonesteel, 1904; Cooper, 1882, pg. 83).

The Hudson Valley Joins the Market Revolution

The area that formerly comprised New Netherland was engaged in agricultural improvement that promoted reclamation and establishment of new forage species, particularly because the region was serviced by several agricultural organizations and journals. During the nineteenth-century Market Revolution that witnessed the rapid transition from a subsistence-

⁶⁹³ 1831, January 28. *New England Farmer*, IX, 220

based agrarian society to a capitalist economy emphasizing specialization and mechanization, the Hudson Valley moved from mixed-husbandry agriculture to production of livestock and fodder crops (Breugel, 1994; Sellers, 1991). Hay, straw, and oats became important crops for area farmers who began shipping their produce downriver to urban markets after 1800 (Breugel, 1994). This transition was common in many areas of the Northeast but particularly accelerated in the Hudson Valley with the opening of the Erie Canal in 1825 because local farmers could no longer compete with the lower cost and greater quantity of grain and flour from western New York. According to Breugel (1994, pg. 139), “These circumstances compelled Hudson Valley farmers to explore the comparative advantages of their region. They introduced clover and spread the use of timothy grass.”

Alexander Coventry produced enough hay in 1791 to be able to sell several tons but *The Cultivator* marked 1820 as the turning point between a wheat-centered agricultural economy and one focused on cattle, sheep, and “coarse grains.” Within a decade hill-town farmers had begun focusing on livestock and riverside farms on lea cultures; a visitor remarked that

Every considerable farmer has his hay press, & sends all his surplus hay on to market. They are raising less grain & keep less stock to make the amount the larger for sale. This change of management has given quite a spring to farming operations.⁶⁹⁴

Nova Scotia was described in 1822 as “one vast grazing ground” and New York became the nation’s leader in hay production by the end of the 1840s, followed closely by the New England states.⁶⁹⁵ Horse-drawn machinery was not known in Massachusetts until around 1840 and elsewhere in the Northeast until after 1850, but hay-spreaders, rakes, and mowers were invented or otherwise known in Albany, Columbia, Dutchess, and Montgomery counties by

⁶⁹⁴ Breugel (1994, citing Shirreff 1835, pg. 140); Coventry (1978, December 23, 1790 and March 25, 1791).

⁶⁹⁵ Baron & Bridges (1983); French (1860); Gates (1960); Young (1822).

1837.⁶⁹⁶ *The Cultivator* reported in 1836 that most of eastern New York State produced less than one-fifth of the wheat needed by its population; French's *Gazette* clarified the situation in Greene County 25 years later by explaining that farmers there were

almost exclusively engaged in stock and sheep raising and in dairying. Little more grain is raised than is strictly necessary for a proper rotation of crops; and the greater part of the grain for home consumption is imported from other sections of the country.⁶⁹⁷

Although wetlands were still used for hay and pasture to some extent, and others were valued for their rich soils, landscapes in eastern New York were reorganized by reclamation and the introduction of European forage species. A century after Jared Eliot's 1749 declaration of a northeastern hay shortage, pastures and meadows constituted over half of the "improvable surface" in portions of the Hudson Valley (Breugel, 1994). His vision had been realized of converting wetlands to uplands, which he articulated in 1753:

Take a View of a Swamp in its original Estate, full of Bogs, overgrown with Flags, Brakes, poisonous Weeds and Vines, with other useful Product, the genuine Offspring of stagnant Waters. Its miry Bottom, and Harbour to turtles, Toads, Efts, Snakes, and other creeping Verm'n. The baleful Thickets of Brambles, and the dreary Shades of larger Growth; the Dwelling-Place of the Owl and the Bittern; a Portion of foxes, and a Cage of every unclean and hateful Bird. Now take another Survey of the same Place, after the Labour of Clearing, Ditching, Dreining, Burning, and other needful Culture has passed upon it. Behold it now cloathed with sweet verdant Grass, adorned with the lofty wide spreading well-set Indian-Corn; the yellow Barley; the Silver coloured Flax; the ramping Hemp, beautified with fine Ranges of Cabbage; the delicious Melon, and the best of Turnips, all pleasing to the Eye, and many, agreeable o the Taste; a wonderful Change this! And all brought about in such a short time; a Resemblance of Creation, as much as well, impotent Beings, can attain to, the happy Product of Skill and Industry (Carman et al., 1934, pg. 96-97).

⁶⁹⁶ Bement (1837, January); Blydenburgh (1836, October); Buel (1837, May); Danhof (1956); 1834, July. *The Cultivator*, 1; 1835, August. *The Cultivator*, 2, 84.

⁶⁹⁷ Breugel (1994, citing French's *Gazette* 1860, pg. 101, 329-330); Buel (1836, October).

Implications of Wetland Use and Management

As romantic as Eliot's vision was, the short-term and legacy effects of wetland use and management are of real concern to modern-day conservation efforts. Wetlands in the former New Netherland region are similar to elsewhere in the glaciated Northeast and Europe and ecological impacts identified through recent study can serve as analogs to those of the colonial-era.

Biogeochemical and Sedimentary Change

Studies on a salt marsh hayed every other year at Plum Island Sound, Massachusetts indicated that recent haying had little impact on surface soil compaction, organic matter content, sedimentation rate, or sulfur content (Greenbaum & Gilbin, 2000). In contrast, haying lowered total phosphorous and nitrogen (Buchsbaum et al., 2009; Greenbaum & Gilbin, 2000). Studies from annually mown palustrine wetlands in central and northern Europe, however, found that although mowing reduced nitrogen-mineralization and potassium content it increased phosphorous content (Venterink et al., 2009; Vasari & Väänänen, 1986). Soil phosphorous was also higher in drained Polish fens but nitrogen-mineralization slightly increased in correlation with an increase in biomass as seen elsewhere in Europe (Venterink et al., 2000).

Mowing can remove up to 90% of the aboveground biomass in tidal marshes and litter is also reduced by summer-grazing of subalpine meadows in the Sierra Nevada, both of which would seem to reduce peat accumulation (Greenbaum & Gilbin 2000; Holmquist et al., 2010; Rosza, 1995). Burning also decreased litter accumulation in central European marshes dominated by common reed (Rolletschek et al., 2000). However, removal of surface vegetation through burning, mowing, and grazing may actually stimulate root growth and therefore peat formation.

For example, sedimentation rates and percent organic matter were similar between adjacent New England hayed and non-hayed salt marshes (Greenbaum & Giblin, 2000).

Mineral deposition by tides is also an important aspect of sedimentation in coastal marshes and diking decreases accretion rates by tidal exclusion (Able et al., 2008). Surface peat on a diked Delaware marsh managed for hay was thick, firm, and highly organic but a layer of inorganic material was rapidly deposited following dike-removal (Able et al., 2008). Another cause of reduced inorganic content of marshes might be mowing and grazing. Peteet and others (2007) measured decreases in inorganic matter after European settlement in tidal marshes from Jamaica Bay, Staten Island, and the Hudson River but also noted that during the same period inorganic sediment increased in Chesapeake marshes. Their hypotheses for the decrease included *in situ* vegetation change that resulted in a less-efficient sediment-trapping matrix, and the results of this dissertation suggest that haying and grazing may have caused such a change. Research should be conducted on wetland use and management in southern colonies like Maryland and Virginia, however, because there are indications that vegetation was also removed from tidal marshes there (Nesbit, 1885).

Vegetation Change

As pioneer ecologist and conservationist Arthur Tansley remarked in 1935, “We cannot confine ourselves to the so-called ‘natural’ entities and ignore the processes and expressions of vegetation now so abundantly provided us by the activities of man.”⁶⁹⁸ Within the field of wetland management, of chief interest is the global increase in scrub-shrub wetlands attributed to the agricultural abandonment of these sites as burning, mowing, and grazing cease (Middleton,

⁶⁹⁸ Quote from Tansley (1935, pg. 304). Tansley developed ideas on what he termed “anthropogenic ecosystems” at Wicken Fen, actively managed today using traditional agricultural practices in order to maintain its unique species assemblages and cultural heritage.

2002). Burning is the primary management technique in North America today (Middleton et al., 2006). Fall burning of a Maine fen was successful in reducing the cover of arbovitae (*Thuja occidentalis*) and tamarack but using winter and summer fire to decrease woody vegetation in upper Midwestern sedge fens failed to reduce the target shrub (dogwood) (Bowles et al., 1996; Middleton, 2002; Rooney, 1990).

Biodiversity, including of rare herbaceous species, was also increased in these fens, a temperate peat bog in New Zealand, and a brackish tidal marsh in California; conversely, spring and summer burning are generally harmful to new plant growth in coastal marshes.⁶⁹⁹ In contrast, annual spring burning of a Maryland tidal marsh increased the biomass and stem densities of saltgrass and salt marsh cordgrass but not saltmeadow cordgrass or clubrush, although other regional studies concluded that fire promoted the growth of clubrush (Flores et al., 2011). Several investigations have concluded that burning increases biomass but that other environmental factors are important, including salinity, flooding, and topography (Flores et al., 2011; Rolletschek et al., 2000).

Mowing has been used in Europe to maintain wetland biodiversity by reducing litter, increasing light penetration to the soil surface, and increasing seedling germination and plant success (Middleton et al., 2006). The practice has been found to facilitate the growth of rare plants, some of which have declined in New England following agricultural abandonment (e.g., yellow sedge [*Carex flava*] and grass-of-Parnassus [*Parnassia glauca*]) (Clark, 1968; Fuller et al., 1999). Summertime haying of tidal marshes on the St. Lawrence River did not seem to change the vegetation with the exception of the European wood sorrel (Hatvany, 2003). Winter mowing of a European wet meadow resulted in higher biomass and number of individual plants, perhaps because the soil warmed sooner after snowmelt, but summer mowing of an identical site damaged vegetation because sap was still in the aerial portion of the plants (Buttler, 1992). In both cases,

⁶⁹⁹ Bowles et al. (1996); de Salazay & Resh (1997); Middleton (2002); Nyman & Chabreck (1995); Norton & Delange (2003).

mowed wetlands had shorter and “bushier” vegetation. One month after mowing the Plum Island Sound tidal marsh, 70% of the original cover of saltmeadow cordgrass had regrown and mowing ultimately had little impact on plant species density or biomass at the end of the year (William et al., 2001). Saltmeadow cordgrass was more common than saltmarsh cordgrass likely because it was more tolerant of cutting and produced more tillers (Buchsbaum et al., 2009). The timing of mowing was important in another site with saltgrass, as well as a central European wetland dominated by common reed, because flooding after mowing killed rhizomes created anoxic conditions (Rolletschek et al., 2000; Smith & Kadlec, 1985). Thoreau’s nineteenth-century account of mowing in Massachusetts’ Great Meadow indicated that woody vegetation was prevented from establishing while a variety of herbaceous plants was encouraged (Foster, 1999). Miller and Egler (1950) also surmised that regular mowing of Connecticut salt marshes prevented the shrubby marsh elder from invading.

Sphagnum was replaced by birches and tamarack in a drained Ontario peat bog (Talbot et al., 2010) and bryophytes were replaced by vascular plants in a drained Polish fen (Venterink et al., 2009). Species richness did not decrease after drainage in Poland but the assemblage shifted from those of fens (e.g., buckbean [*Menyanthes trifoliata*] and lesser panicle sedge [*Carex diandra*]) to meadows (white cap/feather grass and field wood-rush [*Luzula campestris*]) (Venterink et al., 2009). These phenomena were attributed to an increase in nitrogen-mineralization following drainage. Similarly, Mountford and others (1993) documented the replacement of *Carex*, *Juncus*, and bryophytes in an English lowland peat moor by velvet grass and perennial rye after application of nitrogenous fertilizer.

The impact of grazing on nitrogen-mineralization rates has been argued and depends on many factors including type of stock (Middleton et al., 2006). Grazers also directly influence vegetation. Horses grazing in European wetlands tend to consume the most productive plant communities and species (primarily graminoids) and clip them closer to the ground while creating

patchy vegetation cover that increases diversity (Menard et al., 2002). Cattle generally consume broadleaf plants and are better able to reduce the invasion of woody vegetation although cattle-grazing in North American fens encouraged shrub-invasion through trampling (Middleton et al., 2006). Some unpalatable shrubs, like alder, are also avoided by cattle. Similarly, woody vegetation increased in British heathlands as a result of sheep-grazing, though the type of vegetation is influenced by season of grazing (Grant et al., 1985; Hulme et al., 2002). Pasturing livestock on tidal marshes of the St. Lawrence River did not leave an obvious mark on vegetation there (Hatvany, 2003).

Diking of marshes along the St. Lawrence River resulted in vegetation change from low to high marsh as tides were excluded but the original community was restored after *aboiteaux* failure (Hatvany, 2003). Dike breaching or removal in Delaware tidal marshes also resulted in rapid re-vegetation by native species (Able et al., 2008; Hinkle & Mitsch, 2005).

Habitat

As rare habitats for threatened and endangered species, wetlands are among the most vulnerable sites to species invasions and an ecosystem-based conservation scheme targeting these landscape features has become increasingly popular in order to protect entire species assemblages (Dale et al., 2000; Flather et al., 1998, pg. 365). Agricultural practices can facilitate the establishment and spread of invasive species through soil exposure and selective grazing, or restrict them through weeding, mowing, and cultivation of desired species. Agricultural abandonment may allow invasive species to enter wetland systems where they were previously excluded.

Non-native plant invasions can decrease biodiversity by causing species extinctions through parasitism, hybridization, competition, as well as indirectly by changing ecosystem

processes and disrupting essential mutualistic relationships between native species.⁷⁰⁰

Biogeochemical and hydrologic cycling, fire frequency, and pest outbreaks have also been shown to accelerate during biotic invasions (Ehrenfeld, 2003; Reichard & White, 2001). Some non-native species appear to have become increasingly common in the past century following agricultural abandonment and understanding the historical aspects of species-specific invasion processes is central to designing conservation measures because future species introductions and dispersal may be prevented and current threats abated. Common reed, for example, is native to North America but an aggressive genotype from Europe may be responsible for its explosive growth in the Northeast over the past century (Catling et al., 2004; Maltz & Stabile, 2005). Possible negative impacts include replacement of rare tidal marsh communities, alteration of soil chemistry and hydrology, and degradation of fisheries through reduced nekton abundance.⁷⁰¹

Wetlands with water tables lowered by drainage or diking have been particularly invaded, and ditches themselves present important dispersal pathways for invasion in tidal marshes (Bart et al., 2006; Roman et al., 2000; Winogron & Kiviat, 1997). Abandonment of marshes for hay production may have also stimulated common reed invasion along the Northeast coast; only within the past five years, for example, has it expanded in the Great Marsh of northeastern coastal Massachusetts, a salt marsh managed for hay until the 1970s, and the species remains uncommon on the still-farmed Tantramar Marshes on the Bay of Fundy (Catling et al., 2004; Rattigan, 2005; Smith et al., 1989). However, it did not become established along the Hudson River until the mid-twentieth century, well after wetlands were known to be used and managed for agriculture there.

The absence of historical documentation makes it difficult to ascertain how wetland management influenced the establishment patterns of other wetland invasives like purple

700 Bergman et al. (2000); Clavero & Garcia-Berthou (2005); Crooks & Soulé (2001); Manchester & Bullock (2000); McKinney & Lockwood (2001); Mooney & Cleland (2001).

701 Bertness et al. (2002), Catling et al. (2004), Hanson & Osgood (1999), Osgood et al. (2003), Windham & Lathrop (1999), Winogron & Kiviat (1997).

loosestrife, yellow flag (*Iris pseudacorus*), flowering rush (*Butomus umbellatus*) and multiflora rose (*Rosa multiflora*) (Lavoie et al., 2003; Tiner, 1998). However, herbarium records, naturalist reports, and modern surveys show that purple loosestrife probably arrived to North America as an ornamental plant and a stow-away in ballast soil before the turn of the nineteenth century. It was not found in the Hudson Valley until after 1900 and regional botanist Rogers McVaugh described it as “interesting find for a collector” for the next two decades; it was not widely spread there or elsewhere in North America until after ca. 1930 (Lavoie, 2010; McVaugh, 1958, pg. 175).

Although generally not considered weedy, European forage species are common in many wetlands and currently comprise 34% of the legume and grass flora of Columbia County wet meadows (Appendix C). Several are known to have negative effects on native vegetation, including reedtop that reduces wetland biodiversity by outcompeting native species through faster growth, disease-transmission, and hybridization; it also increased by burning. Water meadow grass/reed meadowgrass forms dense monocultures that displace native species and provide inferior wildlife habitat, particularly to macroinvertebrates. It has been found to convert flowing, aerobic streams to stagnant, anaerobic wetlands and is banned in Massachusetts and Connecticut.⁷⁰²

Wildlife is also impacted by wetland management. Fall and winter burning of a Louisiana marsh resulted in avoidance of those areas by sparrows and wrens for the first year although increased visibility probably made them preferable to grackles and blackbirds (Gabrey et al., 1999). Similarly, exposure of invertebrates likely made migratory waterfowl prefer a hayed marsh over an adjacent natural marsh in Massachusetts (Buchsbaum et al., 2009). Many bird species decreased following removal of woody vegetation in a Minnesota scrub-shrub wetland (Hankowski et al., 1999).

702 Global Invasive Species Database (2013).

Burton and others (2007) found that some types of North American frogs were negatively impacted by cattle-grazing in emergent wetlands, perhaps because of a decrease in water quality and vegetation cover. Poor water quality is also a cause of decreased chironomid richness in grazed farm wetlands in Minnesota (Campbell et al., 2009). Shellfish were undoubtedly reduced in areas where swine were permitted to run at-large in tidal wetlands, as was common along the Bay of Fundy, coastal New England, and the Chesapeake (Anderson, 2005; Nesbit, 1885; Woodworth, 1918). Burning a California brackish tidal marsh resulted in greater density of some invertebrates, particularly midges, but negatively impacted others by drying and warming the soil (de Salazay & Resh, 1997). Mowing had no impact on invertebrate densities or richness. Mowing of the Plum Island Sound tidal marsh only temporarily reduced invertebrate abundance (Buchsbaum et al., 2009; Ludlam et al., 2002). Conversely, short-term aquatic invertebrate richness was higher in grazed wetlands in Nebraska than in other managed wetlands (i.e., mowed, burned, disked) (Davis & Bidwell, 2008). No long-term damage was done to arthropod stocks in summer-grazed subalpine wet meadows of the Sierra Nevada and macroinvertebrate communities from Florida pasture wetlands were also unchanged (Holmquist et al., 2010; Steinman et al., 2003). Diking of Delaware River tidal marshes dramatically reduced the abundance and richness of fish by eliminating sources of food and habitat (Able et al., 2004; Nemerson & Able, 2005).

