Turf Management Plan for Martin Van Buren National Historic Site

Kinderhook, New York

Historical Overview

Existing Conditions

Lawn Preservation Guidelines

Lawn Maintenance Guidelines

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TABLE OF CONTENTS

LIST OF ILLUSTRATIONS **V**

FOREWORD **VII**

ACKNOWLEDGMENTS **IX**

INTRODUCTION **1**

1. HISTORICAL OVERVIEW **3**

Site History 3
Lawn History 6
Summary 14

2. EXISTING CONDITIONS **17**

Setting 17
Climate 17
Soils 17
Light 18
Turf Composition 18
Maintenance Practices 18
Lawn Use 21

3. LAWN PRESERVATION GUIDELINES **23**

Management Philosophy and Objectives 23

4. LAWN MAINTENANCE PRACTICES **29**

Overview 29
Preservation Maintenance 29
Integrated Pest Management 35
Maintenance Calendar 41
Record Keeping 42

REFERENCES **43**

APPENDICES **45**

A. Site Analysis Results 45
B. Evaluation of Historic Lawns and High Cut Mowers 53
C. Directions for Soil Sample Collection 61

LIST OF ILLUSTRATIONS

FIGURES

Introduction

0.1 Context map: Kinderhook, New York 2

Historical Overview

1.1 Environmental context, Van Ness Period 3
1.2 Sketch map of Lindenwald, circa1841 4
1.3 Martin Van Buren, portrait, circa1844 6
1.4 *Pastoral Landscape*, 1645, Claude Lorrain 7
1.5 Blenheim palace, Oxfordshire, United Kingdom 7
1.6 Cast-iron roller 12

Existing Conditions

2.1 Front lawn, turf close-up 18
2.2 Front lawn, Historic American Buildings Survey 21

TABLES

Historical Overview

1.1 Lawn Grasses of New York 10
1.2 Lawn Grasses listed in *The American Farmer*, 1851 11
1.3 Common Weeds of New York 11

Existing Conditions

2.1 Front Lawn Turf Inventory 20

Lawn Maintenance Practices

4.1 Custom Turfgrass Mix 30
4.2 Turf Management Quick Reference Calendar 41

DRAWINGS

1 Project Area 25
2 Turf Management Zones 27

FOREWORD

The completion of this plan comes at an opportune time as the Martin Van Buren National Historic Site is undergoing its first General Management Plan. The General Management Plan will use the best information available in current scholarship to develop several alternative visions for the future of the site. The Olmsted Center for Landscape Preservation has already contributed two Cultural Landscape Reports and a Cultural Landscape Treatment Plan for the historic core, key documents upon which the NPS has relied for managing Van Buren's Lindenwald. This fascinating report will certainly be an important part of any discussion regarding the Lindenwald cultural landscape.

I would like to convey the park's gratitude to the Olmsted Center for Landscape Preservation, in particular Charlie Pepper and Matthew Quirey, for building upon earlier work by Marty Petrovic at Cornell University to produce this useful report providing first-rate scholarship and practical guidelines for maintenance of the historic lawn. Implementation of the plan will not only result in a more accurate appearance for Lindenwald, but will also better protect landscape resources and enhance the visitor experience.

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INTRODUCTION

The Hudson River Valley property designated as the Martin Van Buren National Historic Site is significant as the former estate of Martin Van Buren, the eighth president of the United States. He was among the most prominent politicians of his time and an architect of the party system that continues to shape American political life.[1] The property is located on the Albany Post Road near the village of Kinderhook, Columbia County, New York, twenty miles south of Albany and two miles east of the Hudson River.

Van Buren was born in Kinderhook in 1782, the last year of the American Revolution. In 1839, while president, he purchased the site and named it Lindenwald. Under his direction, the property grew to 226 acres and became a grand estate and profitable working farm.[2] He lived at Lindenwald until his death in July 1862, sixteen months into the American Civil War.

After leaving the presidency in 1841, Van Buren returned from Washington, D.C. to his home at Lindenwald. From this location, Van Buren launched two unsuccessful campaigns to regain the Presidency in 1844 and 1848. In this capacity, Lindenwald was a prominent estate that served as much as a public space as a private one and was central to characterizing his social status and supporting his political ambitions.

The Martin Van Buren National Historic Site boundary now encompasses 300 acres, including a 14.3 acre portion of the historic residential core of Lindenwald. Its mission is to interpret and support study and understanding of the life and times of Martin Van Buren while preserving Lindenwald as it appeared during his period of ownership.

The objectives of this report are to identify the characteristics of the 10-acre front lawn as it was in the mid-nineteenth century, the actions necessary to reflect those qualities, and the essential maintenance activities for sustaining the lawn as an important landscape feature at the site. As such, this report documents existing and historic conditions and addresses appropriate maintenance and renovation strategies to preserve and enhance the historic character of the lawn.

This report is based on the *Cultural Landscape Report for Martin Van Buren National Historic Site, Volume 1: Site History, Existing Conditions, and Analysis* (1995), *Cultural Landscape Report Volume 2: Treatment Plan* (1997), the Historic Resource Study *A Return to His Native Town: Martin Van Buren's Life at Lindenwald, 1839—1862* (2006), and other primary and secondary sources from the site and historic archival collections concerning Martin Van Buren and his management of Lindenwald.

As defined in the *Cultural Landscape Report Volume 2: Treatment Plan* (hereafter Volume 2) in 1997, the primary preservation treatment for the lawn is to reflect its appearance during the site's historic period of significance from 1839-1862, the entire span Van Buren owned the property. This turf management plan expands upon the recommendations in Volume 2 by further detailing the treatment of the lawn to the east/southeast of the front of the house, articulating a preservation philosophy for turf management, and establishing guidelines for preservation maintenance (see Drawing 1 and 2).

The recommendations in this turf management plan have been developed in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes* (1996). This report follows methodologies recommended in *A Guide to Cultural Landscape Reports* (NPS, 1998), and *Guide to Developing a Preservation Maintenance Plan for a Historic Landscape* (NPS, 1998).

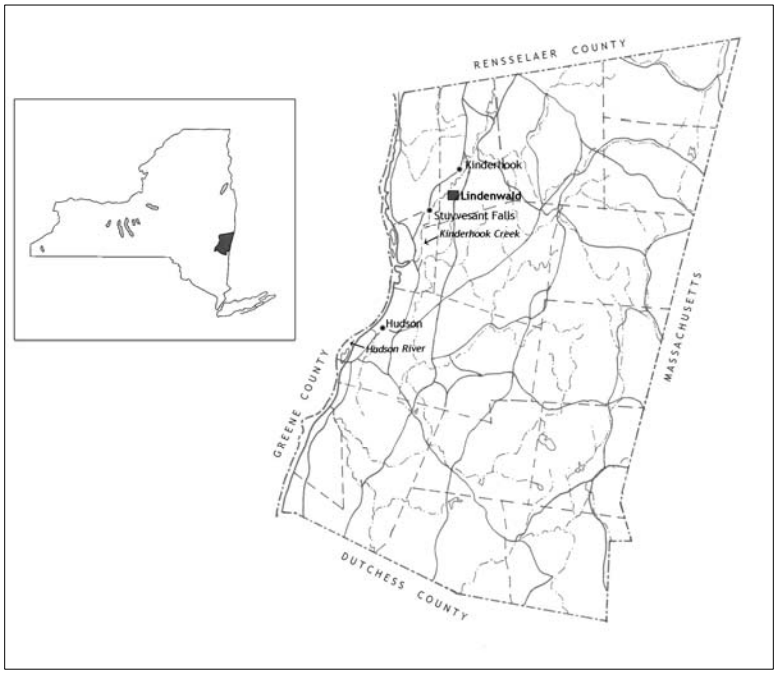

Figure 0.1. Context map: Kinderhook, New York (Uschold, MAVA CLR. 1995).

ENDNOTES

[1] *Interpretive Concept Plan: Martin Van Buren National Historic Site,* National Park Service,-Harper's Ferry Center for Interpretive Planning (2005), 2.

[2] Ibid.

1. HISTORICAL OVERVIEW

SITE HISTORY

Previously inhabited by Native Americans, properties along the Hudson River were later settled by creating manors, principally by the Dutch and then by the English. In particular, the area around Kinderhook had an abundance of farms on large properties and estates. The site that would become Lindenwald was part of a larger parcel purchased in the 1780s by Peter Van Ness, a Revolutionary War commander, New York state senator, and chief judge. A large stone house was situated on gently rolling farmland along Kinderhook Creek. Van Ness named the parcel "Kleinrood."[1] The property was recognized as a respected and established country home.[2]

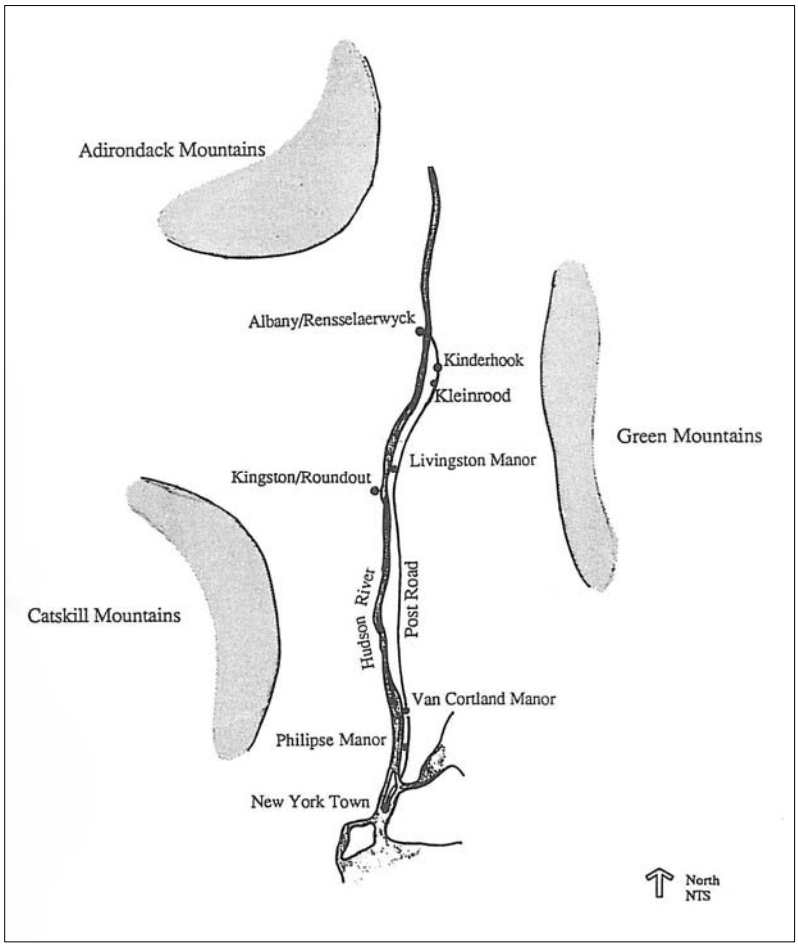

Figure 1.1. Environmental context, Van Ness Period (Uschold, MAVA CLR. 1995).

In 1797, Van Ness built an imposing brick house that would later become the Van Buren home. "The front of the house faced Post Road and the hills beyond the road. . . .This formal arrangement was enhanced by a large front lawn enclosed in a semicircular entrance drive."[3] Van Ness' selection of building site, style and materials, clearly demonstrated his family's social status, wealth, prosperity, political authority, and stability in the region.