Environmental Reconstruction

Disturbance impacts cannot be determined without experimental controls (Norton & DeLange, 2003) and although controls are absent in paleoecological and historically ecological research, researchers should document past land-use in their study area in order to identify possible modern analogs. It is generally unadvisable to use tidal marshes for environmental construction without first doing a thorough land-use history because variation in peat and

vegetation type could be interpreted as changing sea-level when the cause was dike-construction or removal (e.g., Able et al., 2008; Hatvany, 2003). Clark (1986) recognized this as a possible reason why he was not able to identify a known tide-cycle during a study of an eastern Long Island tidal marsh. Early records are especially important for documenting land-use, again exemplified by tidal marshes: in the 1820s the *New England Farmer* referenced more diked marshes on the Massachusetts coast than Nesbit found during his formal 1885 survey.

Interpolation between only a few dates can be erroneous for sediments in drained wetlands where soils are compacted and decomposed, necessitating the use of additional chronostratigraphic markers (Talbot et al., 2010). Exotic species can be used as markers if the date of introduction is known. Clover in Dutch-settled regions of North America, for example, probably pre-dates those in English- and French-settled areas by thirty years. Common reed also promises to be a wetland-specific indicator if phytoliths included as part of a multi-proxy analysis. Ecologists reconstructing the vegetation history of wetlands in the Northeast should also make note of coprophilous fungal spores because grazing is known to impact vegetation. Irrigation may have also been used to stimulate graminoid growth; in Finland, for example, it was found that regularly flooded wetlands had peat and vegetation characteristics similar to beaver meadows (Vasari & Väänänen, 1986). An increase in woody taxa has often been attributed to drier climates but may also be the result of historical drainage. A shift between woody taxa, e.g. from evergreen to deciduous species, may also be indicative of drainage because nutrient increase is advantageous to deciduous species (Talbot et al., 2010).

Charcoal in wetland sediments may be the product of management practices and the subsequent impact on vegetation (e.g., reduction in woody species or increase in herbs) would therefore not be a natural occurrence. The impact of fire on wetland sedimentation is largely unknown because excessive burning can destroy the substrate but also stimulate root growth and therefore peat development. Its impact on organic matter export is also unknown but annual

burning could cause a net loss over time if the temporary increase in biomass is offset by destruction the following year (Nyman & Chabreck, 1995). An historical perspective on the quality of wetlands as wildlife habitat may clarify fluctuations in fish populations because the health of fisheries is related to invertebrates that feed on organic material produced by marshes (Pauly, 1995). Although it appears that invertebrate abundance is not significantly altered by mowing or grazing, diking has deleterious effects on both invertebrates and fish (Able et al., 2008). Leavenworth (2008) partially faulted wetland modification for declines in New England fisheries even prior to large-scale drainage and infilling, and more information on coastal ecosystem management is needed in order to assess the actual baseline status of regional fisheries.

Within the glaciated Northeast a few tentative conclusions might be drawn regarding the short-term and legacy effects of wetland use and management. If burning in did occur in the fall it could have reduced woody vegetation and increased biodiversity, though any follow-up springtime burning (mentioned by van der Donck for New Netherland) would have retarded plant growth as Peter Kalm saw on the Delaware. Non-native plants may have become established in some burned areas if the seed bank was sufficiently degraded.

Mowing occurred in late-summer throughout the Northeast and could have increased the abundance of saltmeadow cordgrass in estuarine and marine tidal marshes but otherwise did not greatly affect vegetation assemblages unless the harvest was followed by flooding. Palustrine wetlands were not greatly impacted except that a more-diverse herbaceous cover probably resulted. In contrast to burning, mowing probably increased biodiversity in all wetland types because seed banks are left intact and native species therefore maintain a competitive advantage over introduced species.

Grazing pressure was probably correlated with livestock numbers, which in New Netherland were low relative to New England. Animals were also permitted to pasture at-large

through much of the year and their impact on any one tract may have been transient. Evidence for grazing on salt marshes is minimal but it perhaps occurred in spring and fall; evidence for grazing on palustrine wetlands exists but seasonality is unknown. Depending on the type of animal, different vegetation communities would have become established and either moved the site towards patches of diverse vegetation (horse) or emergent wetland with some shrubs (cattle).

Ditching was universal and small-scale in the early years of European settlement and historical records do not provide much information on species introductions, but colonial-era drainage systems probably encouraged the establishment of some plants. Aside from allowing the establishment of upland species within former wetlands, drainage probably led to an increase in available soil nutrients that would have favored different vegetation assemblages (such as grasses over sedges). Ditching tidal marshes would also provide microsites for establishment of freshwater species within more saline environments. Diking likely converted low marshes into high marshes, changed the invertebrate fauna, and caused declines in local fish populations, though reversal would be rapid following dike breaching or removal.

Future research should focus on the pre-nineteenth-century uses and management of palustrine wetlands because the historical record is less complete than for tidal wetlands. In addition, Dutch-language records should be consulted for references to uses, management, and species introductions. Untapped sources of information include untranslated portions of the van Rensselaer Manor Papers Collection (New York State Archives) and Long Island town histories (New York Municipal Archives). Records should also be consulted from town and county historical societies because local-scale phenomena are not always well-represented in official government documents. This is especially important in areas like New Netherland where smaller municipalities were characterized by ethnic enclaves.

Directions for Conservation, Restoration, and Environmental Education

In his 1933 treatise on the agricultural history of New York State Ulysses Hedrick romantically proclaimed the Dutch influence in New York as

felt in every farming community in New York, in farm operations, and in the manners, morals, modes of life, and even in the language of the people who till the soil... We are conscious of the Dutch at every turn in the history of agriculture in New York (pg. 85).

However, David Cohen's (1992) analysis of the Dutch-American farm concluded that New Netherland agriculture was a hybrid of indigenous, Dutch, and English practices with only a plow, scythe, and wagon unique to the area. Director Peter Stuyvesant also specified farming implements when wrote in 1677 that "their manner of agriculture is wholly different from that way practised by the English nation" (O'Callaghan, 1853, pg. 164). Just as mixed-husbandry agriculture was similar among northeastern settlement groups, so too were the uses of wetlands. Only the spatial scale of certain practices may have been more restricted in the Dutch-settled colony because of an emphasis on trade that resulted in a smaller population and the importation of many foodstuffs like meat. Nevertheless, the reliance of mixed-husbandry farmers on wetlands as a source of hay and pasture resulted in many European settlements being located near large wetlands.

Dutch-colonial agriculture in the watersheds of the New York-New Jersey Harbor and Estuary may not have practiced on a broad scale and some communities were probably slow to adopt new practices, but the colony generally followed similar methods as other cultural groups in the Northeast. This becomes clearer when considering that reclamation was also an early concern in New Netherland prevented mainly by labor, financial, and legislative constraints; prime examples are the delayed drainage of an Esopus wetland and those adjacent to Manhattan's Fresh Water. With the exceptions of diking and the introduction of clover, the apparent

similarities between New Netherland and other colonies suggest that although the Dutch colony may not comprise a unique “bioregion” in terms of wetlands, the Northeast as a whole does.

Across the Northeast, then, wetlands were first perceived as a resource before certain types (mainly palustrine) began to be seen as unhealthy or dangerous to livestock. Other types (mainly tidal marshes) continued to be used for agriculture into the twentieth century. All types were devalued over time with the introduction of reclamation techniques and European forage species, particularly after 1820 as a result of information shared through the agricultural press. The presence of several prominent agricultural improvers, societies, and journals in eastern New York indicate that innovation was commonplace even in ethnically diverse areas. More research is needed into local-scale agricultural practices before drawing this conclusion and determining if Elkanah Watson was correct in 1791 when he expressed hoped that increased literacy would prompt

the Germans, the Dutch, the Yankees, [to] soon dismiss all local, illiberal prejudices and distinctions; and in twenty or thirty years the shades of discordance will be hardly perceptible. The whole will amalgamate, and all will be dignified by the general name of *Americans*; speaking the same language, and possessing the same genius and education. (Snow et al., 1996, pg. 5).

The agricultural press did attempt to nationalize certain agricultural practices and although the proliferation of journals and similarity of their content was regarded warily by Jesse Buel in 1839, that same year *The Cultivator* received continent-wide contributions and declared that the journal “belongs to our country.”⁷⁰³ Nesbit’s 1885 declaration that methods for draining and diking tidal marshes would become “American” (pg. 5) was quickly affirmed as reclamation became standardized through the creation of drainage districts and government-scale efforts to curb mosquito-born illness.

⁷⁰³ 1839, April. We Spread Our Nets Too Broad. *The Cultivator*, 6, 38-39; 1839, February. Close of the Volume. *Cultivator*, 5, 197; 1840, February. Notices. *The Cultivator*, 7, 21.

As equally wide-reaching as turn-of-the-century reclamation is today's movement to conserve and restore wetlands across North America. Public awareness and stewardship of wetlands can generally be increased by casting a cultural and historical light on these natural resources that have lacked a well-known colonial context. Environmental historians tend to emphasize the recent shift from negative to positive perceptions and disregard the earlier period when wetlands were central to the Northeast's mixed-husbandry agricultural system. This linear interpretation should be replaced by what David Casagrande (1997) termed "the full circle" because wetlands have been cyclically perceived as agricultural assets, disease-ridden and dangerous wastelands, and providers of ecosystem services. When discussing the historical context for urban salt marsh restoration, Casagrande argued that industrialization was responsible for the initial cleft between nature and society and that pre-nineteenth-century perceptions of wetlands need to be taken into account when planning any restoration. Ann Vileisis (1997, pg. 11) drew a similar conclusion:

When a people's stories are well known, individuals lay claim to a heritage that gives them an identity and place in the broader society. The same can be true for natural landscape features. Perhaps when Americans better know the story of their wetlands, they will understand why remaining swamps and marshes at the edges of their fields, their subdivisions, their shopping malls, and their industrial parks need protection.

Many European parks highlight the agricultural history of wetlands as integral to their current appearance, composition, and development of nearby settlements. Examples include Kristianstad Vattenriket Biosphere Reserve in Sweden, Sølendet Nature Reserve in Norway, and Wicken Fen National Reserve in England. The European Thematic Network on Cultural Landscapes and their Ecosystems also recently developed the Cultural Landscape Database to provide information to researchers, planners, policy makers, and the public. For example, the identification of *Pfeifengraswiese* (moor grass meadows) and *Wässerwiesen* (watered meadows)

as cultural landscape types is supported by physical, hydrologic, biologic, and anthropogenic characteristics with management recommendations based on traditional land-use. Some North American parks have moved in this direction, such as the Tantramar Marshes National Wildlife Area on the Bay of Fundy and Minute Man National Historic Park in Massachusetts.

Understanding the historical management of wetlands within the watersheds of the New York-New Jersey Harbor and Estuary can also guide the interpretation of publicly-accessible wetlands in that region because many parks and preserves include wetlands that were managed for hay and pasture. This is especially true for parks with remnants of tidal marshes in the metro-New York City area that are targeted for increased public access and education through the National Estuary Program (2013), Hudson River Estuary Action Agenda (2009), and New York-New Jersey Harbor Estuary Program (2011). A combination of results from this dissertation with findings of the Welikia Project, for example, would reveal the pre-European condition of wetlands in the five boroughs and the uses and management techniques employed by early settlers.

New Netherland may not have a unique wetland story but the anecdotes provided in this dissertation support its inclusion in the narrative of the greater Northeast. They also suggest that an understanding of wetland roles in agriculture, in addition to ecosystem services, may aid in interpretation and restoration. By emphasizing the place of wetlands in Native American and early European heritage a broader audience may be reached by including those who are inclined to favor cultural perspectives on the environment over the purely ecological.

Appendix A

Lead and Mercury Sources in the Northeastern United States and Canada

Owing to lead's one-week atmospheric residence time (Hutchinson & Meema, 1987), and prevailing westerly winds in the mid-latitudes of the northern hemisphere, it is unlikely that emissions from far east and south would have been deposited in Kinderhook. The focus is therefore on the immediate Northeast and mid-Atlantic regions. The earliest and most widespread industrial activities in these regions were iron mining, smelting, and forging, which initially relied on charcoal-fired limonite (bog ore). Iron imported from Russia, Sweden, and Great Britain was also used into the 1820s. Other metals, including lead, copper, and tin, were of lesser importance in early years though they were known and occasionally processed.

Unlike lead, mercury has an atmospheric residence time of months to years and sources are therefore much larger in scale (Fitzgerald, 1986). Gold and silver mining was the source of much of North America's atmospheric mercury in the nineteenth century (Pirrone et al., 1998) but emissions from smelting, coal-burning, waste incineration, and other industry rose dramatically at regional levels in the mid-twentieth century.⁷⁰⁴ Fossil fuel combustion and smelting have been the main modern sources of anthropogenic mercury emissions in North America since the mid-nineteenth century (Pirrone et al., 1998). Coal combustion is a chief source of atmospheric mercury because as much as 90% of the original content is volatilized (in comparison, only 6% of lead in coal is volatilized) (Lovering, 1976; Schultz et al., 1973). Despite a long residence time, about half of atmospheric mercury is still deposited locally and since 1962 a second major source for Kinderhook has been a cement plant just 10 miles west in Ravena, NY (Lafarge, 2012; Mason

⁷⁰⁴ e.g., Greenland and Denmark [Shotyk et al., 2003], Ontario [Givelet et al., 2003], the Great Lakes [Pirrone et al., 1998], and the upper Midwestern United States [Engstrom & Swain, 1997].

et al., 1994). The primary source of this mercury is the local limestone used to make cement, followed by coal used to fire the limestone mixture. This plant is routinely the first- or second-largest mercury emitter in the state and westerly winds would result in significant deposition in the Vly. The plant also releases large amounts of other heavy metals like lead (NYSDoH, 2010).

Iron ore was known from Virginia at the settlement of Jamestown in 1608, a discovery that prompted the Virginia Company to send skilled workers and establish iron works in the 1620s. These failed, however, and Virginia does not seem to have produced more than some pig iron for shipment to Maryland forges (Swank, 1892). A 1727 act encouraged “adventurers in iron works” within the province itself, but nothing occurred until after 1760 when an increasing number of works were built, including as far west as Shenandoah County (Swank, 1892, pg. 259). Virginia became a prominent producer later in the eighteenth century.

Maryland possessed ore but it wasn’t mined in the seventeenth century “for want of a sufficient stock, & persons of skill to engage in such an undertaking” (O’Callaghan, 1854b, pg. 606). Another observer noted in 1719 that progress was hampered by “want of proper encouragement to some first undertakers” (Swank, 1892, pg. 240). Bar iron was processed for export to England the year prior but only a few bloomeries existed in the province before the 1724 construction of a furnace at the head of the Chesapeake. The following year an English ironmaster arrived to begin a works in Cecil County, from which pig iron was exported to England (bar iron remained in America); another successful furnace was erected in 1744 that sent most of its product to England. In 1749 and 1756 there were eight furnaces and nine forges in Maryland—the same English-owned company was proprietor of four of those furnaces and two forges (Swank, 1892).

Delaware’s iron industry was small, slow to develop, and largely linked to an “iron hill” in the far north in an area that was originally part of Pennsylvania. This name is known from at least 1661 and the ore was likely discovered in the 1650s. An iron works in New Castle County

was probably built between 1717 and 1726 and a few others built in that same time period were initially successful but quickly abandoned because limestone was not on hand to act as flux (these were all not far from “iron hill”). Some furnaces existed in Sussex County in the 1760s, and another in the 1820s, but none were reported for the entire state in 1810. Some bog ore was taken to furnaces in New Jersey and rock ore potentially to Maryland and Pennsylvania (Swank, 1892).

Pennsylvania was a latecomer to the industry but became the national leader in iron and steel production after the mid-eighteenth century (Swank, 1892). William Penn was aware of iron and copper in Pennsylvania by 1683 and 40 pounds of iron were reportedly produced in 1692, but a 1702 report noted that a “considerable vein” had not yet been discovered (Swank, 1892, quoting Logan, pg. 164). The first successful iron works were established in 1716 in Berks County and two others were built soon thereafter in Chester and Berks Counties. A number of works were also built in southeastern Pennsylvania in the 1720s. There were four furnaces in 1728 producing at least some pig iron for export to England. Iron works were increasingly built in the following decades, spreading westward, with the first furnace west of the Susquehanna erected in 1763. A major industrial core grew in Chester, Lancaster, and Berks Counties after the Revolution and the first of many works was established in Pittsburgh in 1805; these foundries were supplied by mines and furnaces in western Pennsylvania (Swank, 1892).

New Jersey was known to have ores of iron and copper but no report was made on mining and processing until the 1670s when one or two iron works were established (O’Callaghan, 1854b, pg. 603; Swank, 1892). A furnace and forge were profitable in Shrewsbury in 1682 and remained the only work in the province for several years (Swank, 1892). New Jersey’s iron industry was almost completely restricted to blooming until the turn of the century. A large mine at Hanover provided ore for several works in northern New Jersey after 1710 and many forges were established but progress was slow until the mid-eighteenth century. A 1750 inventory by Governor Belcher listed one mill, one forge, and one steel furnace in the province,

but four other works were soon established. Another string of mines and manufactures opened the following decade and by 1784 there were eight furnaces and 79 forges and bloomeries. In 1802 there were seven furnaces and four mills. Around that time, Egg Harbor produced enough bog ore to export to New England (Swank, 1892).

In late 1646 or early 1647 the *Heeren XIX* wrote to Director Stuyvesant regarding ore samples that were not found to contain metal; they encouraged further exploration, especially of an iron mine on Staten Island (Fernow, 1881). Two decades later New Netherland Director Kieft was informed of lead, copper, and iron discoveries and a good sample of copper ore was shown to him (O’Callaghan, 1856b). However, in 1658 the WIC was asked to send iron to the colony.⁷⁰⁵ The following year the *Heeren XIX* wrote to Stuyvesant regarding a sample of copper believed to have come from Neversink and Stuyvesant replied that he knew nothing of this copper mine but would send men to look the following spring (Fernow, 1881). However, in 1669 a number of men wrote to the *Heeren XIX* complaining that no mines would be found or developed until there were more settlers (O’Callaghan, 1856b). They guessed there was not only iron, copper, lead, and coal, but also marcasite/pyrite, quicksilver, gold, silver, and tin (O’Callaghan, 1856b; O’Callaghan, 1858a).

The Staten Island mine referred to in 1646/7 was producing iron and tin ore in 1670, and was perhaps the well-known “Iron Hill” (in 1645 it was called “Toad Hill”) (Clute, 1877; Denton, 1670). Still, even in 1696, a report was made to the Board of Trade that only a small amount of brittle iron was being mined and made in New York (O’Callaghan, 1854a). Around that same time surveyor Cadwallader Colden reported a “great plenty” of iron ore and imagined that the province’s abundant wood, water power, and proximity to the Hudson River would allow for production and export (O’Callaghan, 1854b). He acknowledged that this had yet occurred because of the difficulty in convincing people to enter into an “adventure upon any new methods

⁷⁰⁵ Versteeg & Shattuck (2011, “New Netherland papers and letters. Extract arrived by the ship de Waech. Read at the meeting, March 26, 1658”).

which are always expensive in the beginning and uncertain in the profits they yield”

(O’Callaghan, 1854b, pg. 688).