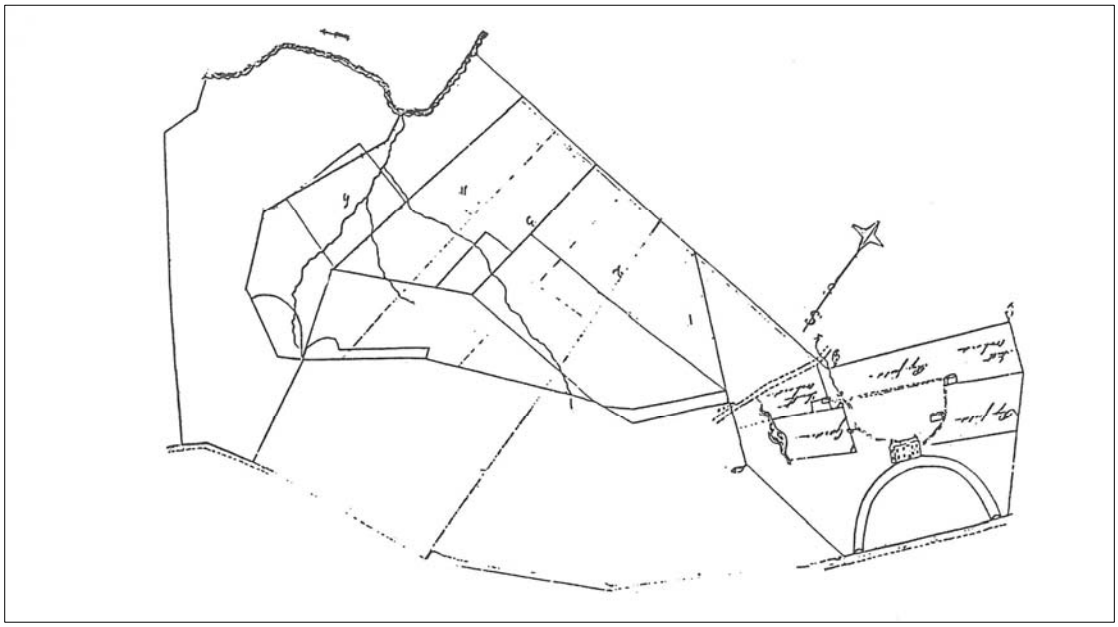

Figure 1.2. Sketch map of Lindenwald, circa 1841 (Uschold, MAVA CLR. 1995).

After the Panic of 1819, which was the first significant financial crisis in the United States, the Van Ness family could no longer support their lifestyle at Kleinrood, and in 1824 the property was auctioned in court to pay off debts.[4] The property was purchased by William Paulding, a close friend of Van Ness and two-term mayor of New York City. Paulding never lived at Kleinrood; he rented land to local farmers, during which time the property slowly began to deteriorate from lack of care.[5]

Van Buren purchased Kleinrood in 1839, while serving as eighth president of the United States, and renamed the property Lindenwald.[6] Interestingly, while Van Buren had grown up in the nearby agricultural village of Kinderhook, he had never shown much interest in the practical aspects of farming.[7] Indeed, he was known as someone who had adopted the trappings of the aristocracy and clearly liked the finer things of life.[8] These facets of his personality ultimately were not at odds with each other and the purchase of a rural "farm", but rather were in keeping with the young republic's dominant political tradition.[9]

After acquiring the property, he took immediate steps to improve deteriorated conditions.[10] He likely considered other presidential estates which showcased the styles and influence of their owners. Van Buren had first-hand knowledge of Jefferson's Monticello which he had visited in 1824 and Jackson's Hermitage where he would spend time in 1842.[11] Each of these men had very impressive estates from which they could express their political views and which served as important symbols of prestige and success.[12] Also, Lindenwald was located on the heavily traveled Post Road connecting Albany to New York City. Since Van Buren intended to have his friends and colleagues visit his home, the Post Road made it a convenient stop along the well traveled route.[13]

Van Buren had long spoken in favor of Jefferson's bucolic vision that identified the nation with independent yeoman farmers.[14] In fact, Jefferson was one of Van Buren's heroes, and Van Buren may have envisioned Lindenwald as a latter day Monticello or George Washington's Mount Vernon.[15] Van Buren, though not such a botanist as Jefferson, developed the landscape of his estate according to the horticultural trends and tastes of the time and in conversations with other gentlemen farmers. While no documentation has been identified that confirms Van Buren consulted with Andrew Jackson Downing, one of the preeminent horticulturists and American garden writers of the period, Van Buren's tastes and intentions were the products of the same "natural" or "English" landscape styles that Downing was promoting.[16]

Van Buren's purchase of Lindenwald and his vision for its design and management was in keeping with other period leaders of his social stature. At this time, men who held positions of authority used the formal spaces of their homes to transact business. Estates like Lindenwald were "inextricably linked to the public work of their residents."[17] The design elements underscored their association with power. Well acquainted with the property since he was fifteen, Van Buren sought to turn the farm into a country gentleman's estate, modeled after properties of the English gentry and prominent Americans of the period. He had seen such European estates himself during the period in which he served as America's Minister to Britain in 1831.

Van Buren improved the site to portray an image of a progressive and capable estate owner and farmer. While considering the advice of other gentlemen farmers and the example of other presidential estates, Van Buren sought to change Lindenwald in ways that would allow visitors to be immediately struck by sweeping lawns and meadows, fine orchards, and fancy gardens that served as a backdrop for the hospitality he extended to his guests. The vast improvements made by Van Buren transformed Lindenwald from a working farm into the property as a country seat, with the necessary formality and elegance.[18]

While set in a different social and geographic context from Mount Vernon or Monticello, Lindenwald was a presidential estate. As such, it was improved and managed for the purpose of receiving visitors and impressing them with the image projected by the grounds and farm.[19] A formal garden and pleasure grounds were laid out in the English style. The locust allée along the curved drive that led to the mansion, establishing a formal and somewhat ceremonial entrance, was retained. The lawn was, according to an early 1840s visitor, "one of the most beautiful lawns I ever saw. . .fresh and smoothly shaven."[20] These improvements set his estate apart from his neighbors.[21] In 1846, an English woman commented "the comforts and elegancies of his residence exactly resemble those we find in the country house of an English gentleman who lives upon his estate."[22]

Figure 1.3. Martin Van Buren, portrait, circa1844 (Library of Congress).

Franklin Ellis in *The History of Columbia County* said of Lindenwald sixteen years after Van Buren's death,

> "It was a home where a refined American gentleman might entertain the cultured and the great of all lands without removing himself from the presence of his peers—the common citizen."[23]

LAWN HISTORY

What is currently thought of as the traditional contemporary lawn in the United States first began to appear in England and France in the seventeenth century. Many formal estate/villa gardens incorporated turf as an element in their grand landscapes. In France, landscape architect André Le Nôtre designed the gardens at Versailles to include a small lawn called a *tapis vert*. The *tapis vert*, or "green carpet" was defined as a portion of a garden or pleasure ground covered in grass and kept closely mown. The term lawn has some derivative from the Old English 'launde' or moor, as a place of wild grass.[24] More generally accepted is the definition given by ecologist Sara Stein who states, "Lawns were named in the fifteenth century after a nubby linen of interesting and irregular texture manufactured in the French town of Laon. Planted with sod dug up from meadows, the grass was not mowed."[25]

The definition of a lawn has evolved radically in the past 250 years. In the sixteenth century a lawn meant an "open space or glade in the woods." In the seventeenth century a lawn consisted of a stretch of untilled ground, either a portion of a garden or pleasure ground, covered with grass. It was not until the eighteenth century that the lawn became closely mown.

In the eighteenth century, British designers began to reject the fashion of formal French landscapes in favor of a more naturalistic style. Paintings by artists such as Claude Lorrain and Salvator Rosa served as inspiration for landscapes created by designers like William Kent (1685—1748) and Lancelot "Capability" Brown (1716—1783), many of which included expansive lawns.

Figure 1.4. Pastoral Landscape, 1645, Claude Lorrain (courtesy of www.claudelorrain.org).

During the eighteenth century, lawns at aristocratic properties were "impressive sweeps of short grass that offered vistas to and from the mansion."[26] This was the style later to be adopted by George Washington and Thomas Jefferson.[27] In fact, cultural historian Elizabeth Rogers contends that "Washington may perhaps be credited as being the father of that important national institution, the American lawn."[28] The grass of his estate at Mount Vernon was described by a Polish aristocrat as "a green carpet of the most beautiful velvet."[29]

Figure 1.5. Blenheim palace, Oxfordshire, United Kingdom (public domain).

Until recently, most scholars believed that the concept of a turf lawn was not widely known or accepted before the Civil War in America. It was believed that most homes were built close to a road with the adjacent land being primarily

beaten or swept dirt covered with sand or pine straw. However, recent research into early American designed landscapes has produced ample evidence of the presence of lawns in pre-Revolutionary America becoming well established by the early national period.[30] In the American colonies, the term lawn referred to a sown or natural area of grass, kept short by scything or grazing.

The concept of turf grass as a lawn in America began to take shape towards the mid to late eighteenth century, having been borrowed from the French and European aristocratic landscapes showing a front yard with turf that would present a formal entrance. The first documented American use of a "lawn" appeared in 1733, described as, "a portion of smooth, grassy ground, usually closely mown in front of or around a dwelling."[31] One of the early English style lawns in America occurred at Monticello, home of Thomas Jefferson, in 1804.[32]

Much of the early lawn "movement" in America was influenced by the developing landscape/horticulture movement spurred by Bernard McMahon, who authored *The American Gardener's Calendar* in 1806, and via horticultural references and architectural pattern books brought over from Europe. Between the American Revolution and the 1820s, much of the landscape style in America followed European fashions and trends.

In 1832 a description of Andrew Jackson's Hermitage differentiated between the yard as a functional area and the lawn as decoration.[33] Thomas Bridgeman, author of the *Young Gardener's Assistant* (1840), provided guidance that shaped the American definition of the lawn; "If there are lawns, they should be frequently…mowed and rolled…to give the whole a neat, regular, carpet-like appearance."[34]

According to George Teyssot, professor of history and architecture and author of *The American Lawn* (1999), "The American lawn is actually a hybrid of two landscape traditions, the colonial era or vernacular garden and the European aristocratic garden."[35] Lawns first appeared on the properties of the well-to-do, fashionable landowners. Lawns were considered a luxury as well as a status symbol, signifying wealth and sophistication. Commonly, in early nineteenth-century America, properties did not include front lawns. Grass was regarded as a ground cover, useful for keeping down dust, protecting children and horses from mud, and for providing pasturage. However, as lawns became more broadly accepted in America toward the middle of the nineteenth century, homeowners were encouraged to plant lawns as good citizens.[36] By the late nineteenth century, lawns became customary and the grazing of animals on the front lawn was no longer accepted in polite society.

Andrew Jackson Downing was the person most responsible for the expansion of the lawn in America. His 1841 *Treatise on the Theory and Practice of Landscape Gardening* was written for the American homeowner. Published in five editions,

Downing promoted the lawn's role as a green backdrop for trees and meandering paths, and insisted that coarse, unruly meadow grass had no place in it. Instead, redtop and white clover should be, "softened and refined by the frequent touches of the patient mower."[37]

Lawn composition

Many grass species native to North America were not in cultivation at the time of European settlement, and were not tolerant to grazing or being closely mown turf as seen in European gardens. The native east coast grasses, which consist of broom straw, wild rye, marsh grass, all have low nutritive qualities and were considered bad for grazing. The first European colonists had no perennial lawn grasses or pasture grasses in America to which they were accustomed. While some European perennial species were introduced in 1633, until the eighteenth century, American farmers made do with wild grasses, and few people grew their own meadows.[38]

Eventually though, unintentionally (seaport dumping) and purposefully, European grasses and clovers were introduced to America and became quickly established.[39] Foreign grasses and weed seeds spread rapidly and would come to be naturalized and accepted as indigenous. An important example of this is Kentucky bluegrass (*Poa pratensis*), the most popular cool climate lawn grass used today. This grass is native to Europe and the Middle East and was established in English lawns by the eighteenth century as Junegrass, also known as smooth meadow grass. By the late eighteenth century, it had become established in America and had at least 27 known common names. In 1780, the Shakers began commercial seed production and established seed houses and nurseries in Philadelphia.[40] From this point on turf seed became more available, and more individuals were able to grow lawns.

A.J. Downing provided the Hudson River Valley with very important information on the management of "dressed grass surface(s)" and designed many landscapes in the 1840s in the country estate style, which included lawns.[41] It was found that European turf grass did very well in the Hudson River Valley because of its similarity in climate to England. In his 1859 book on landscape gardening, Downing recommended for a fine lawn area to be loosely seeded with a mixture of redtop (*Agrostis gigantea*) and white clover (*Trifolum repens*) and frequently mowed. The proportion was 3 to 1 redtop to clover by volume and seeded at a rate of 3 to 4 bushels of the mixture per acre (60-80 lbs. /acre) in the spring for a good fall cover.[42]

A common naturalized cool-season grass that was also used for lawns was sweet vernalgrass (*Anthoxanthum odoratum*), which has *yellow* anthers, not purple, as

with so many other grasses, and produces a commonly recognized pleasant fragrance of Woodruff (*Galium odoratum*) from newly-mown meadow hay.

It is likely most 19th century lawns in the Hudson River Valley region were not of native grasses. The first reported occurrence (year and location) of lawn grasses in New York, as determined from collected specimens in the Bailey Hortorium at Cornell University, are provided in Table 1.1.

Scientific Name	Common Name	Location Collected	Date
Agrostis canina	Velvet bentgrass	Geneva, NY	July 5, 1892
Agrostis capillaries	Colonial bentgrass	Parish, NY	June 1884
Agrostis gigantea (*A. alba*)	Redtop	Seneca Lake, NY	1831
Agrostis stolonifera	Creeping bentgrass	Meadow Vaughns, Washington Co., NY	July 4, 1891
Anthoxanthum odoratum	Sweet vernalgrass	New York City, NY	1874
Festuca ovina	Sheep fescue	Geneva, NY	June 9, 1892
Festuca rubra	Red fescue or Purple fescue	Geneva, NY	June 9, 1892
Festuca trachyphylla	Hard fescue	Taughannock Point, NY	June 10, 1904
Lolium perenne	Perennial ryegrass	Woodmere, Nassau Co., NY	May 24, 1908
Poa pratensis	Kentucky bluegrass	Romulus, NY	1831

Table 1.1. Lawn Grasses of New York as found in the Bailey Hortorium, Cornell University.

An article in a gardener's magazine (1841) suggested using a combination of meadow brome-grass (*Bromus pratensis* , *B. erectus* Sinclair), sheep fescue (*Festuca ovina*), and creeping red fescue (*Festuca rubra*) for lawns. These species were said to be hardy since they thrive for long periods of time. J.C. Loudon (1838), a noted 19th century English garden writer, recommended mixing the following varieties in equal parts: Agrostis vulgaris var. tenuifolia, Hard fescue (*Festuca duriuscula*), Sheep fescue (*F. ovina*), Crested dogstail grass (*Cynosurus cristatus*), Kentucky bluegrass (*Poa pratensis*), Yellow oatgrass (*Avena flavescens*), and Hop clover (*Trifolium minus*); this mix was sown at four to six bushels per acre of land.

The most complicated lawn mixture of the period was found in an article featured in *The American Farmer* (1851) which suggested a diverse mixture* for a hardy, perennial, and dense turf (Table 1.2). Along with many grasses used for lawns, weeds were also introduced to New York State and are listed in Table 1.3.

Scientific Name	Common Name	Quantity of Seed / acre	
Agrostis gigantea (*A. alba*)	Herd's grass or Red-top	1 peck	(0.258 bushel)
Cynosurus cristatus	Crested Dog's-tail	½ bushel	(0.5 bushel)
Festuca duriuscula	Hard fescue	1 gallon	(0.125 bushel)
Festuca ovina	Sheep fescue	1 gallon	(0.125 bushel)
Festuca glauca	Glaucus fescue	1 gallon	(0.125 bushel)
Festuca rubra	Red fescue or Purple fescue	1 gallon	(0.125 bushel)
Festuca ovina hordeiformis	Long awned Sheep's fescue	1 gallon	(0.125 bushel)
Festuca cambrica	Welsh fescue	1 gallon	(0.125 bushel)
Poa pratensis	Kentucky bluegrass	1 peck	(0.258 bushel)
Trifolium arvense	Yellow clover	2 pounds	
Trifolium repens	White clover	3-4 pounds	

Table 1.2. Lawn grasses listed in The American Farmer (1851).

Common Name	Location Collected	Date
Broad leaf plantain	Lodi, Seneca Co.	1831
Dandelion	Warwick, Orange Co.	1846
Goosegrass	Buffalo	1831
Ground ivy	Warwick, Orange Co.	1846
Hawkweed, orange	Kellogsville, Cayuga Co.	June, 1879
Henbit	Staten Island	May 31, 1874
Large crabgrass	Oswego Co.	1866
Narrow leaf or buck horn plantain	Gowanus, Long Island	1880
Nimblewill	Aurora	Oct. 2, 1874
Nut sedge	Ithaca Marsh	Sept. 28, 1874
Oxeye daisy	New York City	1873
Red clover	Lansingburg, Renesselaer Co.	1845
Yellow foxtail	Kellogsville	Oct. 4, 1849

Table 1.3. The first reported occurrence (year and location) of common lawn weeds in New York, as determined from collected specimens in the Bailey Hortorium at Cornell University.

Lawn establishment

Preparing ground for lawn installation was recognized as being very important for turf establishment and resulting visual quality. Downing (1844) recommended that the soil be thoroughly trenched. In the fall the ground should be ploughed at least six inches deep, sub soiled, and harrowed. The stones should be cleared, and manure can be put out; the soil should be left this way for the whole winter. The seeds should be sown in early spring after stirring the soil. It is very important to distribute the seeds liberally for a thick lawn.[43]

Loudon (1838) recommended that before seeding, the soil be leveled, raked and rolled, and that if the owner was well-off, turf be cut from a pasture. He also described in detail an irrigation system that could be employed in lawns. When installing a new lawn, in addition to being ploughed, sub soiled, harrowed, and manured, he recommends the ground should be, "…dressed with ashes, lime, or marl, say 50 bushels to an acre, then carefully harrowed until made of fine tilth, when the grass seeds should be sown by a hand competent to distribute them evenly, then they should be harrowed lightly in, and the ground rolled."[44]

It was recommended that the lawn should not be mowed or grazed the first season of its growth. Any weeds should be removed by hand. The following spring it was suggested that the lawn be rolled and mowed every few weeks.[45]

Figure 1.6. Cast-iron roller (Barron, L. Lawns and How to Make Them, Double Day, Page & Co., 1910).

Lawn mowing and care

Before the late nineteenth century most lawns were either grazed or cut with a scythe. Most of them were cut no more than four to five times a growing season. Until 1832 mowing a lawn meant scything it. The low frequency of mowing was in no doubt due to the level of effort and time it took to cut with a scythe. First, it was rolled and then a day or two later it was scythed. This practice began to change in 1830 when Edwin Beard Budding, a fireman in a Gloustershire, England cloth factory, realized that the machine used to shear nap on velvet could, with some modification, also be used to cut grass.[46]

The first English patent for a mechanical lawn mower, described as a "Machine for Mowing Lawns, etc.", was granted on August 31, 1830.[47] It was a reel-type mower that had a series of blades arranged around a central cylinder. John Ferrabee, owner of Phoenix Foundry at Thrupp Mill, Stroud, England, first produced the “Budding Lawn Mower” in 1832.[48] However, the transition from scythe to mechanical lawn mower took some time to fully realize. In 1850 the *Gardener’s Chronicle* recommended the use of both mower and scythe since, “In wet weather, or on moist soils, it is almost impossible to get the machine to work well, whilst in droughts it is nearly as difficult to make the scythe cut the grass.”[49]

In the United States the first patent for a similar reel-type lawn mower was granted to Amariah Hills on January 12, 1868. These early American lawn mowers were often designed to be horse drawn; the horses oftentimes were fitted with oversize leather booties to prevent lawn damage.[50] In 1870, Elwood McGuire of Richmond, Indiana, designed a very popular human pushed lawn mower. While not the first to be human pushed, McGuire's design was very lightweight and a commercial success. Subsequently, steam powered lawn mowers appeared in the 1890's. And in 1902, Ransome produced the first commercially available mower powered by an internal combustion gasoline engine. These gasoline powered lawn mowers were first manufactured in the United States in 1919 by Colonel Edwin George.[51]

A *Horticultural Architecture* (1835) article recommends that lawns be mowed frequently to maintain softness and color, specifically every three weeks. The same article advises that, “After each mowing the lawn must be neatly swept, and then rolled with a roller of iron, preferable to one of stone.”[52] By 1853 Downing suggests even more frequent mowing. In his “Rural Essays” he lists the keys to having a fine lawn as deep soil, sowing the appropriate grasses, and frequent mowing. According to Downing, lawns should be cut with a broad-bladed scythe or mower every ten days or two weeks, preferably the former; the lawn should be rolled prior to mowing, when the grass is damp.[53]

SUMMARY

Much of the early acceptance and development of lawns in America stemmed from landscape design and gardening practices in Europe. Architectural stylebooks, magazines, and European visits served to mold the American vision of what a lawn should be. However, while the practice of maintaining lawns was well accepted by the early nineteenth century in Europe, lawns were not a standard feature of the average American home landscape until the early twentieth century. However, at the estates of the social elite and well-to-do Americans, lawns were in vogue and highlighted as prominent landscape features as early as the eighteenth century.[54]

When Martin Van Buren purchased Lindenwald in 1839, he was president of the United States and had firsthand knowledge of upper-class European landscapes and renowned American estates and presidential homes, such as Monticello and the Hermitage, which showcased the reputation, social standing and influence of their owners. Much like these property owners, Van Buren envisioned Lindenwald as an impressive estate from which he could express his political views and which would serve as an important symbol of prestige and success.[55] As such, the front lawn at Lindenwald was undoubtedly managed as a focal point of the property.

Van Buren sought to improve Lindenwald in ways that would allow visitors to be immediately awe struck by sweeping meadows, fine orchards, and fancy gardens serving as a backdrop for the hospitality he extended to his guests. Lindenwald had an important social and political function in Van Buren's life, and this was an important reason for operating and maintaining the landscape the way he did. This is seen in his decision to retain the locust allée along the curved drive that led to the mansion because it established a formal, ceremonial entrance. It is in this setting that the lawn should be preserved and maintained as a primary formal feature of the site.

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2. EXISTING CONDITIONS

SETTING

The core area of the Martin Van Buren National Historic Site where the lawn is situated is on the east side of the upper Hudson River Valley, approximately two miles from the river and twenty miles south of Albany, New York. The lawn area at the site is relatively flat, but just beyond, the property begins to gently slope toward the Kinderhook Creek. The lawn and associated historic residential landscape at the site are situated in a rural setting and are surrounded by agricultural fields.

The region is characterized by widely scattered houses, small farms and wooded areas. The nearest village is Kinderhook, located just northwest of the site. The main entrance to the site is off Route 9H, a well traveled two-lane state road that provides north/south access.

The following maps show the Martin Van Buren National Historic Site and a more detailed view of the area around the Lindenwald mansion, including the front lawn.

CLIMATE

Martin Van Buren National Historic Site is in a temperate northern climate with cold winters averaging below freezing and moderate summers. Temperatures can fall below zero for fifteen days or more during the winter and reach summer highs in the low nineties. Precipitation occurs fairly evenly throughout the year with an average snowfall of sixty inches, and an average rainfall of thirty-eight inches per year. The relative humidity can be high in the summer months. The site is in zone 5a of the *USDA Plant Hardiness Zone Map* (United States Department of Agriculture, 1990).

SOILS

Most of Martin Van Buren National Historic Site is located on excessively well-drained soil. Based on data provided by the Natural Resources Conservation Service, the soil where the front lawn is located is a Hoosic gravely sandy loam that is considered well drained.

Soil analysis at the site (Appendix B) indicates a moderately fertile soil with organic matter content of 3.6 percent. The front lawn area is relatively flat with minimal grade change and appears to be very well drained.

The extent of soil disturbance in the lawn area is not known, although it appears that there have been minimal changes to the site since the historic period.

LIGHT

The lawn at Martin Van Buren National Historic Site is composed of ten acres that consist of open and partially shaded turf. The outer perimeter of the lawn is lined with black locust and pine trees that provide filtered shade. There are several clumps of trees in the north eastern center and south western portions of the lawn that provide partial shade to the area.

TURF COMPOSITION

An inventory of grasses and weeds in the lawn was conducted on October 16, 2002, by A. Martin Petrovic and Sarah Klee of the College of Agriculture and Life Sciences at Cornell University. The inventory was conducted by visual inspection of vegetation within a thirty-five by thirty-five foot grid that was incrementally moved across the entire lawn. Plant composition was identified and inventoried in a total of 110 grid locations (Table 2.1).

Figure 2.1. MAVA turf close-up (MAVA staff, June 16, 2010).

The vegetative composition for the entire lawn was calculated by determining the percentage of individual species, i.e., total number of occurrences from the grid counts/total number of grids. The existing grass species in the lawn is primarily fine fescue and Kentucky bluegrass with moderate weed growth. Complete inventory results are provided in Appendix A.

MAINTENANCE PRACTICES

From 1973, when the property became established as Martin Van Buren National Historic Site, the lawn throughout the entire project area has been consistently

mowed to a height of two to three inches. For a brief period in the early 1990s, following general treatment recommendations in the Cultural Landscape Report, the turf was allowed to grow to 8 inches. However, this created an unkempt appearance that proved to be unacceptable to park staff and visitors.

Currently, the front lawn is maintained to a height of approximately three to three and one-half inches. On occasion, during drought conditions, the turf is allowed to grow to four inches. To maintain a manicured appearance, the lawn is mowed on a weekly basis. In the summer, two people are responsible for the mowing, requiring approximately two 8-hour days to complete.