A lack of capital and skilled labor indeed led to the demise of New York’s early mines and smelters, which “were dropt through the mismanagement or inability of the undertakers” (O’Callaghan, 1856c, pg. 335). Governor Cosby reported to the Lords of Trade in 1734 that he was aware of “Iron Mines both of the bogg, and of the Mountain Oar” but no irons works were then established in the province (O’Callaghan, 1855a, pg. 20). He also noted that there were some lead mines but they had not been profitable and went on to surmise that if they did bring in money the owner would likely ship ore to Britain rather than incur the expense of building smelters in the colony (O’Callaghan, 1855a). Four years later, New York Lieutenant-Governor Clarke also lamented that little had been achieved in the way of iron production because it was cost-prohibitive for “proprietors [of iron mines] to build furnaces and forges for pig and barr Iron” (O’Callaghan, 1855a, pg. 116). Both Cosby and Clarke noted that the province might lessen British dependency on Swedish sources if investments were made in iron works.

Governor Robert Hunter reported that a copper mine was “brought to perfection” and a ton was exported to Bristol in 1715, but the source was not known (O’Callaghan, 1854b, pg. 461). It is possible that the material was only ore, however, because in 1749 “copper ore” was listed along with furs and naval stores as a product of New York exported mainly to London (O’Callaghan, 1855a, pg. 511). In that year Governor Clinton reported to the Lords of Trade that lead ore was known to exist in the area but hadn’t yet been mined or processed (O’Callaghan, 1855a, pg. 511). The mine have been be on the western side of the Shawangunk Mountains in Sullivan County, which is one of the oldest in the nation but not operational until 1830 (Sims & Hotz, 1951).

As a result of the 1750 Iron Act permitting only export of pig or bar iron from the colonies to London, New York reported no mills, forges, or steel furnaces in that year. The act

did not prohibit continuation of pre-existing manufactures, however, and the inventory listed two iron furnaces and some bloomeries on Cortlandt Manor and a plating forge in Wawayanda (Orange County) that had been built around 1745—all were non-operational (O’Callaghan, 1855a). Near the Wawayanda forge in 1750 a vein of ore was discovered on Sterling Mountain and the following year a furnace was built close by; in 1765, at an unknown location, a forge and hammer were built to form the Sterling pig iron into bars. Additional furnaces were erected in the area between 1777 and 1806. Another iron mine and furnace were established in Orange County in the 1750s, but at least the furnace was abandoned in 1777 (Swank, 1892).

Swank (1892) described Orange County as the “chief seat” of iron production in New York during the eighteenth century, but Dutchess County was also a significant source. Lieutenant-Governor James de Lancey reported to the Lords of Trade in 1757 that the only iron works in the province were owned by Robert Livingston on his manor at Ancram, which was likely operational the previous decade (O’Callaghan, 1855; O’Callaghan, 1856c; Swank, 1892). Livingston’s forge, later called the Copake Iron Works, was the sole provider of pig iron for the West Point Foundry by 1823 (Keating, 1823). These works not only processed local ore but accepted it from elsewhere, primarily Litchfield County, Connecticut. In 1750 an iron works opened in Millerton, ten miles south of Ancram; within a decade mine was open in Amenia, a further ten miles away, and steel and cast iron were produced there during the Revolution (Swank, 1892).

In 1774 Governor Tryon reported to the Crown that there were only three operational mines in New York: iron mines at Livingston manor and Orange County and a silver and lead mine in Philipsburgh Manor in Westchester County (likely the mineral galena) (O’Callaghan, 1857). A few bloomeries may have been present on the Livingston Manor and in Rockland County during the Revolution (Swank, 1892). Production increased after the repeal of the Iron Act in 1767 (O’Callaghan, 1857), and New York’s major nineteenth-century iron producer

became the Champlain Valley (Swank, 1892). The first attempt at smelting was attempted there around 1770 but was interrupted by the Revolution (O’Callaghan, 1857). Near Kinderhook a “bed of iron ore” was mined in 1800 from “the midst of a low marshy piece of soil” about two miles on the way to Claverack—this limonite was made into cast and forged iron, as well as steel (Warden, 1802). Smelting may have occurred at a bloomery forge on the Valatie Kill that also processed limonite from Kinderhook Lake (Stott, 2007). The Ancram Lead Mines, or “Hot Ground,” was active in the 1820s (Barnes, 1822; Torrey, 1822). By 1837 there were seven iron furnaces between 50 and 60 miles southeast of Kinderhook that produced over 10,000 tons of iron per year, all taken to the Hudson River for shipment (Marcy, 1823). In the 1850s Thomas Smith of Nassau, Rensselaer County, built a coal-powered boiler/blast furnace for casting iron on his farm (*Diary of Thomas H. Smith 1840-1858*).

Sometime after 1650 a furnace and forge were established in New Haven but the western Connecticut hills were the most productive area for iron extraction and processing. A bloomery forge was built in Litchfield County in 1734, a furnace there was active until 1890, and a second works in the county was operational from 1806 to 1856. At least 30 works were ultimately built in western Connecticut near others in eastern New York like those at Ancram, Millerton, and Amenia. Some earlier attempts were made to bloom iron sand in southern Connecticut and in the mid-eighteenth century at least one steel mill was established (Swank, 1892).

Eastern Massachusetts was the primary iron producer in New England prior to 1800. Iron ore was known from Massachusetts by 1629 and a sample was taken to London (Swank 1892). The first foundry was built on the Saugus River and ultimately consisted of a blast furnace and refinery forge. The following year it was reported that that New England was far ahead of New Netherland in terms of mineral extraction and processing, e.g., “they cast iron pots, cannon, shot and similar articles from the mineral they have there” (O’Callaghan, 1856b, pg. 280). “A good store of iron” was reportedly produced in Massachusetts in 1665 by a number of works

established in various towns after 1660, some profitable and some short-lived (O’Callaghan, 1853, pg. 113). The Saugus River foundry was productive until 1671, after which time it slowed until abandonment in 1688 (Swank, 1892). A forge owned by the same proprietors was established on the Monontocot River in the mid-1640s and abandoned in 1653, owing to a lack of ore (Swank, 1892). In 1721 there were still operational iron works in Massachusetts but they only produced small amounts for “common use” (O’Callaghan, 1854b, pg. 598). The longest-running and most successful works appears to be that in Taunton, founded in 1652 and closed in 1865. A 1731 inventory of Massachusetts works reported several forges for producing bar iron, some furnaces for cast iron, a single slitting mill, and one nail forge. At the same time, the entire of New England reported six furnaces and 19 forges and bloomeries. Iron mining and production in western Massachusetts did not take place until after 1750 and the first steel was made around 1775. In 1826 there were at least ten blast furnaces in eastern Massachusetts (Swank, 1892).

New Hampshire, Vermont, and Maine did not produce iron until after 1700 (O’Callaghan, 1854b; Swank, 1892). In New Hampshire, ore was known from 1634—and samples sent to England—but no iron works existed until about 1750 when a few bloomeries were built on the Lamper Eel River (Swank, 1892). Others were built during the Revolution and only three others are known before 1800; the state does not seem to have invested in iron works again after its last furnace was abandoned in 1865. Ore was mined and iron produced in Vermont along the southwestern border—in 1794 there were 14 forges, three furnaces, a slitting mill in Rutland County, and seven forges in other counties. In Maine the story was similar, with only a few bloomeries in York County during the Revolution and afterward and few furnaces. Only two furnaces were operational beyond 1838. Conversely, Rhode Island had a few works as early as 1636 and by 1800 iron manufactures formed the “largest branch of productive industry” in that state (Swank, 1892, pg. 128).

Copper, lead, and iron mines were known in Canada by 1665 and purposeful exploration of those ores (including iron sands in Québec and coal in Cape Breton) was encouraged by the French government in the late-seventeenth century (O'Callaghan, 1855b). Ore was being mined at Trois Rivières in 1672 but as late as the French and Indian War mines were generally non-operational in Canada because the high cost of labor made them unprofitable (O'Callaghan, 1858b; Swank, 1892). During the war an attempt to make cannon failed and experts had to be sent from France to manufacture ammunition and weapons, presumably from imported iron (O'Callaghan, 1855b; O'Callaghan, 1858b). A furnace was erected in Trois Rivières in 1737 and by 1749 the Crown owned one iron mine, one furnace, and five forges in that town. They were operational until ore and fuel were exhausted in 1883 (Swank, 1892).

The first coal recovered in North America was from Cape Breton where it was sold as early as 1687 (Evenson, 1942; O'Callaghan, 1855b). In 1689, coal was on a list of prices for resources Canada hoped to be able to export to France (O'Callaghan, 1855b). The coal was easily accessible in the sea-cliffs, and apparently only required a crow-bar for extraction; it is probable that New England fishermen would return to their home ports with Cape Breton coal at the end of each season (Evenson, 1942). Even in 1850 New England was a chief recipient of Cape Breton coal, along with Britain, leaving only half of the mined material for domestic consumption in Nova Scotia (Chandler, 1972).

Another source of coal was located along the James River near Richmond, Virginia, which was known before 1701 when it was described to the Colonial Council (Evenson, 1942). Unlike the Cape Breton field, this source only provided local smiths with fuel for small forges and was not widely circulated owing to low population and poor transportation. After 1758, however, shipments were made downriver and a few other mines were opened in the district. Virginia coal was important in armament fabrication during the Revolutionary War, though the total amount consumed by forges was small. At least one shipment was made to southeastern

Pennsylvania, where the iron industry was firmly established. In 1795 a canal was built to allow coal barges to circumnavigate the James River falls (Eavenson, 1942).

Coal was also discovered along the Potomac River in 1736 but the remoteness of the area precluded extraction until the 1780s when a canal was built (still, no record of coal transported on that canal exists prior to 1826) (Eavenson, 1942). It was, however, used in a Hagerstown, Maryland nail factory in 1789 and in the Harper's Ferry, Virginia armory in 1802. Collieries were reported in the state in 1817. Coal was also found near Frostburg, Maryland in 1804 and exported to Washington, D.C. in the 1820s; the opening of the Chesapeake and Ohio Canal in that year further opened the market, as did the opening of the Baltimore and Ohio Railroad in 1842 (Eavenson, 1942).

Anthracite coal from Pennsylvania's Wyoming Valley was known from 1762 and blacksmiths in Wilkes-Barre were the first to use it successfully, though even in 1807 a visitor to the area remarked that it wasn't widely used owing to the abundance of wood (Eavenson, 1942; Weld, 1807). Coal from Wilkes-Barre was used to make cannon, shot, and gun carriages in Carlisle during the Revolution (Eavenson, 1942). Alexander Hamilton observed in 1790 that coal was indeed "an important instrument of manufactures... [and] it would be of great consequence to the iron branch" (Eavenson, 1942, pg. 41). Four years later the Assistant Secretary of the US Treasury likewise noted that "the increase of manufactures has occasioned us to turn our attention to coal" (Eavenson, 1942, pg. 42). Other mines along the Schuylkill River and near Lehigh opened before 1800 but despite its utility to blacksmiths and in some air-blasted furnaces and forges, anthracite was not popular as domestic fuel into the early nineteenth century because it was difficult to burn (Swank, 1892). Its adoption at Wilkes-Barre was also slow even in the 1790s because wood was still plentiful (Weld, 1807). A 1740 advertisement announced coal was cheaper "for Hearth Fireing" than wood at that time but Hamilton's 1790 report was ambiguous regarding anthracite's promise in home-heating (Eavenson, 1942, pg. 139). In one Pennsylvania

market between 1807 and 1820, public demonstrations of success with grates were necessary before it was accepted. In another area, a blacksmith performing such a demonstration in 1808 was credited for introducing anthracite to the home—within a decade, new ovens and stoves were introduced for burning anthracite and its use spread (Eavenson, 1942).

A canal along the Schuylkill River was built in 1822 to facilitate export of anthracite, and in 1829 shipments began to the Hudson River via the Delaware and Hudson Canal; another was built along the Susquehanna in 1831 (Eavenson, 1942). Still, in 1825 a Pennsylvanian lamented that “the use of bituminous and anthracite coal in our furnaces is absolutely and entirely unknown” (Eavenson, 1942; Swank, 1892, pg. 365). Anthracite had been used in boilers for some time, but it wasn’t until 1815 and the mid-1820s that records were first made of its use in Maryland and Pennsylvania—both in combination with charcoal (Swank, 1892). Purely anthracite-fired furnaces failed in Pennsylvania in 1826 and Massachusetts in 1827 and successful operations began a decade later in Pennsylvania when six coal-fired furnaces were operational. New Jersey followed with one of its own. An 1832 report revealed that almost all of New York’s furnaces and foundries ran on anthracite (Chandler, 1972), and by 1856 over 120 coal-fired furnaces were operational in the nation—including 14 in New York, which was second only to Pennsylvania (Swank, 1892). As late as the 1830s, only Pittsburgh was using coal to power steam engines to any significant degree but within a decade factories throughout the Northeast were using coal-fired steam engines to forge iron goods smelted in coal-fired furnaces (Chandler, 1972).

Bituminous coal was known from western Pennsylvania and into Kentucky in the 1780s and some was floated down the Monongahela and Ohio rivers as early as 1789 and 1793 (Eavenson, 1942). Being easier to burn than anthracite, Pittsburghers burned bituminous in lieu of wood, so much so that even in 1800 a visitor remarked on the “cloud of smoke” hanging over the city (Eavenson, 1942, pg. 165). This pollution was solely from domestic and small-scale

industry (glass-making, salt-evaporating, smithing, etc.) because bituminous coal was not incorporated into iron-making until a successful coking process was introduced after 1835 (Swank, 1892). Most efforts to implement the process were unsuccessful, however, until 1837 or 1839 in Lonaconing, Maryland (Eavenson, 1942; Swank, 1892). Pittsburgh's bituminous coal fields opened with the construction of a railroad over the Allegheny Mountains in 1853, hastening the adoption of this fuel and adoption of coke as fuel increased soon thereafter (Chandler, 1972; Swank, 1892). In 1856, for example, 21 Pennsylvania and three Maryland furnaces were using it.

Coal mining in most other locations, New York included, was almost non-existent. However, the fuel does seem to have been used at an early date because in 1658 New Netherland requested coal from the *Heeren XIX*.⁷⁰⁶ In the 1720s coal was thought to exist near Cow's Neck, Long Island but no further investigation took place until the increasing cost of firewood around New York City prompted more in-depth searches for coal (Akerly, 1810; O'Callaghan, 1854b). One search, conducted in 1810 in Cow's Neck, turned up nothing but carbonized wood that "exhibit[ed] a deceptive appearance of coal" (Akerly, 1810, pg. 86). Some low-quality and difficult-to-access anthracite coal was known from Rhode Island and Massachusetts in the mid-eighteenth century but only a few abbreviated attempts were made to mine it until after 1860 (Eavenson, 1942). Eavenson (1942) agreed with Swank (1892) that only charcoal was used in New England iron works until after the Revolution. During the eighteenth century coal was imported to the colonies in British ships primarily as ballast, though British ships brought larger quantities to supply its troops during the Revolution like those headquartered in New York City (Eavenson, 1942).

The addition of coal to iron manufacturing did not completely replace charcoal but allowed for a general increase in production, partly due to the re-emergence of the iron industry in areas that had run out of wood to make charcoal and an increase in demand resulting from a

706 Versteeg & Shattuck (2011, "New Netherland papers and letters. Extract arrived by the ship de Waech. Read at the meeting, March 26, 1658").

drop in price. Coal was transported on canals for less than half a century after the first canal opened in 1820; steam-powered railroads quickly replaced water at that point, which used and transported coal even further afield.

Although metal ores were known throughout the Northeast in the seventeenth century, little effort was expended in developing those resources until the 1720s. The earliest iron mining and production near the Kinderhook case-study site occurred after 1740 in the border region of Vermont, Massachusetts, Connecticut, and New York, where mining, smelting, and casting took place until the turn of the century. In the 1750s the industry also became established in Orange County, and after 1800 the Champlain district developed. The earliest increase in Pb sequestered in the Vly's peat could be dated to ca. 1750 although it is likely closer to 1800.

Coal use was a local affair, limited mainly to Virginia and Pennsylvania blacksmiths, until new technology allowed its use for home heating by 1810. Iron works, however, continued to be fueled almost exclusively with charcoal until the 1830s when transportation and technology allowed anthracite and bituminous coal to become more widely available and affordable in the wider Northeast and mid-Atlantic regions. Further improvements in transportation allowed rapid adoption of this new fuel, which had nearly replaced charcoal in the iron industry by 1840. After 1850, coal provided most of the fuel in factories and transportation systems that used steam power (e.g., textile mills, locomotives, boats). The earliest increase in mercury sequestered in the Vly's peat could be dated to 1850, with a second peak in the mid-twentieth century arising from the Ravena cement plant.