Mower damage to buttress and surface tree roots has been occurring for several decades. In addition, many tree trunks have been hit and scarred by mowers. In order to facilitate mowing operations and accommodate large ride-on equipment many lower tree limbs have been removed. Current large mowing equipment being used includes a Toro Zero Turn 328D with a front end rotary mower and a John Deere 455 tractor with rear mounted rotary mowing attachment.

The grass immediately against the house is mowed with a push rotary style John Deere and hand grass clippers. No machinery is allowed adjacent to the house. A string trimmer is used in other areas.

There is no in-ground irrigation system and no manual watering is applied to the turf. There is no application of pre or post-emergent herbicides nor is the turf fertilized. Soil pH is not analyzed or adjusted. Seeding only occurs if bare spots occur.

Species	% Occurrence
Turfgrasses	
Fine fescue	82
Kentucky bluegrass	76
Sweet vernal grass	35
Tall fescue	8
Perennial ryegrass	6
Creeping bentgrass	2
Pasture grasses	
Timothy	17
Orchardgrass	14
Grassy weeds	
Nimblewill	17
Crabgrass	4
Quackgrass	<1
Non-grassy weeds	
Narrow-leaf plantain	57
Dandelion	47
Ground ivy	25
Wild onion	22
Broad-leaf plantain	14
Clover	9
Wild violet	4
Moneywort	4
Hawkweed	4
Oxalis	3
Cinquefoil	3
Knotweed	<1
Bedstraw	<1
Heal-all	<1
Spurge	<1

Table 2.1. Front lawn turf inventory: occurrence of turfgrasses, pasture grasses, grassy weeds and non-grassy weeds in the front lawn at Lindenwald (October 16, 2002)

LAWN USE

Principally, the lawn at Martin Van Buren National Historic Site serves an ornamental purpose and is minimally used for high impact programs. However, the site does hold several events on the lawn each year that attract a significant number of visitors. Harvest Day is the largest event of the year. Held on the lawn each September, visitors learn about nineteenth century agricultural practice. The winter celebration on the weekend of December 5th celebrates Van Buren's birthday. For this evening event a large tent is erected on the lawn. Numerous smaller events are held throughout the year which also utilize the lawn. The frequency, duration and activities associated with these events do not appear to be resulting in adverse impacts to the turf.

Figure 2.2. MAVA front lawn (Historic American Buildings Survey, 1997).

3. LAWN PRESERVATION GUIDELINES

OVERVIEW

This section describes the preservation guidelines that apply to management of the lawn at the Martin Van Buren National Historic Site and establishes a framework for maintenance based on the recommendations in the Cultural Landscape Report.

Historic documentation clearly establishes that Van Buren intended for Lindenwald to be presented as a presidential estate in the tradition of other prominent properties of the period, and that such estates had manicured lawns as features of their landscapes. Because it is the intent of the National Park Service to present the property as it was during his ownership, the following preservation guidelines are provided.

MANAGEMENT PHILOSOPHY AND OBJECTIVES

In National Park Service cultural landscape management, treatment is a term used to describe planned changes to the physical appearance of a landscape, usually for the goal of enhancing historic character in the context of contemporary park operations. Treatment of the Martin Van Buren landscape has been addressed in a number of documents, culminating with the *Cultural Landscape Report Volume 2: Treatment Plan* (hereafter Volume 2). The author recommended restoration as the primary treatment, as defined by *Secretary of the Interior's Standards for the Treatment of Historic Properties*. In light of the park's desire to preserve the historic resources of the site in balance with current practical and legislated requirements, this *Turf Management Plan* incorporates further research to provide recommendations that effectively achieve an appropriate historic appearance through sustainable maintenance practice.

In a restoration treatment, the lawn would be managed to perpetuate its historic character in terms of materials, design, and setting. Over time, lawn restoration may not be possible in some locations due to changes in growing conditions, particularly in terms of increased shade and tree root competition. In such circumstances, a restoration treatment approach may incorporate the use of substitute turf species that are compatible with the historic character of the lawn and are better adapted to the changes in growing conditions.

In the context of restoration as the primary treatment, Volume 2 recommends that as a general approach, the landscape be managed to preserve and enhance its historic character as it existed by the end of the period of significance in c.1850. By this date, the last major improvements had been made to the property. Within the umbrella of this general treatment approach, the ten acre lawn warrants a maintenance approach that includes three historically appropriate management

zones: Zone 1 - manicured to two inches in the largest area to the front of the house and along the entry drives; Zone 2 - rough cut at five to eight inches in areas beneath the trees and away from the front of the house; and Zone 3 - meadow along route 9H.

Within this management philosophy for the lawn, there are three levels of maintenance intensity that correspond to general lawn typologies defined by historic function and intent. The first level, which is presented in Zone 1, encompasses the lawns that are in historically formal areas of the estate. These areas are in close proximity to the house and entrance drives. Based on mid-nineteenth century garden design and horticultural trends, these areas had the highest level of formality and would have received the highest level of care. Maintenance within Zone 1 will involve the most intensity of mowing, seeding, weed management and fertilization to sustain a manicured appearance.

The second level of maintenance intensity, Zone 2, encompasses the lawn areas to the outer perimeter of Zone 1 and serves as a transition to the historic agricultural and functional areas of the property. These areas will involve less frequent mowing and fertilizing. In addition, since the visual quality of turf in these areas is rougher and less manicured than in Zone 1, a higher tolerance of weeds is acceptable.

The third level of maintenance intensity, Zone 3, provides for the establishment of a small meadow along Route 9H. The meadow will provide a slight buffer to the site from the vehicular traffic along the busy road. Maintenance of the meadow will require the least maintenance frequency only requiring one to three rough cuts each year and the possible treatment of invasive weeds if needed.

Zones 1, 2, and 3 are delineated in Drawing 2, Turf Management Zones. The boundaries of each zone are provided as recommendations and should be evaluated by park staff after implementation. As needed, zone boundary lines should be adjusted to more effectively achieve historic period appearance and meet current Park operational and sustainability requirements.

Turf Management Plan

Martin Van Buren National Historic Site

Kinderhook, New York

Project Area

National Park Service
Olmsted Center for Landscape Preservation
www.nps.gov/oclp

SOURCES

1. 2004 Aerial Photography
2. NPS GIS data
3. Field Visit, Andrew Louw, April 2010
4. MAVA Cultural Landscape Inventory

DRAWN BY

Matthew Quirey and Kathleen R. Fitzgerald,
Adobe Illustrator CS3, June 2010

LEGEND

- Project Area Boundary
- Water
- Canopy
- Lawn
- Buildings
- Roads/Parking

NOTES

Location and scale of features are approximate

0' 50' 100' 200' 400'

Drawing 1

Turf Management Plan

Martin Van Buren National Historic Site

Kinderhook, New York

Turf Management Zones

National Park Service
Olmsted Center for Landscape Preservation
www.nps.gov/oclp

SOURCES

1. 2004 Aerial Photography
2. NPS GIS data
3. Field Visit, Andrew Louw, April 2010
4. MAVA Cultural Landscape Inventory

DRAWN BY

Matthew Quirey and Kathleen R. Fitzgerald,
Adobe Illustrator CS3, June 2010

LEGEND

- Water
- Canopy
- Buildings
- Roads/Parking

Turf Management Zones

- Zone 1
  Manage at 2" height
- Zone 2
  Managed at 5-8" height
- Zone 3
  Managed at 16-24" height

NOTES

Location and scale of features are approximate

0' 50' 100' 200'

Drawing 2

4. LAWN MAINTENANCE PRACTICES

OVERVIEW

This section outlines specific maintenance practices aimed at managing the visual qualities of the lawn at the Martin Van Buren National Historic Site to c.1850. The emphasis of this section is on providing general guidance and an operational framework for maintaining the lawn. In keeping with the recommended treatment approach identified in the Cultural Landscape Report, the maintenance recommendations provided in this section integrate sustainable field practices with cultural landscape preservation objectives. They are informed by the National Park Service policies for Natural Resource Management (NPS-77) and Cultural Resource Management (NPS-28).

Turf management recommendations are organized into three main sections: Preservation Maintenance, Integrated Pest Management, and a Maintenance Calendar. Preservation maintenance techniques recommended in this section build on treatment objectives described in the Cultural Landscape Report and are targeted to the three management zones as described in Section 3 – Lawn Preservation Guidelines (Drawing 2). Preservation maintenance principles are emphasized to perpetuate historic landscape character using sustainable methods. Preservation maintenance practices that are necessary for achieving historic lawn qualities include sodding, seeding, mowing, fertilization, and irrigation are covered in this report. Maintenance activities to address deficiencies in conditions that result from special events or changes in the environment are also provided.

Information on using Integrated Pest Management (IPM) techniques to monitor and manage lawn pest damage with minimal chemical applications is provided. In particular, IPM strategies for the most common problematic weeds, insects and diseases are covered in this report. A monthly maintenance calendar which identifies the scheduling of activities for lawn care at Martin Van Buren is included.

PRESERVATION MAINTENANCE

Seeding

The lawn at Martin Van Buren National Historic Site should be maintained with a broad diversity of grass types that present the qualities of lawns during c. 1850. The existing vegetative composition of the lawn represents, in many respects, a historically appropriate plant diversity (Table 2.2 and Appendix A). Unlike many of the modern lawns of today, c. 1850 lawns were composed of a diverse mix of plants. To sustain an appropriate historic character, it is recommended that

overseeding the lawn in Zone 1 and 2 occur twice a year, spring and fall, using a custom blend of seed at 2 lbs/1000sq. ft. or 90 lbs/acre (Table 4.1).

This custom blend incorporates recommendations of lawn seed mixes from c. 1850 that have been adapted to current site environmental conditions such as light and shade. Several custom blends were field tested at Martin Van Buren National Historic Site by Cornell University and evaluated for a number of factors such as visual qualities, sustainability, and suitability to the site conditions (Appendix B).

Scientific Name	Common Name	Quantity of Seed Percentage of mix (%)	Reference Source
Agrostis gigantea Roth	Redtop	5%	1841, 1851
Festuca brevipila Tracey	Hard fescue	10%	1838, Cornell
Festuca ovina L.	Sheep's fescue	5%	1838, 1841, 1851
Festuca rubra L. spp. *rubra*	Creeping red fescue	15%	1841, 1851, Cornell
Poa pratensis L. 'Park'	Park Kentucky bluegrass	60%	1838, Cornell
Trifolium repens L.	White clover	5%	1851, Cornell

Table 4.1: MAVA Custom Turfgrass Mix based on recommended lawn seed mixes of c. 1850 (M. Quirey, OCLP).

When overseeding into the established lawn at Martin Van Buren National Historic Site, a slit-seeder, or slicer-seeder, is recommended. Slicer-seeders are designed to cut a narrow and shallow slit through the existing turf and soil and place seed mechanically in direct contact with the soil. Overseeding into an existing lawn with a slicer-seeder can greatly improve germination success of applied turf seed. There are a variety of slicer-seeders on the market, for rent or purchase. Some examples include small walk-behind models, such as the Turfco Direct LS-22 and Husqvarna DT22/SB22 or large, Tractor PTO driven models like the Toro Seeder 93.

In situations where turf becomes worn thin, heavily infested by weeds, bare ground is exposed, etc. spot-seeding may be necessary. Spot seeding involves digging or scarifying the soil either by hand by using a cultivator, shovel, garden rake, etc. or mechanically using a rototiller, power rake, etc. to create a level seed bed. Seed is then broadcasted into the prepared area. Seed must be applied uniformly over the area being covered. In large areas, use a drop type or centrifugal spreader in two directions at right angles to each other to ensure a uniform application. Following seeding, the area should be lightly raked to incorporate the seed into the top ¼" of soil. Be careful not to rake the seed too deeply into the soil as it needs exposure to sunlight to germinate. Roll the seeded area lightly or gently rake to ensure seed contact with the soil.

Zone 3 should be over seeded with the same custom seed mix during the spring and fall of the first year of transition to a meadow, and then as needed in subsequent years to supplement the vegetative composition of the zone.

Sodding of the lawn is not recommended. Commercial suppliers will not have sod available with the recommended turf composition identified in Table 4.1. Commercially available sod is a primarily a monoculture of Kentucky bluegrass (*Poa pratensis*) which will present an inappropriate historic appearance.

Mowing

One of the critical and labor-intensive aspects of maintaining the historic character of the lawn at Martin Van Buren National Historic Site is appropriate mowing. Each of the three turf management zones at the site need to present different visual characteristics; mowing recommendations for achieving these are provided in this section.

No turf maintenance operation affects the appearance of a lawn more quickly or dramatically than mowing. If left to grow without mowing, the grasses in the recommended turf seed mix (Table 4.1) would grow to a height of over two feet. Mowing, which limits growth to the desired height, puts tremendous stress on grass plants. As such, it is recommended that when cutting the lawn in Zone 1 and 2, no more than one third of the total leaf length should be removed in any one mowing. When more is removed, photosynthesis is reduced, recovery time is extended, and the growing points or crowns of individual grass plants can be injured. The resulting turf is weakened and may become susceptible to weed or disease infestation. The rate of mowing will depend on environmental conditions, i.e., higher amounts of rainfall will result in more active turf growth and require more frequent mowing.

It is recommended that Zone 1 be cut to a height of two to three inches to present a formal, closely clipped, manicured appearance. This will generally require mowing every seven to ten days during the peak growing times; however, more frequent mowing may be necessary as conditions demand. Zone 2 is recommended to be cut at five to eight inches for a rougher, rustic appearance. Mowing will generally be necessary every seven to fourteen days during high growth periods, but at other times every two to four weeks may be fine. Zone 3 will be managed as a meadow, allowing the turf to grow to its full seed head height of twenty-four or more inches. Mowing in this area will only be necessary in mid-spring and late fall each year, primarily to eliminate the establishment of woody plants within the turf. If needed to control invasive species, an additional mowing in mid-summer could be accomplished.

While the lawn at Martin Van Buren was likely cut with a scythe in c.1850, that is not a practical or sustainable contemporary option. Rather, high quality rotary

mowers are recommended for cutting the lawn and producing the desired visual qualities in Zone 1 and 2. Zone 3 should be cut with a tractor, tow behind, power-take-off (PTO) flail mower which is very effective for cutting field vegetation and along roadsides. Each of the zones should have a dedicated mower set at the dedicated height. Adjusting decks is time consuming, cumbersome, and often inconsistent.

For Zone 1 and 2, it is recommended that large open areas of turf be mowed with riding, rotary mowers capable of cutting a forty-eight to sixty-inch swath. Examples of this type of mower include: Toro Z Master, Hustler Z4, or an eXmark Lazer Z mower. The use of an add-on striping kit will contribute to creating an aesthetic to the lawn that mimics the historic use of rolling the turf after mowing. For areas that are inaccessible for the riding mower, a high quality, thirty-inch rotary walk-behind mower is recommended. John Deere, Husqvarna, Honda, and Toro all offer a variety of mowers to meet this need. A small, twenty-inch push mower will offer the best maneuverability while a mid-size walk-behind offers more speed and efficiency. For a higher, rougher cut in Zone 2 that is inaccessible by a riding mower, a walk-behind field mower such as the Dr Field and Brush Mower will achieve the desired results.

Fertilization

Soil fertility refers to the soil's ability to supply the nutrients required to sustain adequate plant growth. Soil fertility is never constant, but varies from soil to soil, and from one place to another within the same soil profile. Fertility of soil is also affected by the texture of the soil. A sandy soil or a soil with little organic matter will typically not be as fertile as other soils, such as a silt loam.

Among the nutrients required by turfgrass, carbon, hydrogen, oxygen, nitrogen, phosphorous, potassium, and calcium are those used in the highest amounts. Carbon, hydrogen, nitrogen, and oxygen are supplied by air and water; the remaining must come from naturally occurring sources in the soil or applied fertilizer.

Fertilizers are soil amendments which provide the nutrients that the soil is not able to supply. The grade of fertilizer is listed as three numbers, such as 10-6-4. The first number always indicates the percentage of nitrogen provided by the fertilizer, the second is always phosphorous, and the third is always potassium.

The nutritional health of turfgrass is dependent on a fertilization program, which is developed based on information derived from soil tests (Appendix C). Fertilizer applications, if needed, should be timed to provide nutrients to plants when they will be used most effectively.

In the mid-nineteenth century, lawn fertilization consisted of applications of manure and potash at various times of the season. The control given by modern fertilizers was not available during c. 1850; however, results similar to those achieved historically can be obtained by using current commercially available products. In keeping with the historic practice of applying manure, which has low nitrogen content, a light application of an organic based fertilizer, with a nutrient analysis of approximately 8-3-1, is recommended. Two applications of one-half pound of actual nitrogen per 1,000 square feet of turf should be applied, one in May and the other in late August. The fall application is recommended for the lawn at Martin Van Buren National Historic Site to stimulate root growth, promote effective overwintering, and encourage a healthy stand of turf for the next growing season. While these recommendations are reduced compared with contemporary lawn fertilization recommendations, applying no more than 1lb. of actual nitrogen per 1,000 square feet of turf is consistent with historic methods.

Maintaining proper pH is a critical aspect to managing appropriate soil fertility. A correct pH allows turf to effectively absorb nutrients, such as nitrogen (N), potassium (K), magnesium (Mg), and calcium (Ca) from the soil. If the pH is too high or too low, nutrients may be chemically "locked" or bound onto soil particles and not be available for plant roots to absorb.

Optimum turfgrass growth occurs at a pH of 6.4 - 6.8. If needed based on a soil analysis, lowering pH typically involves applying an acidic material, such as sulfur, to the soil. A useful method of lowering soil pH under turf cover is to apply slow release sulfur coated fertilizer. This is an effective and efficient method of combining two maintenance functions into one procedure, i.e., fertilizing and pH adjustment, both of which are necessary for improving turf condition at the park. In the greater northeastern United States, application of lime is typically a more common practice, as most sites require raising the soil pH to appropriate levels for turf. Lime is best applied in the fall or early spring.

Lime is not a fertilizer. It is a material which is used to adjust soil pH with the objective of improving nutrient uptake by the turf. Lime applications should be based on soil test results only (Appendix C). Applications should never exceed 50lbs/1000sq. ft./application. If soil pH is low enough to require more than 50lbs/1000sq. ft., two or more applications at different times of the year should be made.

The Martin Van Buren National Historic Site should test the pH and soil fertility once every two years to check nutrient levels and pH. This will help guide application rates of fertilizer and lime as needed.

Irrigation

Typically the average rainfall in the Northeast is sufficient for grass survival. However, summer drought and/or high temperatures often cause grass plants to enter "summer dormancy." This response results in a dieback of green grass blades in order to limit the amount of water lost from the plants' growing tips or "crown" and roots. During summer dormancy browning occurs and the lawn appears "dead." It is important to recognize that this drought and temperature related browning is indeed an indicator of dormancy, not loss of the turf. In most situations, unless drought conditions continue for more than four weeks, turf will come out of dormancy when temperatures fall and rainfall resumes.

No archival information has been found that suggests the lawn at the site was irrigated during c. 1850. As such, irrigation is not recommended as a routine maintenance practice at Martin Van Buren National Historic Site. If extended periods, beyond four weeks, occur with high temperatures above ninety degrees and no rainfall, apply irrigation at a rate of no more than one inch of water per week to the lawn.

An effective method to judge irrigation needs involves monitoring rainfall with the use of an on-site rain gauge and periodically checking soil moisture. To evaluate soil moisture, remove a small sample of soil from 3-4" below grade using a pocket knife or a small soil corer. Squeeze the sample between the fingers noting the presence or absence of a moisture film. The goal is to maintain moist, not soggy or saturated soils.

Special Events

Currently the front lawn is used for several special events, including Harvest Day, an annual September event celebrating the importance of agriculture to Martin Van Buren, and a celebration of Martin Van Buren's birthday each December 5. In addition, numerous smaller events are held on the lawn throughout the year.

Using the lawn to host these events can cause soil compaction and the wear and thinning of turf. Soil compaction causes the loss of air and/or water space between soil particles. Excessive compaction reduces the effectiveness of a soil to support turf growth, limits water and air exchange and increases erosion. Ultimately, if left untreated, soil compaction will result in the failure of turf cover.

Areas of soil compaction at Martin Van Buren National Historic Site can be corrected through mechanical aeration before and after large events held on the lawn. While there are several different types of aerators available, a core aerator provides the best results. A core aerator removes narrow cores, or "plugs", of soil and thatch from the lawn producing a series of small 2-4" deep holes. These holes allow water, air, and fertilizer to reach turf roots. Plugs of soil resulting from the

core aeration should be removed from the lawn and the resulting holes backfilled with high quality shredded compost following each operation.

Using an overseeder, new seed should be incorporated into the lawn after each aeration and/or following each large lawn event. Use the seed mixture recommended in Table 4.1. If possible, alternate the location events on the lawn to minimize soil compaction. In addition, rigid construction mats, temporary platforms or plywood sheets should be considered for use under the highest traffic areas during events to help minimize localized soil compaction and turf wear. The mats should not be allowed to remain in place for more than 8 to 10 hours. Consider using products such as AlturnaMATS® http://www.alturnamats.com/.

Change in Environmental Conditions

Many of the environmental conditions (soil, light, moisture, etc.) associated with the lawn are dynamic and will influence turf maintenance requirements to ensure the long-term preservation of historic character. For example, currently, most of the lawn is in full sun. However, growth of a recently replanted locust allée lining the circular drive will result in shadier conditions. In addition, as older trees deteriorate and are removed, current shade conditions will become sunnier.

While existing conditions are adequate for supporting the lawn, continual monitoring and possible adjustment in turf types may be warranted if environmental conditions such as average temperature and availability of light and water change. The recommended custom turfgrass seed mixture (Table 4.1) contains a broad diversity of plant species that are adapted to full sun and partial shade. For example, Creeping red fescue (*Festuca rubra*) is well adapted to shade while Kentucky bluegrass (*Poa pratensis*) grows well in sunnier conditions. If shadier conditions develop over time, a higher percentage of creeping red fescue can be incorporated in the seed mixture.

INTEGRATED PEST MANAGEMENT

Integrated Pest Management (IPM) is a comprehensive strategy to achieve desired levels of pest control in an environmentally responsible manner, reducing the need for chemical pesticides. The essential elements of IPM are monitoring, setting action thresholds, using multiple control practices, and keeping records of pest activity and the effectiveness of control actions taken.

Monitoring refers to methods used for acquiring important information about the need for control actions; as well assessing whether control actions are effective. Regular inspections of a site and early detection of pests can function as a way to avoid or prevent serious resource damage.

Establishing action thresholds is the process of determining acceptable levels of a particular pest or disease. In an IPM framework, corrective actions are only taken if pests reach the action threshold. The action threshold identifies the level at which action must be taken to prevent significant resource damage. If the impact of pests reaches the action threshold, control steps must be taken.

The use of multiple control practices is recommended and can include cultural, biological, and chemical treatments. Cultural controls are methods that change the environment, making it less favorable to the pest. Practices such as maintaining proper soil pH and mowing only one third of turf grass height are cultural techniques that can effectively improve lawn health and minimize pest damage. Cultural controls also include practices that are sometimes classified as physical controls or mechanical controls. These include structural modifications and barriers to prevent pests from entering a site, such as fencing. Biological controls refer to the use of natural enemies or biological control agents to help manage pests. Biological control agents include predators, parasites, and diseases. Chemical controls, often referred to as pesticides, are used to prevent damage from occurring or assist the desired resource with recuperation from pest infestation.

These are important and commonly used tools in IPM. Like all control actions, if pesticides are to be used, they should be selected based on their effectiveness to manage the target pest, cause the least disruption to natural predators, result in the least hazards to human health, and cause the least damage to the environment.

One of the best defenses against any pest problem that may arise in the lawn at Martin Van Buren National Historic Site is the diversity of species recommended in the custom turf seed mixture (Table 4.1). As compared to a more uniform blend turf species commonly found in contemporary lawns that is more susceptible to pest problems, the diversity of species in this seed mix will help ensure that the lawn, as a whole, has a greater resistance insects and diseases.

Record keeping involves the systematic storing and retrieval of IPM information. Records can indicate the location of problem areas and whether pests or natural predators are increasing or decreasing in numbers. Weather records, coupled with control practices and pest sampling records can indicate how well a specific treatment performed. For the lawn at Martin Van Buren National Historic Site, IPM strategies should principally focus on monitoring pest activities. Prior to the application of any treatment to manage a lawn pest, the Northeast Region Integrated Pest Management Coordinator should be contacted for current control recommendations.