Appendix B

List of Plant Species Possibly Found in the Vly

Family	Species	Common Name	Wetland Indicator Status	Native?*	Source
Aceraceae	<i>Acer pensylvanicum</i>	striped maple	FACU	Y	2
Aceraceae	<i>Acer rubrum</i>	Red maple	FAC	Y	1, 2, 3, 4, 5, 6
Aceraceae	<i>Acer saccharinum</i>	silver maple	FACW	Y	2
Alismataceae	<i>Alisma plantago-aquatica</i>	European water plantain	(OBL)	Y	1
Alismataceae	<i>Alisma subcordatum</i>	American water plantain	OBL	Y	2
Alismataceae	<i>Sagittaria cuneata</i>	Arum leaf arrowhead	OBL	Y	2
Alismataceae	<i>Sagittaria latifolia</i>	Broad-leaved arrowhead	OBL	Y	1, 3, 4, 5, 6
Anacardiaceae	<i>Rhus typhina</i>	Staghorn sumac	NI	Y	1, 2
Anacardiaceae	<i>Toxicodendron radicans</i>	Common poison-ivy	FAC	Y	1, 2
Anacardiaceae	<i>Toxicodendron vernix</i>	Poison sumach	OBL	Y	1, 2
Apiaceae	<i>Angelica atropurpurea</i>	Purplestem Angelica	OBL	Y	1, 2
Apiaceae	<i>Cicuta bulbifera</i>	Bulbiliferous water-hemlock	OBL	Y	1, 2, 3, 4, 5, 6
Apiaceae	<i>Cicuta maculata</i>	spotted water hemlock	OBL	Y	1, 2, 3, 4, 5
Apiaceae	<i>Conioselinum chinense</i>	eastern hemlock parsley	FACW	Y	2
Apiaceae	<i>Cryptotaenia canadensis</i>	honewort	FAC	Y	2
Apiaceae	<i>Daucus carota</i>	Wild carrot, Queen Ann's Lace	NI	N	1, 2
Apiaceae	<i>Heracleum maximum</i>	common cow parsnip	FACW	Y	2
Apiaceae	<i>Hydrocotyle americana</i>	Marsh pennywort	OBL	Y	1, 2, 6
Apiaceae	<i>Osmorhiza claytonii</i>	Clayton's sweet root, sweet cicely	FACU	Y	2
Apiaceae	<i>Osmorhiza longistylis</i>	sweet cicely, longstyle sweet root	FACU	Y	2
Apiaceae	<i>Pastinaca sativa</i>	Wild parsnip	NI	N	1, 2

Apiaceae	<i>Sanicula canadensis</i>	Canadian black snakeroot	FACU	Y	2
Apiaceae	<i>Sanicula marilandica</i>	Maryland sanicle	FACU	Y	2, 3
Apiaceae	<i>Sanicula odorata</i>	clustered black snakeroot	FAC	Y	2
Apiaceae	<i>Sium suave</i>	hemlock water parsnip	OBL	Y	2
Apiaceae	<i>Zizia aurea</i>	Golden Alexanders	FAC	Y	1, 2
Apocynaceae	<i>Apocynum cannabinum</i>	Indian hemp	FAC	Y	1, 2
Aquifoliaceae	<i>Ilex mucronata</i>	mountain holly, catberry	OBL	Y	2
Aquifoliaceae	<i>Ilex verticillata</i>	Winterberry, black alder	FACW	Y	1, 2, 6, 7
Araceae	<i>Acorus calamus</i>	Sweet flag, calamus	OBL	Y	1, 2, 3
Araceae	<i>Arisaema dracontium</i>	green dragon	FACW	Y	2
Araceae	<i>Arisaema triphyllum</i>	jack in the pulpit	FAC	Y	2, 3, 6
Araceae	<i>Calla palustris</i>	water arum, wild calla	OBL	Y	2, 3
Araceae	<i>Peltandra virginica</i>	Green water arum, green arrow arum	OBL	Y	1, 2
Araceae	<i>Symplocarpus foetidus</i>	Skunk cabbage	OBL	Y	1, 2, 3, 6, 7
Araliaceae	<i>Aralia racemosa</i>	American spikenard	FACU	Y	2, 3, 4, 5
Araliaceae	<i>Panax quinquefolius</i>	ginseng	NI	Y	2
Araliaceae	<i>Panax trifolius</i>	dwarf ginseng	NI	Y	2
Aristolochiaceae	<i>Asarum canadense</i>	wild ginger	UPL	Y	2
Asclepidiaceae	<i>Asclepias incarnata</i>	Swamp-milkweed	OBL	Y	1, 2, 7
Asclepidiaceae	<i>Asclepias syriaca</i>	Common milkweed	UPL	Y	1, 2
Asteraceae	<i>Achillea millefolium</i>	Common yarrow	FACU	N	1, 2
Asteraceae	<i>Ageratina altissima</i>	white snakeroot	FACU	Y	2
Asteraceae	<i>Ambrosia artemisiifolia</i>	Common ragweed	FACU	Y	1, 2
Asteraceae	<i>Ambrosia trifida</i>	great ragweed	FAC	Y	2
Asteraceae	<i>Anthemis cotula</i>	Dog fennel, Mayweed, fetid or stinky chamomile	FACU	N	1, 2
Asteraceae	<i>Arctium lappa</i>	great burdock	NI	N	2

Asteraceae	<i>Arctium minus</i>	Common burdock, lesser burdock	FACU	N	1, 2
Asteraceae	<i>Bidens beckii</i>	Beck's water marigold	OBL	Y	2
Asteraceae	<i>Bidens cernua</i>	Bur-marigold, nodding beggartick	OBL	Y	1, 2, 6
Asteraceae	<i>Bidens connata</i>	purplestem beggartick	(FACW+)	Y	2, 6
Asteraceae	<i>Bidens frondosa</i>	Spanish needles, pitchforks, Devil's beggartick	FACW	Y	1, 2
Asteraceae	<i>Bidens tripartita</i>	Strawstem beggar-tick, three-lobed beggartick	FACW	Y	1, 2
Asteraceae	<i>Centaurea jacea</i>	Brown knapweed, brownray knapweed	NI	N	1, 2
Asteraceae	<i>Centaurea stoebe</i> ssp. <i>micranthos</i>	Spotted knapweed	NI	N	1, 2
Asteraceae	<i>Cichorium intybus</i>	Chicory	FACU	N	1, 2
Asteraceae	<i>Cirsium arvense</i>	Canada thistle	FACU	N	1, 2
Asteraceae	<i>Cirsium discolor</i>	field thistle	NI	Y	2
Asteraceae	<i>Cirsium muticum</i>	swamp thistle	OBL	Y	2
Asteraceae	<i>Cirsium vulgare</i>	Bull-thistle	FACU	N	1, 2
Asteraceae	<i>Doellingeria umbellata</i>	parasol whitetop	FACW	Y	2, 7
Asteraceae	<i>Erigeron philadelphicus</i>	Philadelphia fleabane	FAC	Y	1, 2
Asteraceae	<i>Erigeron pulchellus</i>	robin's plantain	FACU	Y	1, 2
Asteraceae	<i>Eupatoriadelphus fistulosus</i>	Trumpet weed	(FACW)	Y	2
Asteraceae	<i>Eupatoriadelphus maculatus</i> var. <i>maculatus</i>	Spotted Joe Pye-weed	(FACW)	Y	1, 2, 7
Asteraceae	<i>Eupatorium perfoliatum</i>	Boneset	FACW	Y	1, 2, 3, 4, 5, 6, 7
Asteraceae	<i>Eupatorium purpureum</i>	sweet-scented Joe Pye-weed	(FAC)	Y	2
Asteraceae	<i>Euthamia graminifolia</i>	Common flat-topped goldenrod	FAC	Y	1, 2, 6
Asteraceae	<i>Gnaphalium uliginosum</i>	Low cudweed, marsh cudweed	FAC	N	1, 2

Asteraceae	<i>Helenium flexuosum</i>	Purple sneezeweed	FAC	N	1
Asteraceae	<i>Helianthus decapetalus</i>	thinleaf sunflower	FACU	Y	2
Asteraceae	<i>Helianthus grosseserratus</i>	sawtooth sunflower	FACW	N	2
Asteraceae	<i>Heliopsis helianthoides</i>	false sunflower, smooth oxeye	FACU	Y	2
Asteraceae	<i>Hieracium caespitosum</i>	Yellow king-devil	NI	Y	1, 2
Asteraceae	<i>Lactuca biennis</i>	blue lettuce	FAC	Y	2
Asteraceae	<i>Lactuca canadensis</i>	wild lettuce	FACU	Y	2
Asteraceae	<i>Lactuca serriola</i>	Prickly lettuce	FACU	N	1
Asteraceae	<i>Leucanthemum vulgare</i>	Ox-eye daisy	NI	N	1, 2
Asteraceae	<i>Mikania scandens</i>	climbing boneset, climbing hemp vine	OBL	Y	2
Asteraceae	<i>Packera aurea</i>	Golden ragwort	FACW	Y	1, 2, 7
Asteraceae	<i>Prenanthes alba</i>	lion's foot, white rattlesnake root	FACU	Y	2
Asteraceae	<i>Prenanthes altissima</i>	tall rattlesnake root	FACU	Y	2
Asteraceae	<i>Prenanthes trifoliolata</i>	gall of the earth	NI	Y	2
Asteraceae	<i>Rudbeckia hirta</i>	Black-eyed Susan	FACU	<i>R. hirta</i> var. <i>pulcherrima</i>	1, 2
Asteraceae	<i>Rudbeckia laciniata</i>	Green-headed coneflower, Cut-leaf coneflower	FACW	Y	1, 2
Asteraceae	<i>Rudbeckia triloba</i>	coneflower, brown eyed Susan	FACU	N	2
Asteraceae	<i>Solidago altissima</i>	Tall goldenrod	FACU	Y	1, 3, 6
Asteraceae	<i>Solidago caesia</i>	blue-stemmed goldenrod, wreath goldenrod	FACU	Y	2
Asteraceae	<i>Solidago canadensis</i>	Canada goldenrod	FACU	Y	1, 2, 4, 7
Asteraceae	<i>Solidago flexicaulis</i>	zigzag goldenrod	FACU	Y	3, 2, 4, 5
Asteraceae	<i>Solidago gigantea</i>	giant goldenrod	FACW	Y	1, 2, 7
Asteraceae	<i>Solidago patula</i>	rough-leaved goldenrod, round leaf goldenrod	OBL	Y	2, 6

Asteraceae	<i>Solidago rugosa</i>	Wrinkle-leaved goldenrod	FAC	Y	1, 2, 6, 7
Asteraceae	<i>Solidago uliginosa</i>	bog goldenrod	OBL	Y	2
Asteraceae	<i>Sonchus arvensis</i>	field sow thistle	FACU	N	2
Asteraceae	<i>Symphyotrichum cordifolium</i>	blue wood aster	NI	Y	2
Asteraceae	<i>Symphyotrichum lanceolatum</i> sspg. <i>lanceolatum</i> var. <i>lanceolatum</i>	Eastern lined aster, white panicle aster	FACW	Y	1, 2, 7
Asteraceae	<i>Symphyotrichum laterifolium</i>	calico aster	FAC	Y	2
Asteraceae	<i>Symphyotrichum novae-angliae</i>	New-England aster	FACW	Y	1, 2
Asteraceae	<i>Symphyotrichum patens</i> var. <i>patens</i>	late purple aster		Y	6
Asteraceae	<i>Symphyotrichum pilosum</i> var. <i>pilosum</i>	Awl aster, hairy white old field aster	FACU	Y	1, 2
Asteraceae	<i>Symphyotrichum prenanthoides</i>	Crooked stem aster	FAC	Y	2
Asteraceae	<i>Symphyotrichum puniceum</i> var. <i>puniceum</i>	Purple-stemmed aster	OBL	Y	1, 2, 7
Asteraceae	<i>Tanacetum vulgare</i>	common tansy	FACU	N	2
Asteraceae	<i>Taraxacum officinale</i>	Dandelion	FACU	N	1, 2
Asteraceae	<i>Tussilago farfara</i>	coltsfoot	FACU	N	2
Asteraceae	<i>Vernonia noveboracensis</i>	New York ironweed	FACW	Y	2
Asteraceae	<i>Xanthium strumarium</i> var. <i>glabratum</i>	rough cocklebur	FAC	N	1, 2
Balsaminaceae	<i>Impatiens capensis</i>	Spotted jewelweed	FACW	Y	1, 2, 3, 4, 5, 6, 7
Balsaminaceae	<i>Impatiens pallida</i>	pale touch-me-not	FACW	Y	2, 3, 4, 5
Berberidaceae	<i>Caulophyllum thalictroides</i>	blue cohosh	NI	Y	2
Berberidaceae	<i>Lindera benzoin</i>	spice-bush	FACW	Y	2, 6
Berberidaceae	<i>Podophyllum peltatum</i>	mayapple, mandrake	FACU	Y	2, 3, 4
Betulaceae	<i>Alnus incana</i> sspg. <i>rugosa</i>	speckled alder	FACW	Y	2, 3, 6
Betulaceae	<i>Alnus incana</i> sspg. <i>serrulata</i>	hazel alder	OBL	Y	2, 4, 5
Betulaceae	<i>Betula alleghaniensis</i>	yellow birch	FAC	Y	2

Betulaceae	<i>Betula populifolia</i>	gray birch	FAC	Y	2
Betulaceae	<i>Betula pumila</i>	swamp birch, bog birch	OBL	Y	2, 7
Betulaceae	<i>Carpinus caroliniana</i>	hornbeam, ironwood	FAC	Y	2, 6
Betulaceae	<i>Corylus americana</i>	American hazlenut	FACU	Y	3, 4
Boraginaceae	<i>Myosotis laxa</i>	bay forget-me- not	OBL	Y	2
Boraginaceae	<i>Myosotis scorpioides</i>	True forget-me- not	OBL	N	1, 2
Brassicaceae	<i>Barbarea vulgaris</i>	Winter cress, garden yellow rocket	FAC	N	1, 2
Brassicaceae	<i>Capsella bursa-pastoris</i>	Shepherd's purse	FACU	N	1, 2
Brassicaceae	<i>Cardamine bulbosa</i>	bulbous bittercress	OBL	Y	2
Brassicaceae	<i>Cardamine diphylla</i>	crinkleroot	FACU	Y	2, 3, 4
Brassicaceae	<i>Cardamine pennsylvanica</i>	Pennsylvania bittercress	FACW	Y	2
Brassicaceae	<i>Nasturtium officinale</i>	Watercress	OBL	N	1, 2
Brassicaceae	<i>Rorippa palustris</i> var. <i>fernaldiana</i>	Fernald's yellow water-cress	OBL	Y	1, 2
Brassicaceae	<i>Sisymbrium officinale</i>	Hedge mustard	NI	N	1, 2
Callitrichaceae	<i>Callitriche heterophylla</i>	Water starwort, two-headed starwort	OBL	Y	1, 2
Callitrichaceae	<i>Callitriche palustris</i>	Water starwort	OBL	Y	1, 2
Campanulaceae	<i>Campanula aparinoides</i>	Marsh- bellflower	OBL	Y	1, 2, 7
Campanulaceae	<i>Lobelia cardinalis</i>	Cardinal flower	OBL	Y	1, 2
Campanulaceae	<i>Lobelia inflata</i>	Indian tobacco	FACU	Y	1, 2
Campanulaceae	<i>Lobelia kalmii</i>	Ontario lobelia	OBL	Y	2, 3, 4, 5
Campanulaceae	<i>Lobelia siphilitica</i>	Great lobelia, great blue lobelia	FACW	Y	1, 2
Campanulaceae	<i>Lobelia spicata</i>	palespike lobelia	FAC	Y	2
Capparidaceae	<i>Polanisia dodecandra</i>	clammyweed	UPL	N	2
Caprifoliaceae	<i>Lonicera morrowii</i>	Morrow's honeysuckle	FACU	N	6
Caprifoliaceae	<i>Lonicera</i> sp.	Honeysuckle	n/a	Y	1, 2
Caprifoliaceae	<i>Sambucus nigra</i> ssp. <i>canadensis</i>	Common elderberry	FACW	Y	1, 2, 6

Caprifoliaceae	<i>Triosteum perfoliatum</i>	horse gentian, feverwort	NI	Y	2
Caprifoliaceae	<i>Viburnum lentago</i>	nannyberry	FAC	Y	2
Caprifoliaceae	<i>Viburnum nudum</i> var. <i>cassinoides</i>	wild raisin, witherod	FACU	Y	2, 7
Caprifoliaceae	<i>Viburnum opulus</i>	highbush cranberry	FACW	Y	2, y
Caprifoliaceae	<i>Viburnum recognitum</i>	Arrow-wood, southern arrow-wood	FAC	Y	1, 2, 6
Caryophyllaceae	<i>Cerastium fontanum</i> sspg. <i>vulgare</i>	Mouse-ear chickweed, big chickweed	FACU	N	1, 2
Caryophyllaceae	<i>Dianthus armeria</i>	Debtford pink	NI	N	1, 2
Caryophyllaceae	<i>Moehringia lateriflora</i>	bluntleaf sandwort	FACU	Y	2
Caryophyllaceae	<i>Myosoton aquaticum</i>	Giant chickweed	FAC	N	1
Caryophyllaceae	<i>Saponaria officinalis</i>	Soapwort, bouncing bet	FACU	N	1, 2
Caryophyllaceae	<i>Stellaria borealis</i> sspg. <i>borealis</i>	northern starwort, boreal starwort	FACW	Y	2
Caryophyllaceae	<i>Stellaria graminea</i>	Common stitchwort, grass-like starwort	UPL	N	1, 2
Caryophyllaceae	<i>Stellaria longifolia</i>	longleaf starwort	FACW	Y	2
Celastraceae	<i>Celastrus orbiculatus</i>	Oriental bittersweet	UPL	N	1, 6
Ceratophyllaceae	<i>Ceratophyllum echinatum</i>	Spineless hornwort	OBL	Y	1, 2
Chenopodiaceae	<i>Chenopodium album</i>	Common lamb's quarters	FACU	N	1, 2
Chenopodiaceae	<i>Chenopodium ambrosioides</i>	Mexican tea	(FACU)	Y	2
Clusiaceae	<i>Hypericum ascyron</i>	great St. John's-wort	FAC	Y	2
Clusiaceae	<i>Hypericum boreale</i>	northern St. John's-wort	OBL	Y	2
Clusiaceae	<i>Hypericum ellipticum</i>	pale St. Johnswort	OBL	Y	2
Clusiaceae	<i>Hypericum majus</i>	large St. John's-wort	FACW	Y	2
Clusiaceae	<i>Hypericum mutilum</i>	Dwarf St. John's-wort	FACW	Y	1, 2
Clusiaceae	<i>Hypericum perforatum</i>	St. John's-wort	UPL	N	1, 2
Clusiaceae	<i>Hypericum punctatum</i>	spotted St. John's-wort	FAC	Y	1, 2

Clusiaceae	<i>Triadenum fraseri</i>	Fraser's marsh St. John's-wort	OBL	Y	1, 2
Clusiaceae	<i>Triadenum virginicum</i>	Virginia marsh St. John's-wort	OBL	Y	2
Convolvulaceae	<i>Calystegia sepium</i>	Hedge bindweed, hedge false bindweed	FAC	N	1
Convolvulaceae	<i>Convolvulus arvensis</i>	Field bindweed	NI	N	1, 2
Cornaceae	<i>Cornus amomum</i>	silky dogwood	FACW	Y	1, 2, 7
Cornaceae	<i>Cornus canadensis</i>	dwarf dogwood, bunchberry dogwood	FAC	Y	1, 2
Cornaceae	<i>Cornus racemosa</i>	gray dogwood	FAC	Y	6
Cornaceae	<i>Cornus sericea</i>	red osier dogwood	(FACW)	Y	1, 2, 3, 4, 7
Cucurbitaceae	<i>Echinocystis lobata</i>	wild cucumber	FACW	Y	2
Cucurbitaceae	<i>Sicyos angulatus</i>	oneseed bur cucumber	FACW	Y	2
Cupressaceae	<i>Juniperus</i> sp.	low/bush juniper, red cedar	n/a	<i>J. communis</i>	1, 2
Cuscutaceae	<i>Cuscuta gronovii</i>	Common dodder, scaldweed	NI	Y	1, 2, 6
Cyperaceae	<i>Carex amphibola</i>	eastern narrowleaf sedge	FAC	Y	2
Cyperaceae	<i>Carex aquatilis</i> var. <i>substricta</i>	water sedge	OBL	Y	2
Cyperaceae	<i>Carex atherodes</i>	wheat sedge	OBL	Y	2
Cyperaceae	<i>Carex aurea</i>	golden sedge	FACW	Y	2
Cyperaceae	<i>Carex bebbii</i>	Bebb's sedge	OBL	Y	1, 6
Cyperaceae	<i>Carex bromoides</i>	brome-like sedge	FACW	Y	1, 2
Cyperaceae	<i>Carex bushii</i>	Bush's sedge	FAC	Y	1, 2
Cyperaceae	<i>Carex comosa</i>	longhair sedge	OBL	Y	1, 2, 6
Cyperaceae	<i>Carex conoidea</i>	openfield sedge	FACW	Y	1, 2
Cyperaceae	<i>Carex crinita</i>	Fringed sedge	OBL	Y	1, 2
Cyperaceae	<i>Carex cristatella</i>	crested sedge	FACW	Y	2
Cyperaceae	<i>Carex cryptolepis</i>	northeastern sedge	OBL	Y	2
Cyperaceae	<i>Carex davisii</i>	Davis' sedge	FAC	Y	2
Cyperaceae	<i>Carex deweyana</i>	Dewey sedge	FACU	Y	2
Cyperaceae	<i>Carex diandra</i>	lesser panicled sedge	OBL	Y	2
Cyperaceae	<i>Carex disperma</i>	softleaf sedge	OBL	Y	2
Cyperaceae	<i>Carex flava</i>	yellow sedge	OBL	Y	1, 2, 7
Cyperaceae	<i>Carex formosa</i>	handsome sedge	FAC	Y	2