Weeds

The definition of a weed is commonly understood to be a plant out of place. The historic character of the lawn at the site was one of plant diversity. Many plants that we consider lawn weeds today were viewed as integral plants in the c. 1850 lawn, white clover being one of the best examples. Currently there are no weeds in the lawn that require targeted control but continued monitoring for problematic, invasive weeds is an important part of lawn care at the site.

Acceptable levels of weed populations in the lawn at Martin Van Buren National Historic Site vary by zone. In Zone 1, the area where the highest visual quality is desired, weed coverage should not be allowed to exceed 30 percent of the total area. In Zone 2, where rougher, more rustic turf is the desired visual quality, less than 50 percent weed cover is acceptable. Zone 3, where a meadow is desired, only noxious, invasive weeds should be removed.

Insects

In the Northeast, white grubs, the larval stage of the Japanese Beetle (*Popillia japonica*) are one of the more common lawn insect pests. Cinch bugs (*Blissus spp.*), bluegrass billbugs (*Sphenophorus parvulus*), and sod webworms (*Crambus spp. and Parapediasia spp.*) can also be problematic; however they typically occur less frequently than white grubs.

During c. 1850, no pesticides were used to manage turfgrass insects. Currently, the lawn at Martin Van Buren National Historic Site shows no indication of problematic insect populations or damage. Routine monitoring for insect activity and damage is an important part of lawn care at the site. For best monitoring practices and up-to-date management information regarding lawn insects, i.e., how to identify them, scout for them, and when treatment action should be taken, consult Cornell University, Agricultural Extension Services or visit their website at www.gardening.cornell.edu/lawn.

Diseases

Some of the more common cool-season turf diseases in the Northeast are: brown patch, dollar spot, snow molds, fungal diseases, necrotic ring spot, plythium blights, leaf spot and melting out. However, given the diversity of species recommended for the lawn at Martin Van Buren National Historic Site, it is unlikely that a turf disease will cause a dramatic impact to or loss of the lawn

Routine monitoring for diseases should be considered as part of the turf management program. For best monitoring practices and up-to-date management information regarding lawn diseases, i.e., how to recognize them and

understanding treatment options, consult Cornell University, Agricultural Extension Services or visit their website at www.gardening.cornell.edu/lawn.

MAINTENANCE CALENDAR

The following section provides a monthly preservation maintenance schedule for the lawn at Martin Van Buren National Historic Site. Actions listed in this calendar cover recurring and preventative maintenance operations. Actions needed to address deferred maintenance or unexpected deficiencies that result from events such as storms or over-use are covered on page(s) 34-35 of this report. In addition, a quick reference calendar, in table format is included on page 41.

January

No action required

February

No action required

March

Remove accumulated debris, leaves and fallen branches from turf Zones 1and 2.

If needed, remove excessive old growth and build-up of thatch.

Collect soil samples for pH analysis every 2 years. Adjust pH as needed based on soil analysis.

April

If not completed in March, if needed, remove excessive old growth and build-up of thatch.

Spot seed thin or bare spots in Zones 1, 2, and 3.

Start mowing in Zones 1 and 2, as needed, at recommended heights.

Remove excessive clippings.

Aerate Zones 1 and 2 if soil is compacted.

Overseed Zones 1 and 2 with custom turf seed mixture.

May

Mow turf in Zones 1, 2, and 3.

Apply fertilizer in Zones 1 and 2.

June

Mow turf in Zones 1 and 2.

Sharpen mower blades.

July

Mow turf in Zones 1 and 2.

Irrigate lawn 1” per week if drought extends beyond four weeks.

August

Mow turf in Zones 1 and 2.

Spot seed thin or bare spots in Zones 1, 2, and 3.

Overseed Zones 1 and 2 with custom turf seed mixture.

Continue monitoring and insect control. Make plans for fall lawn renovation. Select and purchase grass seed and fertilizer.

Apply fertilizer in Zones 1 and 2.

Irrigate lawn 1” per week if drought extends beyond four weeks.

September

Mow turf in Zones 1 and 2.

If needed, remove excessive old growth and build-up of thatch.

Spot seed thin or bare spots in Zones 1, 2, and 3.

Apply fertilizer in Zones 1 and 2 if not completed in August.

Aerate Zones 1 and 2 if soil is compacted.

Remove accumulated debris, leaves and fallen branches from turf Zones 1and 2.

Overseed Zones 1 and 2 with custom turf seed mixture if not completed in August.

Irrigate lawn 1” per week if drought extends beyond four weeks.

October

Mow turf in Zones 1, 2, and 3.

If not completed in March, collect soil samples for pH analysis every 2 years. Adjust pH as needed based on soil analysis.

October (continued)

Remove accumulated debris, leaves and fallen branches from turf Zones 1and 2.

Recondition lawn mower. Store mover with clean oil and empty fuel tank.

Use soluble fertilizer or calcium chloride instead of salt for melting winter ice adjacent to lawn.

November

Mow turf in Zones 1 and 2 if needed.

Remove accumulated debris, leaves and fallen branches from turf Zones 1and 2.

December

Remove accumulated debris, leaves and fallen branches from turf Zones 1and 2.

Maintenance Activity	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Fertilization					X			X	X*			
Spot Seed				X	X				X			
Soil Test			X	X								
Adjust Soil pH*				X						X		
Thatch Removal*			X	X					X			
Aeration*				X						X		
Mowing				X*	X	X	X	X	X	X	X*	
Overseed				X					X	X		
Leaf Removal*			X								X	X

*AS NEEDED ONLY

Figure 4.2: Turf Maintenance Quick Reference Calendar

RECORD KEEPING

As part of a plan for managing the lawn, the park should maintain an accurate and detailed record of lawn condition and work performed. It is recommended that the park utilize the Facilities Management Software System (FMSS) to support this process.

FMSS supports detailed information regarding specific work activities, costs, materials, staffing and frequency for facilities maintenance. This program can be used to document inspections and direct preservation maintenance operations. FMSS can also be used to create Work Orders and Job Plans for scheduling and conducting field inspections. Work Orders should be prepared to fully document all accomplishments associated with improving resource condition. Maps, photographs, hand written field notes, receipts and other materials generated during field inspections should be retained and can be uploaded as digital files into FMSS. These documents can be valuable supporting documentation for the long-term preservation of the lawn.

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Martin Van Buren National Historic Site, Park Archive
Kinderhook, NY

Mount Auburn Cemetery Archives
Cambridge, MA

APPENDIX A

SITE ANALYSIS RESULTS

The following is a site analysis conducted on October 16, 2002 by A. Martin Petrovic and Sara Klee of Cornell University, College of Agriculture and Life Sciences, Department of Horticulture. Location number and plants present are based on a 35 ft by 35 ft grid. Please see attached map at the end of the Appendix A for the location of each observation point.

Plot #	Plants Present	Plot #	Plants Present
1	Orchard Grass Fine Fescue Creeping Bentgrass Tall Fescue	2	Nimblewill Ground Ivy Buckhorn Plantain Oxalis Wild Onion Timothy
3	Kentucky Bluegrass Creeping Bentgrass Orchard Grass	4	Fine Fescue Timothy Kentucky Bluegrass Clover
5	Fine Fescue Plantain Perennial Ryegrass Kentucky Bluegrass Dandelion Ground Ivy	6	Fine Fescue Kentucky Bluegrass Ground Ivy Perennial Ryegrass
7	Dandelion Kentucky Bluegrass Fine Fescue Wild Onion	8	Fine Fescue Dandelion Plantain Nimblewill Ground Ivy Orchard Grass Timothy Sweet Vernal
9	Kentucky Bluegrass Fine Fescue Plantain Ground Ivy Wild Onion Nimblewill Tall Fescue	10	Plantain Fine Fescue Clover Kentucky Bluegrass Timothy Crab Grass

Plot #	Plants Present	Plot #	Plants Present
11	Fine Fescue Kentucky Bluegrass Clover Narrow Leaf Plantain	12	Tall Fescue Fine Fescue Orchard Grass Wild Onion Narrow Leaf Plantain Crab Grass Kentucky Bluegrass
13	Narrow Leaf Plantain Kentucky Bluegrass Fine Fescue Perennial Ryegrass	14	Wild Onion Narrow Leaf Plantain Kentucky Bluegrass Fine Fescue Ground Ivy Kentucky Bluegrass
15	Fine Fescue Kentucky Bluegrass Sweet Vernal Narrow Leaf Plantain	16	Kentucky Bluegrass Ground Ivy Narrow Leaf Plantain Dandelion Cinquefoil Sweet Vernal
17	Fine Fescue Wild Onion Narrow Leaf Plantain Kentucky Bluegrass Wild Violet Moneywort Sweet Vernal	18	Broad Leaf Plantain Perennial Ryegrass Narrow Leaf Plantain Wild Onion Sweet Vernal Fine Fescue Tall Fescue
19	Nimblewill Fine Fescue Kentucky Bluegrass Ground Ivy Narrow Leaf Plantain Timothy	20	Oxalis Moneywort Ground Ivy Timothy Kentucky Bluegrass Fine Fescue Creeping Bentgrass
21	Narrow Leaf Plantain Fine Fescue Sweet Vernal	22	Narrow Leaf Plantain Ground Ivy Nimblewill Dandelion Kentucky Bluegrass Sweet Vernal
23	Dandelion Narrow Leaf Plantain Clover Kentucky Bluegrass Fine Fescue Sweet Vernal Wild Onion	24	Kentucky Bluegrass Fine Fescue Narrow Leaf Plantain Timothy

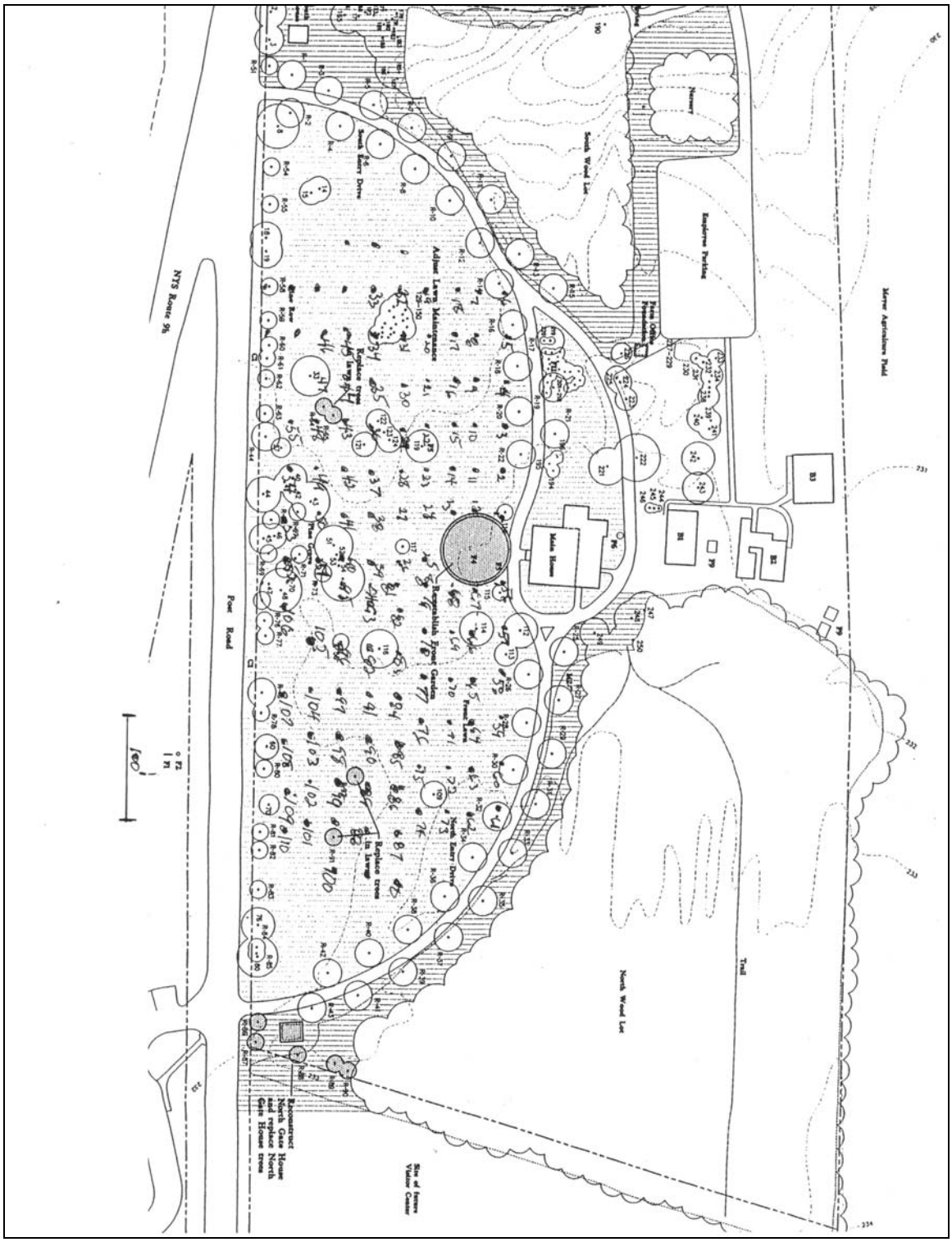
Plot #	Plants Present	Plot #	Plants Present
25	Fine Fescue Kentucky Bluegrass Dandelion Wild Onion Narrow Leaf Plantain Sweet Vernal	26	White Pine Fine Fescue
27	Dandelion Narrow Leaf Plantain Ground Ivy Fine Fescue Oxalis Kentucky Bluegrass Creeping Bentgrass	28	Fine Fescue Kentucky Bluegrass Dandelion Moneywort Narrow Leaf Plantain Clover
29	Fine Fescue Narrow Leaf Plantain Kentucky Bluegrass Sweet Vernal Knotweed	30	Ground Ivy Narrow Leaf Plantain Kentucky Bluegrass Tall Fescue Sweet Vernal Fine Fescue Dandelion
31	Cedar Trees Fine Fescue Ground Ivy Kentucky Bluegrass Sweet Vernal Nimblewill	32	Narrow Leaf Plantain Dandelion Wild Onion Fine Fescue Sweet Vernal Timothy Violets
33	Narrow Leaf Plantain Dandelion Sweet Vernal Wild Onion Moneywort Timothy Narrow Leaf Plantain Fine Fescue	34	Fine Fescue Kentucky Bluegrass Sweet Vernal Timothy Wild Onion Ground Ivy Narrow Leaf Plantain
35	Fine Fescue Kentucky Bluegrass Wild Onion Ground Ivy Narrow Leaf Plantain Fine Fescue	36	Kentucky Bluegrass Wild Onion Narrow Leaf Plantain Timothy
37	Yellow Nutsedge Perennial Ryegrass Bedstraw	38	Fine Fescue Kentucky Bluegrass Ground Ivy Kentucky Bluegrass Wild Onion

Plot #	Plants Present	Plot #	Plants Present
39	Fine Fescue Heal-all Ground Ivy Narrow Leaf Plantain Kentucky Bluegrass Perennial Ryegrass	40	Fine Fescue Orchard Grass Dandelion Plantain Timothy
41	Fine Fescue Kentucky Bluegrass Sweet Vernal Wild Onion Dandelion	42	Fine Fescue Broad Leaf Plantain Narrow Leaf Plantain Ground Ivy Wild Onion Dandelion Timothy
43	Fine Fescue Narrow Leaf Plantain Kentucky Bluegrass Timothy	44	Fine Fescue Kentucky Bluegrass Sweet Vernal Ground Ivy Violets Dandelion Narrow Leaf Plantain
45	Kentucky Bluegrass Fine Fescue Sweet Vernal Narrow Leaf Plantain	46	Fine Fescue Narrow Leaf Plantain Kentucky Bluegrass
47	Kentucky Bluegrass Fine Fescue Narrow Leaf Plantain Sweet Vernal	48	Fine Fescue 99% Wild Onion Dandelion
49	Fine Fescue Nimblewill Dandelion Timothy	50	Fine Fescue Kentucky Bluegrass Dandelion
51	Fine Fescue Kentucky Bluegrass Sweet Vernal	52	Fine Fescue Ground Ivy Hawkweed
53	Fine Fescue Narrow Leaf Plantain Dandelion Timothy	54	Kentucky Bluegrass Fine Fescue Dandelion Orchard Grass
55	Tall Fescue Kentucky Bluegrass Fine Fescue Narrow Leaf Plantain	56	Kentucky Bluegrass Narrow Leaf Plantain Ground Ivy

Plot #	Plants Present	Plot #	Plants Present
57	Orchard Grass Kentucky Bluegrass Perennial Ryegrass Chickweed	58	Kentucky Bluegrass Dandelion Broad Leaf Plantain Narrow Leaf Plantain Tall Fescue Crab Grass
59	Quackgrass Kentucky Bluegrass Dandelion Broad Leaf Plantain Spurge	60	Crab Grass
61	Fine Fescue Kentucky Bluegrass Narrow Leaf Plantain	62	Fine Fescue Kentucky Bluegrass Nimblewill Narrow Leaf Plantain Dandelion Clover
63	Fine Fescue Kentucky Bluegrass Sweet Vernal Narrow Leaf Plantain 90% Nimblewill	64	Kentucky Bluegrass Nutsedge Sweet Vernal Ground Ivy
65	Fine Fescue Kentucky Bluegrass Timothy Sweet Vernal	66	Kentucky Bluegrass Narrow Leaf Plantain Nimblewill Orchard Grass
67	Kentucky Bluegrass Narrow Leaf Plantain Clover Narrow Leaf Plantain Dandelion	68	Kentucky Bluegrass Fine Fescue Narrow Leaf Plantain
69	Kentucky Bluegrass Nimblewill 85% Orchard Grass Sweet Vernal	70	Fine Fescue Kentucky Bluegrass Narrow Leaf Plantain Dandelion Sweet Vernal
71	Fine Fescue Kentucky Blugrass Nimblewill Narrow Leaf Plantain Dandelion Wild Onion	72	Kentucky Bluegrass Fine Fescue
73	Kentucky Bluegrass Clover Narrow Leaf Plantain	74	Sweet Vernal Nimblewill Narrow Leaf Plantain

Plot #	Plants Present	Plot #	Plants Present
75	Fine Fescue Kentucky Bluegrass Narrow Leaf Plantain 90%	76	Kentucky Bluegrass Kentucky Bluegrass Narrow Leaf Plantain Dandelion
77	Kentucky Bluegrass Fine Fescue Nimblewill Sweet Vernal Kentucky Bluegrass Dandelion Narrow Leaf Plantain	78	Kentucky Bluegrass Broad Leaf Plantain Narrow Leaf Plantain Dandelion Sweet Vernal Cinquefoil
79	Fine Fescue Kentucky Bluegrass Narrow Leaf Plantain 90% Nimblewill Sweet Vernal	80	Fine Fescue Kentucky Bluegrass Narrow Leaf Plantain Dandelion Wild Onion Timothy
81	Fine Fescue Narrow Leaf Plantain Broad Leaf Plantain Sweet Vernal	82	Kentucky Bluegrass Violets Wild Onion Plantain Dandelion
83	Fine Fescue Kentucky Bluegrass Tall Fescue Orchard Grass Dandelion Broad Leaf Plantain	84	Fine Fescue Kentucky Bluegrass Narrow Leaf Plantain Hawkweed Sweet Vernal
85	Fine Fescue Kentucky Bluegrass Dandelion Timothy	86	Kentucky Bluegrass Nimblewill Narrow Leaf Plantain 95%
87	Kentucky Bleugrass Fine Fescue Nimblewill Dandelion Orchard Grass	88	Fine Fescue Orchard Grass
89	Fine Fescue Kentucky Bluegrass Dandelion Wild Onion Hawkweed	90	Fine Fescue 95% Kentucky Bluegrass Sweet Vernal Dandelion Narrow Leaf Plantain
91	Kentucky Bluegrass Fine Fescue Narrow Leaf Plantain Dandelion Sweet Vernal Orchard Grass	92	Kentucky Bluegrass Fine Fescue Ground Ivy Dandelion Narrow Leaf Plantain

Plot #	Plants Present	Plot #	Plants Present
93	Fine Fescue 99% Narrow Leaf Plantain Sweet Vernal	94	Fine Fescue Dandelion Narrow Leaf Plantain Ground Ivy Orchard Grass
95	Fine Fescue Orchard Grass Dandelion Narrow Leaf Plantain	96	Fine Fescue Clover Orchard Grass Dandelion
97	Fine Fescue Narrow Leaf Plantain	98	Fine Fescue Ground Ivy Narrow Leaf Plantain Wild Onion
99	Fine Fescue 40% Kentucky Bluegrass Narrow Leaf Plantain 60% Sweet Vernal	100	Fine Fescue Kentucky Bluegrass Dandelion Ground Ivy Sweet Vernal Nimblewill
101	Fine Fescue Ground Ivy Sweet Vernal	102	Fine Fescue 90% Kentucky Bluegrass Orchard Grass
103	Fine Fescue Dandelion Sweet Vernal	104	Fine Fescue Ground Ivy Orchard Grass
105	Fine Fescue 98% Kentucky Bleugrass Orchard Grass	106	Fine Fescue Nimblewill Clover Dandelion Kentucky Bluegrass Sweet Vernal
107	Tall Fescue Kentucky Bluegrass Narrow Leaf Plantain Dandelion Cinquefoil	108	Fine Fescue 99% Orchard Grass
109	Fine Fescue	110	Fine Fescue Kentucky Bluegrass Wild Onion Ground Ivy Dandelion Hawkweed



Map of 35 ft X 35 ft grid plots in front lawn, Martin Van Buren National Historic Site.

APPENDIX B

EVALUATION OF HISTORIC LAWNS AND HIGH CUT MOWERS AT LINDENWALD

The following is an evaluation of historic lawns and high cut mowers at Lindenwald conducted over a series of visits from 2001 through 2005 to the Martin Van Buren National Historic Site in Kinderhook, New York. A. Martin Petrovic and Sara Klee of Cornell University, College of Agriculture and Life Sciences, Department of Horticulture conducted the research methodology and evaluation. Petrovic and Klee's evaluation is broken into the following sections: site, general observations, and mowing quality.

SITE

The site for the study is the lawn area north of the front lawn and northwest of the office buildings. The soil is a Hoosic gravelly sandy loam. The test area was 100' by 100' divided into 6 plots of 16.7' wide by 100' long. The site was a low maintenance lawn area maintained by the park staff. On November 2, 2001, the plot area was treated with two non-selective herbicides (glyphosate and glufosinate) prior to seeding and the six historic lawn seed mixtures were the seeded. The six seed mixtures were:

Mix 1

5 lbs. of redtop and 5 grams of white clover

(3 lbs./1000 sq.ft. & 0.0066 lbs/1000 sq. ft.)

Mix 2

6 lbs. of Park Kentucky bluegrass (3.6 lbs./1000 sq. ft.)

2 lbs. of SR 7200 velvet bentgrass (1.2 lbs./1000 sq. ft.)

3 lbs. of SR 7100 colonial bentgrass (1.8 lbs./1000 sq. ft.)

2 lbs. of Herbie forage perennial ryegrass (1.2 lbs./1000 sq. ft.)

100 grams of white clover (0.13 lbs./1000 sq. ft.)

Mix 3

3.5 lbs. of SR 7100 colonial bentgrass (2.1 lbs./1000 sq. ft.)

3.5 lbs. of SR 3200 sheep blue fescue (2.1 lbs./1000 sq. ft.)

3.5 lbs. of SR 3100 hard fescue (2.1 lbs./1000 sq. ft.)

3.5 lbs. of Park Kentucky bluegrass (2.1 lbs./1000 sq. ft.)

2 lbs. of crested dog's tail (*Cynosurus cristatus*) (1.2 lbs./1000 sq. ft.)

2 lbs. of yellow oatgrass (*Trisetum flavescens*) (1.2 lbs./1000 sq. ft.)

Mix 4

12 lbs. of meadow brome (*Bromus biebersteinii* Roem. & Schult) (7.2 lbs./1000 sq. ft.)

12 lbs. of SR 3200 sheep's blue fescue (7.2 lbs./1000 sq. ft.)

6 lbs. of SR 5100 chewings fescue (3.6 lbs./1000 sq. ft.)

6 lbs. of SR 5200 strong creeping red fescue (3.6 lbs./1000 sq. ft.)

Mix 5

5 lbs. of Park Kentucky bluegrass (3 lbs./1000 sq. ft.)

Mix 6

5 lbs. of Park Kentucky bluegrass (3 lbs./1000 sq. ft.)

1 lb. of sweet vernal grass (0.6 lbs./1000 sq. ft.)

Mixes 1, 2, 5, and 6 were seeded with a power slit seeder (Olathe Manuf. Co) and Mixes 3 and 4 were applied with a drop seeder due to the large seeds in the mix not being able to go through the slit seeder. This form of site prep and seeding is done to minimize site disturbance and cost, thus, would work best on a site like Lindenwald where a change in grade or soil modification is not warranted and extensive trees roots may be present (especially in the front lawn area). The use of the non-selective herbicide (does not damage seed) was done to kill the existing vegetation and as it dies the seeding will be able to establish.