Cyperaceae	<i>Carex gracilescens</i>	slender loose flower sedge	UPL	Y	2
Cyperaceae	<i>Carex gracillima</i>	graceful sedge	FACU	Y	1, 2
Cyperaceae	<i>Carex granularis</i>	limestone meadow sedge	FACW	Y	1, 2
Cyperaceae	<i>Carex grayi</i>	Gray's sedge	FACW	Y	2
Cyperaceae	<i>Carex gynandra</i>	nodding sedge	OBL	Y	2
Cyperaceae	<i>Carex hirtifolia</i>	pubescent sedge	NI	Y	2
Cyperaceae	<i>Carex hystericina</i>	bottlebrush sedge	OBL	Y	2
Cyperaceae	<i>Carex interior</i>	inland sedge	OBL	Y	2
Cyperaceae	<i>Carex intumescens</i>	greater bladder sedge	FACW	Y	2
Cyperaceae	<i>Carex lacustris</i>	hairy sedge	OBL	Y	1, 2, 7
Cyperaceae	<i>Carex laevivaginata</i>	Smooth sheath sedge	OBL	Y	2
Cyperaceae	<i>Carex lasiocarpa</i>	Woolly fruit sedge	OBL	Y	2
Cyperaceae	<i>Carex leptalea</i>	Bristly stalked sedge	OBL	Y	7
Cyperaceae	<i>Carex lupulina</i>	Hop sedge	OBL	Y	1, 2
Cyperaceae	<i>Carex lurida</i>	Shallow sedge	OBL	Y	1, 2
Cyperaceae	<i>Carex molesta</i>	troublesome sedge	FAC	Y	2
Cyperaceae	<i>Carex normalis</i>	greater straw sedge	FACW	Y	1, 2
Cyperaceae	<i>Carex pallescens</i>	pale sedge	FAC	Y	1, 2
Cyperaceae	<i>Carex pellita</i>	woolly sedge	OBL	Y	1, 2
Cyperaceae	<i>Carex prasina</i>	drooping sedge	OBL	Y	2
Cyperaceae	<i>Carex pseudocyperus</i>	cypress-like sedge	OBL	Y	2
Cyperaceae	<i>Carex radiata</i>	eastern star sedge	NI	Y	2
Cyperaceae	<i>Carex retrorsa</i>	Knot sheath sedge	OBL	Y	1, 2
Cyperaceae	<i>Carex rostrata</i>	beaked sedge	OBL	Y	2
Cyperaceae	<i>Carex scabrata</i>	eastern rough sedge	OBL	Y	2
Cyperaceae	<i>Carex schweinitzii</i>	Schweinitz' sedge	OBL	Y	2
Cyperaceae	<i>Carex scoparia</i>	broom sedge	FACW	Y	1, 2
Cyperaceae	<i>Carex sprengelii</i>	Sprengel's sedge	FAC	Y	2
Cyperaceae	<i>Carex squarrosa</i>	Squarrose sedge	OBL	Y	1, 2
Cyperaceae	<i>Carex stipata</i>	Sawbeak sedge, awlfruit sedge	OBL	Y	1, 2
Cyperaceae	<i>Carex stricta</i>	Tussock sedge, upright sedge	OBL	Y	1, 2, 6, 7
Cyperaceae	<i>Carex tenera</i>	quill sedge	FAC	Y	1, 2
Cyperaceae	<i>Carex torta</i>	twisted sedge	OBL	Y	2

Cyperaceae	<i>Carex tribuloides</i>	blunt broom sedge	FACW	Y	1, 2
Cyperaceae	<i>Carex trichocarpa</i>	hairyfruit sedge	OBL	Y	1, 2
Cyperaceae	<i>Carex tuckermanni</i>	Tuckerman's sedge	OBL	Y	2
Cyperaceae	<i>Carex vesicaria</i>	blister sedge	OBL	Y	2
Cyperaceae	<i>Carex viridula</i>	little green sedge	OBL	Y	2
Cyperaceae	<i>Carex vulpinoidea</i>	Fox sedge	OBL	Y	1, 2
Cyperaceae	<i>Cyperus bipartitus</i>	slender flatsedge	FACW	Y	1, 2
Cyperaceae	<i>Cyperus diandrus</i>	umbrella flatsedge	OBL	Y	2
Cyperaceae	<i>Cyperus esculentus</i>	yellow nutsedge, nutgrass	FACW	<i>C. esculentus</i> var. <i>leptostachyus</i> and <i>C. esculentus</i> var. <i>macrostachyus</i>	2
Cyperaceae	<i>Cyperus squarrosus</i>	bearded flatsedge	OBL	Y	2
Cyperaceae	<i>Cyperus strigosus</i>	False nutsedge, straw-colored nutsedge	FACW	Y	1, 2
Cyperaceae	<i>Dulichium arundinaceum</i>	Three-way sedge	OBL	Y	1, 2
Cyperaceae	<i>Eleocharis acicularis</i>	needle spikerush	OBL	Y	2
Cyperaceae	<i>Eleocharis elliptica</i>	elliptic spikerush	OBL	Y	2
Cyperaceae	<i>Eleocharis erythropoda</i>	bald spikerush	(OBL)	Y	2
Cyperaceae	<i>Eleocharis intermedia</i>	matted spikerush	OBL	Y	2
Cyperaceae	<i>Eleocharis obtusa</i>	Blunt spike rush	OBL	Y	2
Cyperaceae	<i>Eleocharis olivacea</i>	bright green spikerush	OBL	Y	2
Cyperaceae	<i>Eleocharis ovata</i>	Blunt spike rush, ovate spikerush	OBL	Y	1, 2
Cyperaceae	<i>Eleocharis palustris</i>	Spike-rush	OBL	Y	1, 2
Cyperaceae	<i>Eleocharis tenuis</i>	Slender spikerush	FACW	Y	1, 2
Cyperaceae	<i>Eriophorum viridicarinarum</i>	thinleaf cottonsedge	OBL	Y	2
Cyperaceae	<i>Fimbristylis autumnalis</i>	slender fimbry	FACW	Y	2
Cyperaceae	<i>Rhynchospora alba</i>	white beaksedge	OBL	Y	2
Cyperaceae	<i>Rhynchospora capillacea</i>	needle beak sedge	OBL	Y	2
Cyperaceae	<i>Schoenoplectus acutus</i> var. <i>acutus</i>	hardstem bulrush	OBL	Y	2

Cyperaceae	<i>Schoenoplectus americanus</i>	chairmaker's bulrush	OBL	Y	2
Cyperaceae	<i>Schoenoplectus fluviatilis</i>	river bulrush	OBL	Y	2
Cyperaceae	<i>Schoenoplectus tabernaemontani</i>	Softstem bulrush	OBL	Y	1, 2
Cyperaceae	<i>Schoenoplectus torreyi</i>	Torrey's bulrush	OBL	Y	2
Cyperaceae	<i>Scirpus atrocinctus</i>	Black girdle bulrush	OBL	Y	2
Cyperaceae	<i>Scirpus atrovirens</i>	green bulrush	OBL	Y	1, 2, 6, 7
Cyperaceae	<i>Scirpus cyperinus</i>	Wool grass	OBL	Y	1, 2
Cyperaceae	<i>Scirpus lineatus</i>	drooping bulrush	(OBL)	Y	2
Cyperaceae	<i>Scirpus microcarpus</i>	Barberpole bulrush, paniced bulrush	OBL	Y	1, 2
Cyperaceae	<i>Scirpus pedicellatus</i>	stalked bulrush	OBL	Y	2
Cyperaceae	<i>Scirpus pendulus</i>	rufous bulrush	OBL	Y	1
Cyperaceae	<i>Scirpus polyphyllus</i>	leafy bulrush	OBL	Y	2
Dioscoreaceae	<i>Dioscorea villosa</i>	wild yam	FAC	Y	2
Ericaceae	<i>Eriocaulon aquaticum</i>	Seven angle pipewort	OBL	Y	2
Ericaceae	<i>Vaccinium corymbosum</i>	highbush blueberry	FACW	Y	2, 3
Ericaceae	<i>Vaccinium fuscatum</i>	black highbush blueberry	FACW	Y	2
Euphorbiaceae	<i>Acalypha rhomboidea</i>	Three- seeded mercury	FACU	Y	1, 2
Fabaceae	<i>Acalypha rhomboidea</i>	hog peanut	FAC	Y	1, 2, 6
Fabaceae	<i>Apios americana</i>	Groundnut, wild bean	FACW	Y	1, 2
Fabaceae	<i>Cassia hebecarpa</i>	wild senna	(FAC)	Y	2
Fabaceae	<i>Desmodium canadense</i>	showy tick-trefoil	FAC	Y	1, 2
Fabaceae	<i>Desmodium glutinosum</i>	pointed leaf trefoil	NI	Y	1, 2
Fabaceae	<i>Desmodium nudiflorum</i>	naked tick-trefoil	NI	Y	1, 2
Fabaceae	<i>Lathyrus palustris</i>	wild pea, marsh pea	FACW	Y	2
Fabaceae	<i>Lotus corniculatus</i>	Birdsfoot trefoil	FACU	N	1, 2
Fabaceae	<i>Medicago lupulina</i>	Black medick, hop clover	FACU	N	1, 2
Fabaceae	<i>Melilotus officinalis</i>	White sweet clover, sweet clover	FACU	N	1, 2

Fabaceae	<i>Trifolium aureum</i>	Palmate hop-clover, golden clover	NI	N	1, 2
Fabaceae	<i>Trifolium hybridum</i>	Alsike clover	FACU	N	1, 2
Fabaceae	<i>Trifolium pratense</i>	Red clover	FACU	N	1, 2
Fabaceae	<i>Trifolium repens</i>	White clover	FACU	N	1, 2
Fabaceae	<i>Vicia cracca</i>	Cow-vetch, bird vetch	NI	N	1
Fabaceae	<i>Vicia tetrasperma</i>	Slender vetch, lentil vetch	NI	N	1, 2
Fagaceae	<i>Castanea dentata</i>	chestnut	NI	Y	2
Fagaceae	<i>Fagus grandifolia</i>	beech	FACU	Y	2
Fagaceae	<i>Quercus alba</i>	White oak seedling	FACU	Y	1, 2
Fagaceae	<i>Quercus bicolor</i>	swamp white oak	FACW	Y	1, 2
Fagaceae	<i>Quercus macrocarpa</i>	bur oak, mossy-cup oak	FACU	Y	1, 2
Fagaceae	<i>Quercus rubra</i>	red oak	FACU	Y	1, 2
Fumariaceae	<i>Dicentra cucullaria</i>	Dutchman's-breeches	NI	Y	2
Gentianaceae	<i>Bartonia virginica</i>	yellow screwstem	FACW	Y	2
Gentianaceae	<i>Gentiana andrewsii</i>	closed bottle gentian	FACW	Y	2
Gentianaceae	<i>Gentiana clausa</i>	bottle gentian	FACW	Y	2
Gentianaceae	<i>Gentianopsis crinita</i>	greater fringed gentian	FACW	Y	2
Geraniaceae	<i>Geranium maculatum</i>	Wild geranium	FACU	Y	1, 2, 3, 4, 5
Geraniaceae	<i>Geranium robertianum</i>	Robert geranium	NI	Y	2
Grossulariaceae	<i>Ribes americanum</i>	black currant	FACW	Y	2, 3, 7
Grossulariaceae	<i>Ribes cynosbati</i>	Gooseberry, eastern prickly gooseberry	FACU	Y	1, 2
Haloragidaceae	<i>Proserpinaca palustris</i>	marsh mermaidweed	OBL	Y	2
Hydrocharitaceae	<i>Elodea canadensis</i> var. <i>crebra</i>	Waterweed, Ditch-moss	OBL	Y	1, 2
Hydrophyllaceae	<i>Hydrophyllum virginianum</i>	waterleaf	FAC	Y	2
Iridaceae	<i>Iris versicolor</i>	Northern blueflag, Iris, harlequin blueflag	OBL	Y	1, 2, 3, 4, 5, 6, 7
Iridaceae	<i>Sisyrinchium angustifolium</i>	narrowleaf blue-eyed grass	FAC	Y	2, 3
Iridaceae	<i>Sisyrinchium montanum</i>	Common blue-eyed Grass	FAC	Y	1, 2

Juglandaceae	<i>Carya cordiformis</i>	bitternut hickory	FAC	Y	1, 2, 3, 4
Juglandaceae	<i>Juglans cinerea</i>	butternut	FACU	Y	2, 3, 4, 5
Juglandaceae	<i>Juglans nigra</i>	black walnut	FACU	Y	2
Juncaceae	<i>Juncus acuminatus</i>	tapertip rush	OBL	Y	1, 2
Juncaceae	<i>Juncus articulatus</i>	jointleaf rush	OBL	Y	1, 2
Juncaceae	<i>Juncus brachycephalus</i>	smallhead rush	OBL	Y	2
Juncaceae	<i>Juncus brevicaudatus</i>	Narrow panicle rush	OBL	Y	2
Juncaceae	<i>Juncus bufonius</i>	toad rush	FACW	Y	2
Juncaceae	<i>Juncus canadensis</i>	Canadian rush	OBL	Y	2
Juncaceae	<i>Juncus dudleyi</i>	Dudley's rush	FACW	Y	2
Juncaceae	<i>Juncus effusus</i>	Soft rush, candle rush, lamp rush, common rush	OBL	<i>J. effusus</i> var. <i>conglomeratus</i>	1, 2, 3, 4
Juncaceae	<i>Juncus marginatus</i>	grassleaf rush	FACW	Y	1, 2
Juncaceae	<i>Juncus nodosus</i>	knotted rush	OBL	Y	1, 2
Juncaceae	<i>Juncus tenuis</i>	Path rush, poverty rush	FAC	Y	1, 2
Juncaceae	<i>Luzula multiflora</i>	common woodrush	FACU	Y	2
Lamiaceae	<i>Collinsonia canadensis</i>	richweed	FAC	Y	2, 3, 4
Lamiaceae	<i>Galeopsis tetrahit</i>	Hempnettle, brittlestem hempnettle	FACU	N	1, 2
Lamiaceae	<i>Glechoma hederacea</i>	Gill-over-the-ground, Ground ivy	FACU	N	1, 2
Lamiaceae	<i>Lycopus americanus</i>	Cut-leaved water-horehound, American water-horehound	OBL	Y	1, 2
Lamiaceae	<i>Lycopus uniflorus</i>	Northern water-horehound, northern bugleweed	OBL	Y	1, 2, 7
Lamiaceae	<i>Lycopus virginicus</i>	Virginia water-horehound	OBL	Y	2
Lamiaceae	<i>Mentha arvensis</i>	Wild mint	FACW	N	1, 2, 7
Lamiaceae	<i>Mentha spicata</i>	Spearmint	FACW	N	1, 2
Lamiaceae	<i>Mentha x gracilis</i> (<i>M. arvensis</i> × <i>M. spicata</i>)	gingermint	OBL	N	1, 2
Lamiaceae	<i>Monarda fistulosa</i>	Wild bergamot	FACU	Y	1, 2

Lamiaceae	<i>Physostegia virginiana</i>	dragon-head, obedient plant	FACW	Y	2
Lamiaceae	<i>Prunella vulgaris</i>	Heal-all, common self-heal	FAC	N	1, 2
Lamiaceae	<i>Pycnanthemum tenuifolium</i>	Narrowleaf mountain-mint	FAC	Y	1, 2
Lamiaceae	<i>Pycnanthemum virginianum</i>	Virginia mountain-mint	FACW	Y	1, 2
Lamiaceae	<i>Scutellaria galericulata</i>	Marsh-skullcap	OBL	Y	1, 2, 3, 4, 7
Lamiaceae	<i>Scutellaria lateriflora</i>	Mad-dog skullcap, blue skullcap	OBL	Y	1, 2, 7
Lamiaceae	<i>Teucrium canadense</i>	Canada germander	FACW	Y	2
Lemnaceae	<i>Lemna</i> spp.	Duckweed	n/a	Y	1, 2, 6
Lemnaceae	<i>Spirodela polyrhiza</i>	Large duckweed	OBL	Y	1, 2
Lemnaceae	<i>Wolffia</i> sp.	Watermeal	n/a	Y	1, 2
Lentibulariaceae	<i>Utricularia intermedia</i>	flatleaf bladderwort	OBL	Y	2
Liliaceae	<i>Allium canadense</i>	meadow garlic, wild onion	FACU	Y	2
Liliaceae	<i>Allium tricoccum</i>	wild leek, ramp	FACU	Y	2
Liliaceae	<i>Allium vineale</i>	Field garlic	FACU	Y	1, 2
Liliaceae	<i>Erythronium americanum</i>	dogtooth violet, yellow adder's tongue, trout lily	NI	Y	2, 3
Liliaceae	<i>Hemerocallis fulva</i>	day lily	UPL	Y	2
Liliaceae	<i>Hypoxis hirsuta</i>	Stargrass, common goldstar	FAC	Y	1, 3, 4, 5
Liliaceae	<i>Lilium canadense</i>	Canada lily	FAC	Y	2, 3, 4, 5
Liliaceae	<i>Maianthemum racemosum</i>	feathery false lily of the valley	FACU	Y	2, 3
Liliaceae	<i>Maianthemum stellatum</i>	starry false lily of the valley	FAC	Y	2, 3
Liliaceae	<i>Maianthemum trifolium</i>	threeleaf false lily of the valley, false Solomon's seal	OBL	Y	7
Liliaceae	<i>Medeola virginiana</i>	Indian cucumber	NI	Y	2, 3
Liliaceae	<i>Polygonatum biflorum</i>	smooth Solomon's seal	FACU	Y	2, 3
Liliaceae	<i>Polygonatum pubescens</i>	hairy Solomon's seal	NI	Y	3, 4, 5

Liliaceae	<i>Trillium cernuum</i>	white trillium, whippoorwill flower	FAC	Y	2
Liliaceae	<i>Trillium erectum</i>	red lily, red trillium, carrion flower	FACU	Y	2, 3, 4, 5
Liliaceae	<i>Uvularia grandiflora</i>	Large flower bellwort	NI	Y	3
Liliaceae	<i>Uvularia perfoliata</i>	perfoliate bellwort	FACU	Y	3
Liliaceae	<i>Uvularia sessilifolia</i>	Sessile leaf bellwort	FACU	Y	3
Liliaceae	<i>Veratrum viride</i>	green false hellebore	FACW	Y	2
Lythraceae	<i>Lythrum salicaria</i>	Purple loosestrife	OBL	N	1, 2, 6
Malvaceae	<i>Abutilon theophrasti</i>	Velvet-leaf	FACU	N	1, 2
Menyanthaceae	<i>Menyanthes trifoliata</i>	buckbean	OBL	Y	3, 4, 5
Oleaceae	<i>Fraxinus nigra</i>	black ash	FACW	Y	1, 2, 3, 4
Oleaceae	<i>Fraxinus pennsylvanica</i>	green ash	FACW	Y	1, 2, 6
Onagraceae	<i>Chamerion angustifolium</i>	fireweed	FAC	Y	2
Onagraceae	<i>Circaea alpina</i>	small enchanter's nightshade	FACW	Y	1, 2
Onagraceae	<i>Circaea lutetiana</i>	broadleaf enchanter's nightshade	(FACU)	Y	1, 2, 3
Onagraceae	<i>Epilobium ciliatum</i> sspg. <i>glandulosum</i>	fringed willow- herb	FACW	Y	2
Onagraceae	<i>Epilobium coloratum</i>	Eastern willow- herb, purpleleaf willowherb	OBL	Y	1, 2, 7
Onagraceae	<i>Epilobium hirsutum</i>	codlins and cream	FACW	N	2
Onagraceae	<i>Epilobium leptophyllum</i>	bog willow- herb	OBL	Y	2
Onagraceae	<i>Epilobium strictum</i>	downy willow- herb	OBL	Y	2
Onagraceae	<i>Gaura biennis</i>	biennial beeblossom	FACU	N	2
Onagraceae	<i>Ludwigia alternifolia</i>	Seedbox	OBL	Y	1, 2
Onagraceae	<i>Ludwigia palustris</i>	Common water purslane, marsh seedbox	OBL	Y	1, 2

Onagraceae	<i>Oenothera perennis</i>	Little sundrops, little evening primrose	FAC	Y	1, 2
Orobanchaceae	<i>Orobanche uniflora</i>	broom-rape, one-flowered broomrape	UPL	Y	2
Oxalidaceae	<i>Oxalis stricta</i>	Common Wood-sorrel	FACU	Y	1, 2, 3, 4
Oxalidaceae	<i>Oxalis violacea</i>	violet wood sorrel	NI	Y	2
Papaveraceae	<i>Chelidonium majus</i>	celandine	UPL	N	2
Papaveraceae	<i>Sanguinaria canadensis</i>	bloodroot	FACU	Y	2, 3
Phytolaccaceae	<i>Phytolacca americana</i>	Pokeweed	FACU	Y	1, 2
Pinaceae	<i>Larix laricina</i>	tamarack, larch	FACW	Y	2, 3, 4, 5
Pinaceae	<i>Tsuga canadensis</i>	hemlock	FACU	Y	2
Plantaginaceae	<i>Plantago cordata</i>	heartleaf plantain	OBL	Y	2
Plantaginaceae	<i>Plantago lanceolata</i>	English plantain, Rib Grass	FACU	N	1, 2
Plantaginaceae	<i>Plantago major</i>	Common plantain	FACU	N	1, 2
Poaceae	<i>Agrostis gigantea</i>	Redtop	FACW	N	1, 2
Poaceae	<i>Agrostis perennans</i>	upland bentgrass	FACU	Y	1, 2
Poaceae	<i>Andropogon gerardii</i>	big bluestem	FACU	Y	2
Poaceae	<i>Anthoxanthum odoratum</i>	Sweet vernal grass	FACU	N	1, 2
Poaceae	<i>Arrhenatherum elatius</i>	tall oatgrass	FACU	N	2
Poaceae	<i>Brachyelytrum erectum</i>	bearded shorthusk	NI	Y	2
Poaceae	<i>Bromus ciliatus</i>	fringed brome	FACW	Y	2, 7
Poaceae	<i>Bromus hordeaceus</i>	soft brome	UPL	N	1
Poaceae	<i>Bromus inermis</i>	Smooth brome	UPL	N	1, 2
Poaceae	<i>Bromus secalinus</i>	rye brome	NI	N	2
Poaceae	<i>Calamagrostis canadensis</i>	Blue joint grass	OBL	Y	1, 2, 7
Poaceae	<i>Cinna arundinacea</i>	sweet woodreed	FACW	Y	1, 2
Poaceae	<i>Cinna latifolia</i>	drooping woodreed	FACW	Y	2
Poaceae	<i>Dactylis glomerata</i>	Orchard grass	FACU	N	1, 2

Poaceae	<i>Dichanthelium acuminatum</i> var. <i>fasciculatum</i>	western panicgrass	FAC	Y	1, 2
Poaceae	<i>Dichanthelium clandestinum</i>	deertongue	FACW	Y	2
Poaceae	<i>Echinochloa crus-galli</i>	Barnyard grass	FAC	N	1, 2
Poaceae	<i>Elymus repens</i>	Quack-grass	FACU	N	1, 2
Poaceae	<i>Elymus riparius</i>	riverbank wildrye	FACW	Y	2
Poaceae	<i>Elymus villosus</i>	hairy wildrye	FACU	Y	2
Poaceae	<i>Elymus virginicus</i>	Virginia wildrye	FACW	Y	2
Poaceae	<i>Elymus wiegandii</i>	Wigand's wildrye	FAC	Y	2
Poaceae	<i>Eragrostis pectinacea</i>	tufted lovegrass	FAC	Y	2
Poaceae	<i>Eragrostis spectabilis</i>	purple lovegrass	UPL	Y	2
Poaceae	<i>Festuca ovina</i>	sheep fescue	UPL	N	1, 2
Poaceae	<i>Festuca rubra</i>	Red fescue	FACU	N	1, 2
Poaceae	<i>Glyceria acutiflora</i>	Mannagrass	OBL	Y	1, 2
Poaceae	<i>Glyceria borealis</i>	small floating mannagrass	OBL	Y	2
Poaceae	<i>Glyceria canadensis</i>	Rattlesnake mannagrass	OBL	Y	1, 2
Poaceae	<i>Glyceria grandis</i>	American mannagrass	OBL	Y	1, 2, 6
Poaceae	<i>Glyceria melicaria</i>	melic mannagrass	OBL	Y	2
Poaceae	<i>Glyceria septentrionalis</i>	floating mannagrass	OBL	Y	2
Poaceae	<i>Glyceria striata</i>	Fowl mannagrass	OBL	Y	1, 2, 7
Poaceae	<i>Holcus lanatus</i>	Velvet grass	FACU	N	1, 2
Poaceae	<i>Leersia oryzoides</i>	Rice cutgrass, sawgrass	OBL	Y	1, 2, 6, 7
Poaceae	<i>Leersia virginica</i>	whitegrass	FACW	Y	2
Poaceae	<i>Lolium perenne</i> var. <i>perenne</i>	English ryegrass	FACU	N	1, 2
Poaceae	<i>Muhlenbergia glomerata</i>	spiked muhly	OBL	Y	2
Poaceae	<i>Muhlenbergia mexicana</i>	Mexican muhly	FACW	Y	2
Poaceae	<i>Muhlenbergia schreberi</i>	nimblewill	FAC	Y	2
Poaceae	<i>Muhlenbergia sylvatica</i>	woodland muhly	FACW	Y	2
Poaceae	<i>Panicum gattingeri</i>	Gattinger's panicgrass	FAC	Y	2

Poaceae	<i>Panicum virgatum</i>	switchgrass	FAC	Y	2
Poaceae	<i>Phalaris arundinacea</i>	Reed canary-grass	FACW	Y	1, 2, 6
Poaceae	<i>Phleum pratense</i>	Timothy	FACU	N	1, 2
Poaceae	<i>Phragmites australis</i>	Common reed	FACW	N	1, 2, 6
Poaceae	<i>Poa palustris</i>	Fowl meadow-grass	FACW	Y	1, 2, 6, 7
Poaceae	<i>Poa pratensis</i>	Kentucky bluegrass	FACU	N	1, 2
Poaceae	<i>Poa trivialis</i>	rough bluegrass	FACW	N	1, 2
Poaceae	<i>Schedonorus pratensis</i>	Tall/Meadow Fescue	NI	N	1, 2
Poaceae	<i>Setaria</i> sp.	Foxtail	n/a	<i>S. faberi, italica, pumila, verticillata, verticilliformis, viridis</i>	1, 2
Poaceae	<i>Sphenopholis intermedia</i>	slender wedgescale	NI	Y	2
Poaceae	<i>Torreyochloa pallida</i>	pale false mannagrass	OBL	Y	2
Poaceae	<i>Torreyochloa pallida</i> var. <i>fernaldii</i>	Fernald's false mannagrass	OBL	Y	2
Polygalaceae	<i>Polygala sanguinea</i>	Blood milkwort, purple milkwort	FACU	Y	1, 2
Polygonaceae	<i>Polygonum amphibium</i>	Water smartweed	(OBL)	Y	1, 2
Polygonaceae	<i>Polygonum amphibium</i> var. <i>emersum</i>	Long root smartweed	(OBL)	Y	2
Polygonaceae	<i>Polygonum arifolium</i>	Halberd-leaved tearthumb	OBL	Y	1, 2, 3, 4, 6
Polygonaceae	<i>Polygonum aviculare</i>	prostrate knotweed	FACU	N	1, 2
Polygonaceae	<i>Polygonum cespitosum</i>	Long-bristled smartweed, oriental lady's thumb	(FACU-)	Y	1
Polygonaceae	<i>Polygonum hydropiper</i>	Water pepper, marsh pepper knotweed	OBL	Y	1, 2
Polygonaceae	<i>Polygonum hydropiperoides</i>	False Water pepper, swamp smartweed	OBL	Y	1, 2, 6
Polygonaceae	<i>Polygonum lapathifolium</i>	Dock-leaved smartweed, curlytop knotweed	FACW	Y	1, 2
Polygonaceae	<i>Polygonum pensylvanicum</i>	Pennsylvania smartweed	FACW	Y	1, 2

Polygonaceae	<i>Polygonum persicaria</i>	Lady's thumb	FAC	Y	1, 2
Polygonaceae	<i>Polygonum punctatum</i>	Dotted smartweed	OBL	Y	1, 2, 3, 4
Polygonaceae	<i>Polygonum sagittatum</i>	Arrow-leaved tearthumb	OBL	Y	1, 2, 3, 4, 7
Polygonaceae	<i>Polygonum scandens</i>	climbing false buckwheat	(FAC)	Y	1, 2
Polygonaceae	<i>Polygonum virginianum</i>	jumpseed	FAC	Y	2, 3
Polygonaceae	<i>Rumex acetosella</i>	Sheep sorrel	FACU	<i>R. acetosella</i> var. <i>pyrenaicus</i>	1, 2
Polygonaceae	<i>Rumex crispus</i>	Curly Dock	FAC	N	1, 2
Polygonaceae	<i>Rumex obtusifolius</i>	Broad-leaved dock	FAC	N	1, 2
Polygonaceae	<i>Rumex orbiculatus</i>	great water dock	(OBL)	Y	2, 7
Polygonaceae	<i>Rumex salicifolius</i> var. <i>mexicanus</i>	Mexican dock	NI	Y	2
Polygonaceae	<i>Rumex verticillatus</i>	swamp dock	OBL	Y	2
Pontederiaceae	<i>Pontederia cordata</i>	Pickereel-weed	OBL	Y	1, 2
Portulacaceae	<i>Claytonia virginica</i>	Virginia spring beauty	FACU	Y	2, 3, 4
Potamogetonaceae	<i>Potamogeton crispus</i>	Curly pondweed	OBL	N	1, 2
Potamogetonaceae	<i>Potamogeton pusillus</i>	Slender pondweed, small pondweed	OBL	Y	1, 2
Primulaceae	<i>Lysimachia ciliata</i>	Fringed loosestrife	FACW	Y	1, 2, 3, 4
Primulaceae	<i>Lysimachia nummularia</i>	Moneywort, creeping Jenny	FACW	N	1, 2
Primulaceae	<i>Lysimachia terrestris</i>	Swamp candle, earth loosestrife	OBL	Y	1, 2, 6
Primulaceae	<i>Lysimachia thyrsiflora</i>	Tufted loosestrife	OBL	Y	1, 2
Ranunculaceae	<i>Actaea pachypoda</i>	white baneberry	UPL	Y	3, 4
Ranunculaceae	<i>Actaea racemosa</i>	black bugbane	NI	Y	3
Ranunculaceae	<i>Actaea rubra</i>	red baneberry	FACU	Y	3, 5
Ranunculaceae	<i>Anemone canadensis</i>	Canadian anemone	FACW	Y	2, 3
Ranunculaceae	<i>Anemone quinquefolia</i>	wood anemone	FACU	Y	3
Ranunculaceae	<i>Caltha palustris</i>	yellow marsh marigold	OBL	Y	1, 2, 3, 7
Ranunculaceae	<i>Clematis virginiana</i>	Virgin's bower, Devil's darning needles, woodbine	FAC	Y	1, 2, 7

Ranunculaceae	<i>Coptis trifolia</i>	Three leaf goldthread	FACW	Y	2, 3, 4, 5
Ranunculaceae	<i>Ranunculus abortivus</i>	Little leaf buttercup	FAC	Y	2, 3
Ranunculaceae	<i>Ranunculus acris</i>	Common buttercup	FAC	N	1, 2, 5
Ranunculaceae	<i>Ranunculus hispidus</i>	bristly buttercup, swamp buttercup	FAC	Y	2
Ranunculaceae	<i>Ranunculus pensylvanicus</i>	Bristly crowfoot	OBL	Y	1, 2
Ranunculaceae	<i>Ranunculus recurvatus</i>	blisterwort	FACW	Y	2, 3
Ranunculaceae	<i>Thalictrum dasycarpum</i>	purple meadow-rue	FACW	N	7
Ranunculaceae	<i>Thalictrum dioicum</i>	early meadow-rue	FACU	Y	2, 3
Ranunculaceae	<i>Thalictrum pubescens</i>	Tall meadow rue, king of the meadow	FACW	Y	1, 2
Ranunculaceae	<i>Thalictrum thalictroides</i>	rue anemone	FACU	Y	2, 3
Rhamnaceae	<i>Rhamnus alnifolia</i>	Alder leaf buckthorn	OBL	Y	1, 2
Rhamnaceae	<i>Rhamnus cathartica</i>	buckthorn		N	6
Rosaceae	<i>Agrimonia gryposepala</i>	Common agrimony, tall hairy agrimony	FACU	Y	1, 2
Rosaceae	<i>Agrimonia parviflora</i>	Small-flowered agrimony, harvest lice	FAC	Y	1, 2
Rosaceae	<i>Amelanchier canadensis</i>	Canadian serviceberry	FAC	Y	2
Rosaceae	<i>Comarum palustre</i>	purple cinquefoil, purple marshlocks	OBL	Y	2, 7
Rosaceae	<i>Crataegus macracantha</i>	fleshy hawthorn	NI	Y	1, 2
Rosaceae	<i>Crataegus macrosperma</i>	bigfruit hawthorn	n/a	Y	2
Rosaceae	<i>Dalibarda repens</i>	robin runway	FAC	Y	2
Rosaceae	<i>Dasiphora fruticosa</i> ssp. <i>floribunda</i>	Shrubby cinquefoil	FACW	Y	1, 2
Rosaceae	<i>Fragaria vesca</i> var. <i>americana</i>	woodland strawberry	UPL	<i>F. vesca</i> var. <i>vesca</i>	1, 2
Rosaceae	<i>Geum aleppicum</i>	Yellow avens	FAC	Y	1, 2
Rosaceae	<i>Geum canadense</i>	White avens	FAC	Y	1, 2

Rosaceae	<i>Geum laciniatum</i>	Rough-stemmed avens	FACW	Y	1, 2
Rosaceae	<i>Geum rivale</i>	purple avens	OBL	Y	2, 3, 4, 5
Rosaceae	<i>Malus pumila</i>	paradise apple	NI	N	2
Rosaceae	<i>Malus sylvestris</i>	European crabapple	NI	N	1, 2
Rosaceae	<i>Photinia floribunda</i>	purple chokecherry	FACU	Y	7
Rosaceae	<i>Physocarpus opulifolius</i>	common ninebark	FACW	Y	2
Rosaceae	<i>Potentilla arguta</i>	tall cinquefoil	(UPL)	Y	2
Rosaceae	<i>Potentilla norvegica</i>	Rough cinquefoil	FAC	<i>PG. norvegica</i> sspg. <i>monspeliensis</i>	1, 2
Rosaceae	<i>Potentilla simplex</i> (or <i>PG. canadensis</i>)	Common cinquefoil (or Running five-finger)	FACU	Y	1, 2
Rosaceae	<i>Rosa blanda</i>	smooth rose	FACU	Y	2
Rosaceae	<i>Rosa multiflora</i>	Multiflora rose	FACU	N	1
Rosaceae	<i>Rosa palustris</i>	Swamp rose	OBL	Y	1, 2
Rosaceae	<i>Rubus allegheniensis</i>	Blackberry, highbush blackberry, Allegheny blackberry	FACU	Y	1, 2
Rosaceae	<i>Rubus hispidus</i>	running swamp blackberry, bristly dewberry	FACW	Y	2, 7
Rosaceae	<i>Rubus idaeus</i> sspg. <i>strigosus</i>	red raspberry	FACU	<i>R. idaeus</i> sspg. <i>idaeus</i>	7
Rosaceae	<i>Rubus pubescens</i>	dwarf red blackberry	FACW	Y	2, 7
Rosaceae	<i>Rubus setosus</i>	setose blackberry	FACW	Y	2
Rosaceae	<i>Spiraea alba</i> var. <i>latifolia</i>	Meadowsweet	FACW	Y	1, 2, 3, 4, 5, 7
Rosaceae	<i>Spiraea tomentosa</i>	Steeplebush, Hardhack, pink spiraea	FACW	Y	1, 2, 3, 4, 5, 6
Rubiaceae	<i>Cephalanthus occidentalis</i>	Bottonbush	OBL	Y	1, 2, 3, 4
Rubiaceae	<i>Galium aparine</i>	Cleavers, goose grass, stickywilly	FACU	Y	1, 2
Rubiaceae	<i>Galium asprellum</i>	Rough bedstraw	OBL	Y	1, 2, 6, 7
Rubiaceae	<i>Galium mollugo</i>	Wild madder, false baby's breath	NI	N	1, 2

Rubiaceae	<i>Galium obtusum</i>	bluntleaf bedstraw	FACW	Y	2
Rubiaceae	<i>Galium palustre</i>	common marsh bedstraw	OBL	Y	2
Rubiaceae	<i>Galium tinctorium</i>	stiff marsh bedstraw	OBL	Y	2, 3, 4, 5
Rubiaceae	<i>Galium trifidum</i>	Northern three-lobed bedstraw, threepetal bedstraw	FACW	Y	1, 2, 3, 4, 5
Rubiaceae	<i>Galium triflorum</i>	sweet-scented bedstraw, fragrant bedstraw	FACU	Y	2
Rubiaceae	<i>Houstonia caerulea</i>	bluets, Quaker ladies	FACU	Y	2, 4
Rubiaceae	<i>Mitchella repens</i>	partridge berry	FACU	Y	2
Rutaceae	<i>Zanthoxylum americanum</i>	common pricklyash	FACU	Y	3, 4, 5
Salicaceae	<i>Populus deltoides</i>	cottonwood	FAC	Y	2, 3, 4, 5
Salicaceae	<i>Populus tremuloides</i>	Trembling aspen	FACU	Y	1, 2
Salicaceae	<i>Salix alba</i>	white willow	FACW	N	2
Salicaceae	<i>Salix bebbiana</i>	Bebb willow	FACW	Y	2, 7
Salicaceae	<i>Salix candida</i>	hoary willow, sageleaf willow	OBL	Y	2
Salicaceae	<i>Salix discolor</i>	Pussy willow	FACW	Y	1, 2, 7
Salicaceae	<i>Salix eriocephala</i>	Diamond willow, Missouri River willow	FACW	Y	1, 2
Salicaceae	<i>Salix exigua</i>	narrowleaf willow	(OBL)	Y	7
Salicaceae	<i>Salix fragilis</i>	crack willow	FAC	Y	2
Salicaceae	<i>Salix lucida</i>	shining willow	FACW	Y	2
Salicaceae	<i>Salix nigra</i>	Black willow	OBL	Y	1, 2
Salicaceae	<i>Salix petiolaris</i>	slender willow, meadow willow	FACU	Y	7
Salicaceae	<i>Salix purpurea</i>	purple willow, purple osier willow	FACW	Y	2
Salicaceae	<i>Salix sericea</i>	Silky willow	OBL	Y	1, 2
Salicaceae	<i>Salix serissima</i>	autumn willow	OBL	Y	2
Salicaceae	<i>Salix x sepulcralis</i>	Weeping willow	FACW	N	1
Saxifragaceae	<i>Chrysosplenium americanum</i>	American golden saxifrage	OBL	Y	2
Saxifragaceae	<i>Mitella nuda</i>	naked miterwort	FACW	Y	2

Saxifragaceae	<i>Parnassia glauca</i>	Grass-of-Parnassus	OBL	Y	1, 2
Saxifragaceae	<i>Penthorum sedoides</i>	Ditch stonecrop	OBL	Y	1, 2, 3
Saxifragaceae	<i>Saxifraga pennsylvanica</i>	eastern swamp saxifrage	OBL	Y	2, 3
Saxifragaceae	<i>Tiarella cordifolia</i>	false miterwort, heartleaf foamflower	FACU	Y	2
Scrophulariaceae	<i>Agalinis paupercula</i>	smallflower false foxglove	OBL	Y	2
Scrophulariaceae	<i>Chelone glabra</i>	Turtlehead	OBL	Y	1, 2, 3, 4, 6, 7
Scrophulariaceae	<i>Gratiola neglecta</i>	clammy hedgehyssop	OBL	Y	2
Scrophulariaceae	<i>Linaria vulgaris</i>	Butter-and-eggs	NI	Y	1, 2
Scrophulariaceae	<i>Lindernia dubia</i>	yellowseed false pimpernel	OBL	Y	1, 2
Scrophulariaceae	<i>Mimulus alatus</i>	sharpwing monkeyflower	OBL	Y	2, 6
Scrophulariaceae	<i>Mimulus ringens</i>	Allegheny monkey-flower	OBL	Y	1, 2, 7
Scrophulariaceae	<i>Pedicularis canadensis</i>	Canadian lousewort	FACU	Y	2, 3
Scrophulariaceae	<i>Pedicularis lanceolata</i>	swamp lousewort	FACW	Y	2
Scrophulariaceae	<i>Penstemon digitalis</i>	Tall white beard-tongue, foxglove beardtongue	FAC	Y	1, 2
Scrophulariaceae	<i>Scrophularia marilandica</i>	carpenter's square	FACU	Y	2
Scrophulariaceae	<i>Verbascum blattaria</i>	Moth mullein	FACU	N	1, 2
Scrophulariaceae	<i>Verbascum thapsus</i>	Common mullein	UPL	N	1, 2
Scrophulariaceae	<i>Veronica americana</i>	Brooklime, American speedwell	OBL	Y	1, 2
Scrophulariaceae	<i>Veronica anagallis-aquatica</i>	Water speedwell	OBL	Y	1, 2
Scrophulariaceae	<i>Veronica peregrina</i>	Purslane speedwell, neckweed	FAC	Y	1, 2
Scrophulariaceae	<i>Veronica scutellata</i>	Narrow-leaved speedwell, skullcap speedwell	OBL	Y	1, 2

Scrophulariaceae	<i>Veronicastrum virginicum</i>	Culver's root	FAC	Y	2, 3
Smilacaceae	<i>Smilax herbacea</i>	smooth carrion flower	FAC	Y	1, 2
Smilacaceae	<i>Smilax tamnoides</i>	bristly greenbrier	FAC	Y	2
Solanaceae	<i>Solanum carolinense</i>	Horsenettle	FACU	Y	1, 2
Solanaceae	<i>Solanum dulcamara</i>	climbing nightshade	FAC	N	1, 2, 6
Solanaceae	<i>Solanum nigrum</i>	Common nightshade, black nightshade	NI	N	1, 2
Sparganiaceae	<i>Sparganium americanum</i>	American bur-reed	OBL	Y	1, 2
Sparganiaceae	<i>Sparganium emersum</i>	European bur-reed	OBL	Y	2
Sparganiaceae	<i>Sparganium eurycarpum</i>	Giant bur-reed	OBL	Y	1, 2
Staphylaceae	<i>Staphylea trifolia</i>	bladdernut, rattlesberry	FAC	Y	2
Thymelaeaceae	<i>Dirca palustris</i>	eastern leatherwood	FAC	Y	2
Typhaceae	<i>Typha angustifolia</i>	Narrow-leaved cattail	OBL	Y	1, 2
Typhaceae	<i>Typha latifolia</i>	Common cattail	OBL	Y	1, 2, 3, 4, 5, 6
Typhaceae	<i>Typha</i> × <i>glauc</i>	Cattail hybrid	OBL	N	1
Ulmaceae	<i>Ulmus americana</i>	American elm	FACW	Y	2, 3, 4, 5, 6
Ulmaceae	<i>Ulmus rubra</i>	slippery elm	FAC	Y	1, 2, 3, 4, 5
Urticaceae	<i>Boehmeria cylindrica</i>	False nettle	OBL	Y	1, 2, 6
Urticaceae	<i>Laportea canadensis</i>	wood nettle	FACW	Y	2
Urticaceae	<i>Morus rubra</i>	red mulberry	FACU	Y	2
Urticaceae	<i>Pilea pumila</i>	Clearweed, Richweed	FACW	Y	1, 2, 6
Urticaceae	<i>Urtica dioica</i>	Stinging nettle	FAC	N	1, 2
Valerianaceae	<i>Valeriana sitchensis</i> sspg. <i>uliginosa</i>	mountain valerian	NI	Y	2
Verbenaceae	<i>Phryma leptostachya</i>	American lopseed	FACU	Y	2
Verbenaceae	<i>Verbena hastata</i>	Common vervain, swamp verbena	FACW	Y	1, 2
Verbenaceae	<i>Verbena urticifolia</i>	White vervain	FAC	Y	1, 2

Violaceae	<i>Viola blanda</i>	sweet white violet	FACW	Y	1, 2
Violaceae	<i>Viola blanda</i> var. <i>palustriformis</i>	sweet white violet	FACW	Y	1, 2
Violaceae	<i>Viola canadensis</i>	Canada white violet	FACU	Y	1, 2
Violaceae	<i>Viola cucullata</i>	Blue marsh violet, swamp blue violet	OBL	Y	1, 2, 3, 4, 5
Violaceae	<i>Viola labradorica</i>	dog violet, alpine violet	FAC	Y	1, 2
Violaceae	<i>Viola macloskeyi</i> sspg. <i>pallens</i>	smooth white violet	OBL	Y	1, 2
Violaceae	<i>Viola pubescens</i>	downy yellow violet	FACU	Y	1, 2, 3, 4, 5
Violaceae	<i>Viola sagittata</i>	arrowleaf violet	FAC	Y	1, 2
Violaceae	<i>Viola septentrionalis</i>	northern woodland violet	FACU	Y	1, 2
Violaceae	<i>Viola sororia</i>	meadow violet, common blue violet	FAC	Y	1, 2
Vitaceae	<i>Parthenocissus quinquefolia</i>	Virginia creeper	FACU	Y	1, 2
Vitaceae	<i>Vitis labrusca</i>	Fox grape	FACU	Y	1, 2, 6
Vitaceae	<i>Vitis riparia</i>	Frost grape, riverbank grape	FAC	Y	1, 2, 6

Accepted names from USDA, NRCS (2012)

Wetland indicator status for the North-Central/Northeast (Lichvar and Kartesz 2009), parenthetical statuses are from the 1988 list (not on the 2012 list) (US Fish and Wildlife Service 1988).

OBL - Obligate Wetland - Almost always is a hydrophyte, rarely in uplands

FACW - Facultative Wetland - Usually is a hydrophyte but occasionally found in uplands

FAC - Facultative - Commonly occurs as either a hydrophyte or non-hydrophyte

FACU - Facultative Upland - Occasionally is a hydrophyte but usually occurs in uplands

UPL - Obligate Upland - Rarely is a hydrophyte, almost always in uplands

* N=No, Y=Yes. If a name is given, only that subspecies or variety is known to be non-native.

Sources:

- | | |
|----------------------|------------------------|
| 1) Knab-Vispo (2009) | 5) Woodworth (1839) |
| 2) McVaugh (1958) | 6) Knab-Vispo (2012) |
| 3) McVaugh (1935) | 7) Cohen & Kost (2007) |
| 4) Woodworth (1840) | |

Appendix C

Introduced Forage Species List

Family: Fabaceae

Latin name: *Medicago lupulina*

Common names: wolf clover, black medick, black medic, hop clover, hop medic, nonesuch, yellow trefoil

Native range: Eurasia, northern Africa

North American range: continent-wide

Wetland indicator status: FACU

In Columbia County wet meadows?: yes

Introduction details: "hop clover" sown in Orange Co. alone 1727 (died from cold) and with *Phleum pratense* in 1728 (died from heat)

Other information: "hop clover" sown in Orange Co. in wet parts of fields and in a meadow

Sources: Haley (1989); McVaugh (1958); Stoddart (1886)

Family: Fabaceae

Latin name: *Medicago sativa*

Common names: Chili clover, alfalfa, lucerne, lucern

Native range: Eurasia

North American range: continent-wide

Wetland indicator status: n/a

In Columbia County wet meadows?: n

Introduction details: First introduced to South Carolina from Antigua by "the glamorous Eliza Lucas" before 1800 (didn't take); in 1761 a man from Marshfield, MA reportedly had two acres of "Lucern grass"; being tested in VA 1761, winters thought to be a problem unless near the coast; Robert R. Livingston of Columbia Co., NY successfully experimented with it in 1790s; head of Onondaga Agricultural Society was optimistic about it in 1822; extensively grown in Mediterranean region but only a bit in Britain and America by 1830s; seed (mainly from France) readily available in US by 1830s; ½ acre successfully planted in Schenectady in 1835; thought not to do well in the Northeast or generally between 42-43° latitude, but Livingston and Le Ray de Chaumont's turn-of-the-19th Century experiments showed it could do well; was better able to hand the cold after additional introductions were made from cooler areas and the plant was improved

Other information: good hay for cattle; needs deep, dry, upland soil; less nutritious than *Trifolium pratense* but grows faster and can be cut more often; can plant alone or with barley or oats, will last 9 to 10 years before re-seeding is needed

Sources: Bradley (1822, March 23); Buel (1836b, April); Buel (1837b, August); Carman et al. (1934); Deane (1822); Livingston (1792); McVaugh (1958); Russell (1976); Stoddart (1886); 1835, March. *The Cultivator*, 2, 37; 1820, February 5. *The Plough Boy*, I, 284-286; Tomlinson (1836, May).

Family: Fabaceae

Latin name: *Onobrychis* spp.

Common names: Lupinella, St. Foin, sainfoin, sanfoin

Native range: Eurasia

North American range: continent-wide except the southeast

Wetland indicator status: n/a

In Columbia County wet meadows?: n

Introduction details: Popular in Britain by 1751 but thought that hot, dry summers and cold winters in US would make it impractical there; “widely planted” in New England with *Trifolium*, *Medicago sativa*, and “artificial grasses” by 1753; William Logan of Philadelphia planted seed sent by Mr. Ellis from England in 1755 (died from drought); Recommended by Rev. Dr. Henry Muhlenberg from Lancaster, PA to Dr. Mitchill of NY in 1793; Capt. William H. Crawford, Secretary of War, brought several bushels of seed from Italy and distributed it in 1820; attempts to grow in America still unsuccessful by 1820s

Other information: good for neat cattle and horses; matures 2-3 weeks before *Trifolium* and good for building soil; grows anywhere but stony ground, produces 2 crops per year, will last 9 to 12 years before re-seeding required; adapted to calcareous upland soils, so need to dress with marl, etc.

Sources: Buel (1823, December 20); Buel (1836, March); Buel (1837a, August); Carman et al. (1934); Delabigarre (1792); Kerr (1964).

Family: Fabaceae

Latin name: *Trifolium aureum*

Common names: hop clover, palmate hop clover

Native range: Europe

North American range: continent-wide except the southwest and Great Plains

Wetland indicator status: n/a

In Columbia County wet meadows?: y

Introduction details: "hop clover" sown in Orange Co. alone 1727 (died from cold) and with *Phleum pratense* in 1728 (died from heat)

Other information: "hop clover" sown in Orange Co. in wet parts of fields and in a meadow

Sources: Haley (1989); McVaugh (1958); Stoddart (1886).

Family: Fabaceae

Latin name: *Trifolium pratense*

Common names: red clover

Native range: Europe

North American range: continent-wide

Wetland indicator status: FACU

In Columbia County wet meadows?: y

Introduction details: sown with *Trifolium repens*, trefoil, *Lolium perenne*, *Dactylis glomerata*, etc. in Britain; probably very early because many people believed it was native to the US; sown alone and with *Trifolium pratense* and *T. repens* in Orange Co., NY in 1728-1730 in a wheat field, "swamp," and limed meadow; in 1747 Benjamin Franklin planted on a drained NJ pond with *Holcus lanatus*, *Phleum pratense*, and *Agrostis capillaris*, also on a frequently-flooded meadow in NJ; known in PA by 1740; seen around NY City in 1749; hard to find good seed in 1755, still came from England; known in eastern NY by 1800; in early 1820s, one of few cultivated species in US along with *Trifolium repens*, *Phleum pratense*, and *Agrostis capillaris*

Other information: red the "most generally cultivated" of the clovers because of highest yield; broad leaves, good growth; not good as permanent grassland but used in rotation with grains and grasses in convertible husbandry; often sown with *Phleum pratense* because Timothy takes a few years to be productive and in the meantime clover produces and gives space to grow, although the clover matures 10-15 days earlier; good for hay, forage, green manure where fertilizer is scarce, green fodder; seed probably the most weed-contaminated on the market

Sources: Buel (1836, March); Carman et al.(1934); 1822, May 25. Grasses. *The Plough Boy*, III, 410; Haley (1989); Lemon (1972); McVaugh (1958); Stoddart (1886); Welles (1824, March 6); Whitney (1994).

Family: Fabaceae

Latin name: *Trifolium repens*

Common names: white clover, Dutch clover, ladino clover, white Dutch clover, creeping clover

Native range: Europe

North American range: continent-wide

Wetland indicator status: FACU

In Columbia County wet meadows?: y

Introduction details: Common in English pastures; Probably very early because many people believed it was native to the US; introduced through livestock to New England meadows; in many parts of America it grows "spontaneously" but not often sown intentionally; not usually grown, but appeared spontaneously; in 1659 seed sent from Holland to eastern NY; 1740s planted by Jared Eliot on a drained pond with *Agrostis* or *Poa*, *Poa annua*, and *Phleum pratense*; 1747 planted by Benjamin Franklin on a frequently-flooded meadow in NJ; seen near Québec City by 1749; not really known in PA before 1790; in Orange Co., NY *T. pratense* and *T. repens* sown together in 1728 on a wheat field and swamp, and *T. repens* sown with peas in 1729; in early 1820s, one of few cultivated species in US along with *T. repens*, *Phleum pratense*, and *Agrostis capillaris*

Other information: Shrinks and has less nutritive value than *T. pratense*; not good for hay but good for pasture because adapted to trampling, forms a mat close to the ground of creeping stems, grows "spontaneously," and low yield; good pasture with *Alopecurus pratensis*; does well on soils dressed with gypsum, lime, or ashes

Sources: Buel (1823, December 20); Buel (1836, March); Donahue (2004); 1822, May 25. Grasses. *The Plough Boy*, III, 410; Haley (1989); Lemon (1972); McVaugh (1958); Stoddart (1886); Welles (1824, March 6); Whitney (1994).

Family: Poaceae

Latin name: *Agrostis capillaris*

Common names: herd's grass (middle/southern states), red-top (New England, US), colonial bentgrass, white-top, foul/fowl meadow grass (east), duck grass, swamp wire grass, English grass?, spire grass?, burden grass?, Burden's grass?, blue bent?, Rhode Island bent, fine bent, browntop, Waipu bent, English bent, furzetop, Prince Edward Island bend, dew grass, Astoria bent

Native range: Europe

North American range: continent-wide except the southwest and Great Plains

Wetland indicator status: FAC

In Columbia County wet meadows?: n

Introduction details: probably introduced early because many people thought it was native; "fowl meadow grass" traditionally claimed to have been brought to the Neponset River at Dedham, MA by a flock of wild birds before 1710; first cultivated in RI; mentioned by 1747 in literature; in 1749 was planted by Benjamin Franklin on a drained pond in NJ, along with *Phleum pratense*, *Holcus lanatus*, and *Trifolium pratense*; in 1756 English grass was grown on a drained swamp in MA with *Trifolium*, hemp, and cabbages; again brought to NJ from New England by William Foster, and arrived in PA ca. 1810; may have been first introduced to NS and New England by colonists who used it on ships as bedding; one of few cultivated species in America along with *T. repens*, *T. pratense*, and *Phleum pratense* in early 1820s; in 1831 described as "one of our most profitable grasses for low land meadows, should never be sown upon upland as the roots are very troublesome in cultivated fields"

Other information: "fowl meadow grass" was a "superior type of herbage" and made good hay and pasture; convenient to farmers because can be mown anytime between July and October; produced one crop per year, has higher water content than *Phleum pratense*, softer than *Trifolium pratense* so good for pressing/shipping; very good on wet soils including wetlands; very good on drained soils

Sources: Buel (1923); Buel (1836, June); Carman et al. (1934); Clark & Malte (1913); Coventry (1978); Deane (1822); 1822, May 25. Grasses. *The Plough Boy*, III, 410; Monteith (1930); Odland (1930); 1826, June 9. On Grasses, No. II. *New England Farmer*, IV, 361-362; Russell (1976); Stoddart (1886); 1820, February 26. *The Plough Boy*, I, 310.

Family: Poaceae

Latin name: *Agrostis gigantea*

Common names: herd's grass (middle states) red-top (New England), fiorin grass (England), fowl meadow grass, black bent, water bentgrass, creeping bent, carpet bent, seaside bent, whitetop, English bent, southern bent, marsh bent, couch grass, Rhode Island grass (northeast), marsh bent grass (England), redtop

Native range: Eurasia

North American range: continent-wide

Wetland indicator status: FACW

In Columbia County wet meadows?: y

Introduction details: in early 1800s began to be used in Britain in cold, wet, mountainous areas unsuitable for other species; common in Ireland; probably introduced early to US because some people thought it was native; "bent grass" first cultivated in Rhode Island and then elsewhere in New England by 1647; "fowl meadow grass" traditionally claimed to have been brought to the Neponset River at Dedham, MA by a flock of wild birds before 1710; 1740s planted by Jared Eliot on a drained pond in CT with *Poa* and *Phleum pratense*; "bent grass" 1787 seen along the Susquehanna several feet tall; "redtop" common in the eighteenth century; much talked about in US but doesn't seem to have caught on by 1820s; drew attention in England by 1830s

Other information: "fowl meadow grass" was a "superior type of herbage"; good for pasture, including on poor soils; good hay if cut early, and nutritious, including on poor soils; not as high-yielding as *Phleum pratense*; the most-cultivated species in US in 19th Century; tolerates cold and moisture; good in areas where other grasses won't grow; very good on wet soils, including wetlands; today considered an aquatic invader and can create a thick mat that is a barrier to seed establishment

Sources: Buel (1823, December 20); Buel (1836b, May); Buel (1836, June); Clark & Malte (1913); Coventry (1978); Deane (1822); Goodsell (1831); Kerr (1964); Monteith (1930); 1826, June 9. On Grasses, No. II. *New England Farmer*, IV: 361-362; Russell (1976); Stoddart (1886); 1820, February 26. *The Plough Boy*, I, 310; USGS (2011); Welles (1824, March 6).

Family: Poaceae

Latin name: *Alopecurus pratensis*

Common names: meadow foxtail, foxtail

Native range: Europe

North American range: continent-wide except southern states

Wetland indicator status: FAC

In Columbia County wet meadows?: n

Introduction details: A good pasture grass in England where it was usually sown with 5 or 6 other grasses; known in the US from the 1700s but not extensively cultivated until 1800s; recommended by Rev. Dr. Henry Muhlenberg of Lancaster, PA to Dr. Mitchill of NY in 1793; "copper or blue grass" with similar description was growing in Claverack, Dutchess Co. and Cossackie, Greene Co., NY in 1786; sown with red and white clover in Dutchess Co. in 1789; in 1830s, grew in PA and around NY

Other information: good pasture and hay, including with *Trifolium repens* and *Lolium perenne*; popular with sheep; looks like *Phleum pratense* but in different habitat; good in clayey soils, moist soils, and under irrigation; doesn't grow on too wet or too dry soils; grows quickly after being harvested; early growth/maturity; high yield and nutritious, can last 9 or 10 years without reseeding; can be cut twice per year; does well in wet soils; does well in drained wetlands; does well in "watered" meadows

Sources: Coventry (1978); Graves (1822); Kerr (1964); n.a. (1792); Stoddart (1886); 1820, February 5. *The Plough Boy, I*, 284-286.

Family: Poaceae

Latin name: *Anthoxanthum odoratum*

Common names: sweet vernal grass, sweet-scented vernal grass

Native range: Eurasia

North American range: continent-wide except the southwest and Great Plains

Wetland indicator status: FACU

In Columbia County wet meadows?: n

Introduction details: common in English pastures in 1830s; probably introduced to US early because some people thought it was native; recommended by Rev. Dr. Henry Muhlenberg of Lancaster, PA to Dr. Mitchill of NY 1793; seeds sold in NYC, Philadelphia, and Boston by 1830s; naturalized in American meadows by 1880s; not as widely adopted as other species

Other information: not good for hay because of small size; good for lawn or pasture if mixed with other species; good in a variety of soils; early growth; quickly regrows after harvest; good in wet soils and wetlands; good in "watered" meadows

Sources: Buel (1823, December 20); Buel (1836, June); Buel (1837a, August); Buel (1837b, August); n.a. (1792); 1820, February 5. *The Plough Boy, I*, 284-286; Welles (1824, March 6); Whitney (1994).

Family: Poaceae

Latin name: *Dactylis glomerata*

Common names: orchard grass (US), cocksfoot (UK), rough cock's foot?, swamp cock's foot

Native range: Europe

North American range: continent-wide except some northern and central provinces

Wetland indicator status: FACU

In Columbia County wet meadows?: y

Introduction details: along with *Phleum pratense*, seeds sent to London Society of Arts, Manufactures and Commerce in 1763 and grown near London (94); common English pasture grass; by 1820s grown in England with *Trifolium* as a substitute for *Lolium perenne* and *Trifolium*; probably introduced early because people thought it was native; in 1830s only known from experiments at Woburn in England and not yet in use in US; farmer in central NY was growing "orchard grass" in 1791 using seed from RI; recommended by Rev. Dr. Henry Muhlenberg of Lancaster, PA to Dr. Mitchill of NY in 1793; George Washington wrote to a British researcher in 1797 that *Dactylis glomerata* and *Trifolium* made a good forage and hay mix; in 1820s beginning to replace *Phleum pratense* as grass of choice around Philadelphia; a promising grass by 1824 in MA

Other information: excellent pasture and hay; will form tussocks if not sown thickly and/or with other species; mixed with rye, *Phleum pratense*, or *Trifolium*; matures early and grows quickly after cropping; sheep like it; tolerance of varying light levels make it good for orchards; good in a variety of soils, climates, and light levels including orchards; does well in "watered" meadows

Sources: Beddows (1968); Buel (1823, December 20); Buel (1836b, May); Buel (1836, June); Buel (1837a, August); Kerr (1964); Stoddart (1886); Welles (1824, March 6); Whitney (1994).

Family: Poaceae

Latin name: *Festuca ovina* or *rubra*

Common names: sheep or red fescue

Native range: Europe

North American range: *F. ovina*: Northeast, Pacific coast, assorted other states; *F. rubra*: continent-wide

Wetland indicator status: FACU

In Columbia County wet meadows?: y

Introduction details: Probably introduced early because some people thought it was native; in 1830s not really cultivated or well-known in America, seeds not available in stores

Other information: good for pastures and lawns; good as sheep pasture; used for turf and erosion control/ground cover; low, densely tufted; creeping rootstock; good in poor, disturbed, and wet soils, including wetlands

Sources: Buel (1836b, May); Buel (1836, June); Stoddart (1886).

Family: Poaceae

Latin name: *Glyceria maxima*

Common names: reed meadow grass, water meadow grass, reed mannagrass, reed sweet grass

Native range: Eurasia

North American range: northeastern provinces, Pacific northwestern provinces and Alaska

Wetland indicator status: OBL

In Columbia County wet meadows?: n

Introduction details: one of the most useful grasses in Britain by 1820s; just gaining notice in US 1820s; not cultivated by 1830s

Other information: high-yield hay; fast-growing, can be cut three times per year in Britain; cattle and swine like it; often sown with *Phleum pratense*; good in wetlands; good in drained wetlands; considered a noxious weed in some parts of the Northeast

Sources: Buel (1823, December 20); Graves (1822).

Family: Poaceae

Latin name: *Holcus lanatus*

Common names: velvet grass or meadow soft grass, woolly soft grass or Yorkshire white (England), Salem grass or white timothy (New England), velvet lawn grass or velvet mesquite grass US south), Yorkshire fog, feather grass, white cap

Native range: Europe

North American range: continent-wide except northern Great Plains and far northwestern provinces

Wetland indicator status: FACU

In Columbia County wet meadows?: y

Introduction details: Common in British fields at an early date; probably introduced early because some people thought it was native; sowed in an Orange Co., NY wet field in 1728 and with oats and in “wet ground” in 1729; recommended by Rev. Dr. Henry Muhlenberg of Lancaster, PA to Dr. Mitchill of NY in 1793; planted in 1749 by Benjamin Franklin on a drained pond in NJ with *Phleum pratense*, *Holcus lanatus*, and *Trifolium pratense*

Other information: no good for hay or pasture, sometimes used as an ornamental; easy to cultivate, very productive; late-flowering, disliked by cattle, not often propagated artificially even though its seeds are easily harvested; good in wet soils or poor, dry soils; good in “watered” meadows

Sources: Buel (1836b, May); Buel (1837a, August); Carman et al. (1934); Haley (1989); Muhlenburg (1792); Stoddart (1886).

Family: Poaceae

Latin name: *Lolium perenne*

Common names: ray grass, rye grass, perennial ryegrass, Italian rye grass, darnel, Pacy's/Pacy grass

Native range: Europe

North American range: continent-wide

Wetland indicator status: FACU

In Columbia County wet meadows?: y

Introduction details: grown in Britain as early as 1577 and remained very common in British pastures by 1820s, more so than any other grass, large part because seed was easy to get and was reliably clean; began to be used elsewhere in the UK and Europe by 1830s and valued in Europe by 1880s; recommended by Rev. Dr. Henry Muhlenberg of Lancaster, PA to Dr. Mitchill of NY in 1793; hadn't done well in America because of winter kill until some success in mid-1830s; someone in Hoosick, NY planted it unsuccessfully in 1833; introduced to US in 1833; NY Agricultural Society distributed seeds to interested farmers in 1834; Dr. Beekman of Kinderhook planted some in 1834 but failed; Jesse Buel planted some in 1834 but failed

Other information: Good as hay and pasture; adapted to trampling and cattle like it but short-lived; in 1820s Britain it was thought it might overrun the land, especially wet land; often sown with clover or other species; can handle frost better than other species; can be cut 2-4 times/year and a good soil-builder; good in wet or clayey soils; good in "watered" meadows

Sources: Beddows (1968); Buel (1823, December 20); Buel (1836b, May); Buel (1836, June); Buel (1837b, August); Graves (1822); Grove (1835, March); Kerr (1964); Muhlenberg (1792); Stoddart (1886); 1835, June. *The Cultivator*, 1, 53; 1835, August. *The Cultivator*, 2, 83; 1820, February 5. *The Plough Boy*, 1, 284-286; Welles (1824, March 6); Whitney (1994).

Family: Poaceae

Latin name: *Poa annua*

Common names: speargrass

Native range: Europe

North American range: continent-wide

Wetland indicator status: FACU

In Columbia County wet meadows?: n

Introduction details: one of the most common grasses in Britain by 1820s; introduced through livestock to New England meadows; most common grass and didn't need to be sown because it grew everywhere

Other information: used for pasture, but at least in Britain very short and as an annual not long-lasting; may have been undesirable because it could "overrun" or "run out" meadows planted with *Phleum pratense* or *Trifolium*; grows on a variety of soils

Sources: Donahue (2004); Goodsell (1831); Graves (1822).

Family: Poaceae

Latin name: *Poa compressa*

Common names: wire grass, blue grass, Canada bluegrass, Dutch grass?, couch grass? (England), flat stalked meadow grass

Native range: Europe

North American range: continent-wide

Wetland indicator status: FACU

In Columbia County wet meadows?: n

Introduction details: probably introduced early because some people thought it was native; "copper or blue grass" with similar description was growing on a field in Claverack, Dutchess Co., NY in 1786

Other information: Good, dense hay because it was easily cured; good for pasture; livestock, especially sheep, like it; a pest in tilled grounds; either low in nutrition or nutritious; small yields; good in poor or dry soils

Sources: Buel (1823, December 20); Buel (1836, June); Coventry (1978); Deane (1822); Stoddart (1886).

Family: Poaceae

Latin name: *Poa palustris*

Common names: Fowl meadow-grass, fowl bluegrass, fowl meadow grass, false red top, duck grass, swamp wire grass

Native range: Eurasia

North American range: continent-wide except the South

Wetland indicator status: FACU

In Columbia County wet meadows?: y

Introduction details: probably introduced early because in 1761 Jared Eliot wrote to the London Society of Arts, Manufactures and Commerce that along with *Phleum pratense* "fowl meadow grass" was the only native grass used in American agriculture

Other information: used for hay; 1749 account by Jared Elliot says it presses/ships well and is therefore better than *Phleum pratense*; good when mixed with other species; similar to *Glyceria striata*; does well in New England and NY; did well on wet soils and wetlands

Sources: Beddows (1968); Donahue (2004); Stoddart (1886).

Family: Poaceae

Latin name: *Poa pratensis*

Common names: fescue grass, green grass, spear grass, Kentucky bluegrass, smooth stalked meadow grass, great meadow grass, June grass, English grass, redtop

Native range: Eurasia

North American range: continent-wide

Wetland indicator status: FACU

In Columbia County wet meadows?: y

Introduction details: common in English pastures; probably introduced early because some people thought it was native; introduced through livestock to New England meadows; no need to sow, common everywhere by 1836; common in PA by 1822; in 1749 Benjamin Franklin grew it with *Trifolium repens* on a ditched meadow that was frequently flooded in NJ; seen near Québec City in 1749; most common pasture grass in Europe and America by 1824; most well-known and valued of the *Poas* by 1880s; naturalized in northern, northwestern, and Atlantic regions of the US

Other information: good for hay but mainly used for pasture, often with *Trifolium repens*; adapted to trampling; often grown “upon meadows made by banking out rivers” but also good for dry pasture; low yield for hay; good for winter grass in the southern US because able to tolerate hot summers; good in a variety of soils

Sources: Buel (1823, December 20); Buel (1836b, May); Buel (1836, June); Carman et al. (1934); Deane (1822); Donahue (2004); Kerr (1964); n.a. (1792); Stoddart (1886); Welles (1824, March 6); Whitney (1994).

Accepted names and North American range from USDA, NRCS (2012).

Wetland indicator status for the North-Central/Northeast, Lichvar & Kartesz (2009), parenthetical statuses are from the 1988 list (not on the 2012 list), US Fish and Wildlife Service (1988).

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Vita

- 2013 **Pennsylvania State University**, Doctor of Philosophy, Geography. *Informing Environmental History with Historical Ecology: Agricultural Wetlands in New Netherland, 1630-1830.*
2006 **Syracuse University**, Master of Arts, Geography. *A Descriptive and Analytical Biogeography of Earthworms (Annelida: Oligochaeta) in the Yukon Territory, Canada*
2004 **SUNY Geneseo**, Bachelor of Arts, Geography

Employment and Appointments

- 2010-2013 **NYS Museum Research & Collections**—Research Associate, Biology
2012 **Penn State**—Instructor, *Mapping our Changing World*
2008-2012 **Penn State**—TA, *Introduction to Mapping; Biogeography and Global Ecology; The American Scene*
2007-2008 **Springfield City School District, MA**—Earth Science Teacher
2006-2007 **University of Georgia Institute of Ecology**—Lab Manager, Research Assistant
2004-2006 **Syracuse University**—TA, *The Natural Environment; Cartographic Design*

Select Conference Presentations

- 2013 **Geological Society of America Northeastern Section**, *Multi-Proxy Reconstruction of a Floodplain Wetland in Eastern New York State, with Emphasis on the Historical Period*
2012 **Association of American Geographers (AAG)**, *Informing Environmental History with Historical Ecology: Agricultural Wetlands in New Netherland, 1620-1800*
2010 **AAG**, *The Contribution of European Landscape Gardening to the Flora and Fauna of the Northeastern United States*
2009 **Hudson River Environmental Society**, *The Introduction and Naturalization of Exotic Ornamental Plants in New York's Hudson River Valley*
2009 **AAG**, *Charismatic Exotic Species in the Hudson Valley*
2006 **Northeast Natural History Conference IX**, *Mastodon Diet Inferred from Sites in NY*
2006 **AAG**, *An Analytical and Descriptive Biogeography of Earthworms (Annelida: Oligochaeta) in the Yukon Territory, Canada*
2005 **AAG**, *Dung Deal: Mastodon Digesta as a Paleobiogeographic Proxy Record*
2003 **AAG**, *Preserving Rural Character through Urban Conservation in Geneseo, NY*
2002 **Annual Tourism Conference**, *Ecotourism and the Sustainable Biosphere Initiative*

Publications

- 2012 Teale, C. & N. Miller. Mastodon Herbivory in Mid-Latitude Late Pleistocene Boreal Forests of Eastern North America. *Quaternary Research*, 78, 72-81.
2011 Teale, C. A revised account of initial mute swan (*Cygnus olor*) introductions to the northeastern United States. *Biological Invasions*, 13, 1729-1733.
2011 Teale, C. The Introduction and Naturalization of Exotic Ornamental Species in the Hudson Valley. Ch. 13 In R. Henshaw (ed.) *Environmental History of the Hudson Valley*. Albany, NY: SUNY Press.
2007 Teale, C. A preliminary survey of the oligochaete fauna of the Yukon Territory, Canada. *Megadrilologica*, 11, 3-7.
2003 Teale, C. Ecotourism and the Sustainable Biosphere Initiative. Chapter 20 In A. Capacci (ed.) *Paisaje, Ordenamiento Territorial y Turismo Sostenible*. Génova, Italy: Brigati.

Select Grants and Awards

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| Maxwell Dean's Summer Stipend | Cunningham-Quinn Library Research Fellowship |
| Larry J. Hackman Research Residency | Best AAG Biogeography Masters Paper |
| E. Willard Miller Award in Geography | NSF Doctoral Dissertation Research Improvement Grant |
| Society of Women Geographers National Fellowship | |