In 2002—2004 and once in the first week of May, 2005, the site was mowed at 2 inches along with the surrounding lawn. In 2005, the site was evaluated on 4 dates for the rustic lawn appearance, just before and 10 to 14 days after being mowed high (about 6 inches). The site was mowed perpendicular to the short side of the

plot at about the 10 foot and 40 foot location to get two points for mowing quality and lawn quality observations. About the first 50 feet of the 100 foot long plots, part closest to the wooded western border, was used for evaluation. The part of the plots east of the midway point of each plot was poorly established with the seed mixtures and was therefore not evaluated.

Three mowers were evaluated as to the ability to mow high cut-rustic lawns of different composition. The mowers were: Toro Z Master is a 5 foot wide, upfront zero turning radius rotary mower set at the highest mowing height of 5 inches; Toro Groundsmaster 328 D is 6 foot wide upfront rotary mower set at the highest mowing height of 5.25 inches; and Land Pride 5220 with a 8 foot wide rear rotary mower (brush-hog type) set at the highest mowing height of 5.5 inches run at 3590 rpm.

There were two methods to evaluate the rustic lawn seed mixes and mowers: turfgrass quality rating using a scale of 1 to 5, where 5 is best, 1 is a very poor rustic lawn and 3 is an acceptable rustic lawn; and to determine how well the mower preformed by measuring the height in two spots of a mowing pass, one in the wheel track and the other outside the wheel track. Notes were also taken as to the presence of the plants that were seeded then on October 6, 2005 about 4 years after seeding to indicate the usefulness on this site.

GENERAL OBSERVATIONS

On October 6, 2005 A. Martin Petrovic made observations on the success of the seedings (test plots) made four years earlier.

Mix 1

Except in the first 15 feet of the 100 long plot, the section closest to the trees which provide for a shadier-wet site, redtop did not successfully establish on this site. This is not surprising since redtop does best on wet-poorly drained sites and thus is not recommended for use at Lindenwald. The small amount of white clover used in the mix was present but if clover is to be used on this site a higher rate should be used, about 5 percent of the mix was a common practice when white clover was used in lawn seed mixtures (prior to the 1950s).

Mix 2

Velvet bentgrass and forage ryegrass did not establish on this site. The common (variety Park) Kentucky bluegrass and colonial bentgrass were successfully established on this site along with white clover.

Mix 3

The strawberry clover was successfully established, however, crested dogtail and yellow oatgrass did not establish. The Kentucky bluegrass and colonial bentgrass were dominate, but in the more open –drier sections, there were equal amounts of hard fescue, Kentucky bluegrass, and colonial bentgrass.

Mix 4

The meadow bromegrass only established the shadier parts of the site, less than 10 percent of the entire 100 foot plot. Thought not in the seed mix, Kentucky bluegrass was prevalent in this plot. The fine fescues (chewing and creeping red fescue) also were well established.

Mix 5

Kentucky bluegrass was the only seeded grass and dominated the plot, but several other grasses (fine and tall fescue and orchard grass) were present.

Mix 6

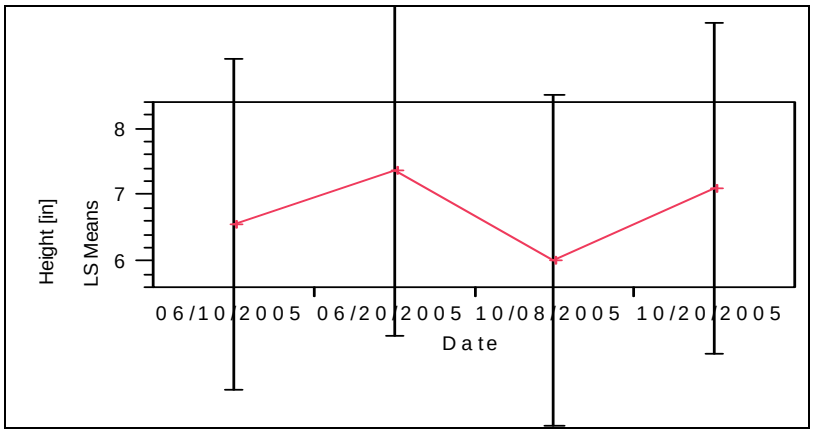
Both Kentucky bluegrass and sweet vernal grass easily established this site, with about 70-75 percent Kentucky bluegrass to 25-30 percent sweet vernal grass.

MOWING QUALITY

The second method to evaluate the effectiveness of a lawn seed mixture for a rustic mid-1800s lawn look, the lawn seed mixture site was used for a mower study. The June and October 2005 evaluations reflect the end of the high growth periods to test the mower-grass mix quality at the worst state. As seen in the table below, the two upfront rotary mowers were effective at mowing the high lawns mixes (June 10- right after mowing) compared to the rear mounted rotary. The Toro 328 mower left a slightly better quality turf just after mowing. There were considered differences in how the lawn seed mixes looked just after mowing and 10 day later. Mixes dominated with Kentucky bluegrass (Mix 5 and 6) had the best turfgrass quality when mowed high. Turfgrass quality reflects turfgrass density, color, texture and uniformity. Data was also taken on the lawn just outside the mix area that reflects the current lawn on site (control). The existing lawn did not mow well with any of the three mowers, similar to what was observed by park staff in the past.

	Just mowed - 6/10/2005				10 days after mowing – 6/20/2005			
Mix	Toro Z	Land Pride	Toro 328	Ave	Toro Z	Land Pride	Toro 328	Ave
1	1.5	1.0	2.0	1.5	3.5	2.5	3.0	3.0
2	2.0	1.0	2.0	1.7	3.5	3.0	3.0	3.2
3	2.5	1.0	3.0	2.2	3.5	2.5	4.0	3.3
4	2.5	1.0	3.0	2.2	3.5	3.0	4.0	3.5
5	4.0	1.0	5.0	3.3	5.0	3.0	5.0	4.3
6	3.5	1.0	4.5	3.0	3.5	3.0	4.5	3.7
Control	1.5	1.0	2.0	1.5	3.0	2.5	3.0	2.7
Ave	2.5	1.0	3.1		3.6	2.7	3.8	

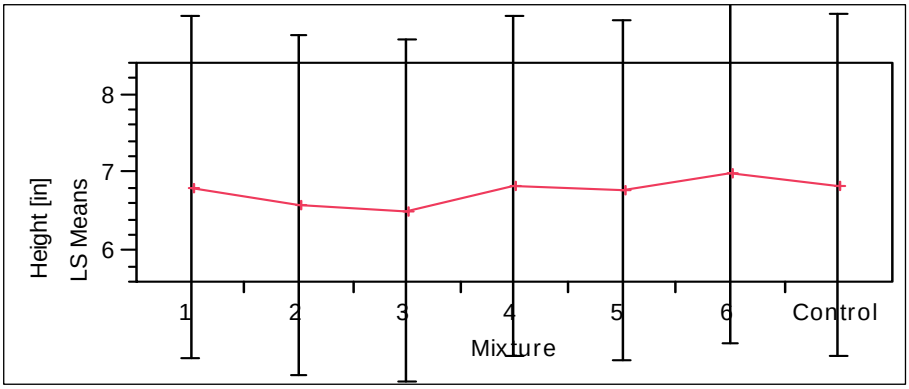
The research team assessed turfgrass quality (1-5 scale, 5 best, 1 poor, 3 acceptable) just after and 10 days after mowing as influenced by mower type (3 mowers) and lawn composition. The effective height of cut of each mower and grass mix was evaluated twice in 2005 just after and again 10-14 days after mowing. Five measurements of height (inches) were made in the wheel track and out side the wheel track at two locations in each seed mix plot and a control plot of existing lawn. The only wheel track visible after mowing was with the Land Pride mower, therefore only the heights outside the wheel tracks will be shown. On the June mowing date the grasses were higher reflecting the longer days, but the site was very dry. The October mowing date, the grasses were less tall but the conditions were much wetter. The figure and table below indicate the height just after mowing (June 10 and October 8, 2005) and 10-12 days after mowing (June 20 and October 20, 2005) (reflect the heights averaged over all grasses mixes and mowers).



Date					Mean height in inches
06/20/2005	A*				7.37
10/20/2005		B			7.10
06/10/2005			C		6.54
10/08/2005				D	6.00

*Levels not connected by same letter are significantly different.

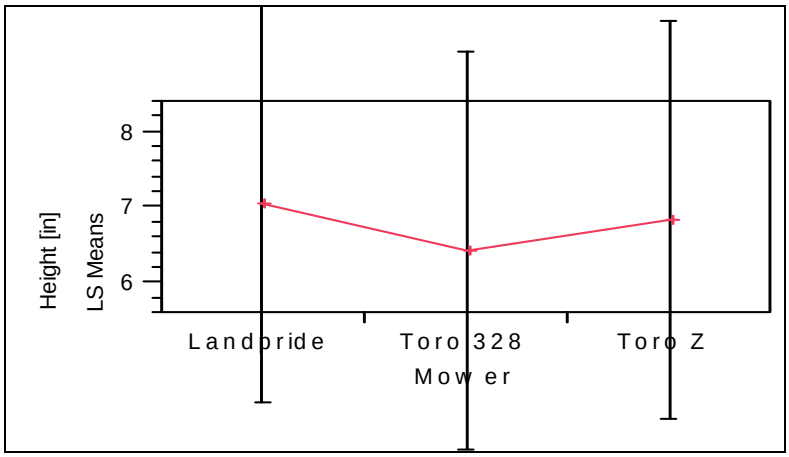
There was a difference in how well the lawn mixes were mowed. As seen below, when averaged over all three mowers and the 4 dates, Mixes 2 & 3 (which have colonial bentgrass) had the lowest height, but only significantly lower than Mix 6 (about 0.4 inch lower) which had the greatest amount of an upright growing grass, in this case sweet vernal grass.



Seed Mix				Mean height in inches
6	A*			6.98
Control	A	B		6.83
4	A	B		6.82
1	A	B		6.80
5	A	B	C	6.76
2		B	C	6.58
3			C	6.50

*Levels not connected by same letter are significantly different.

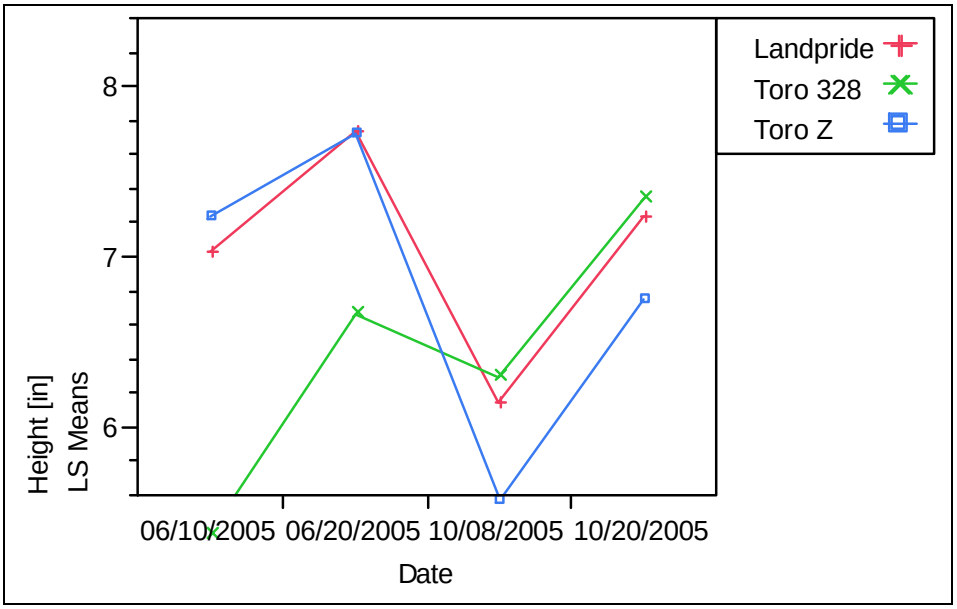
A anticipate and hoped, there was a difference in how well the mowers mowed, lower number means better mowing ability. When averaged over all grass mixes and dates, the upfront rotory mowers gave the best cut.



Mower				Mean height in inches
Land Pride	A*			7.03
Toro Z Master		B		6.81
Toro 328			C	6.41

*Levels not connected by same letter are significantly different.

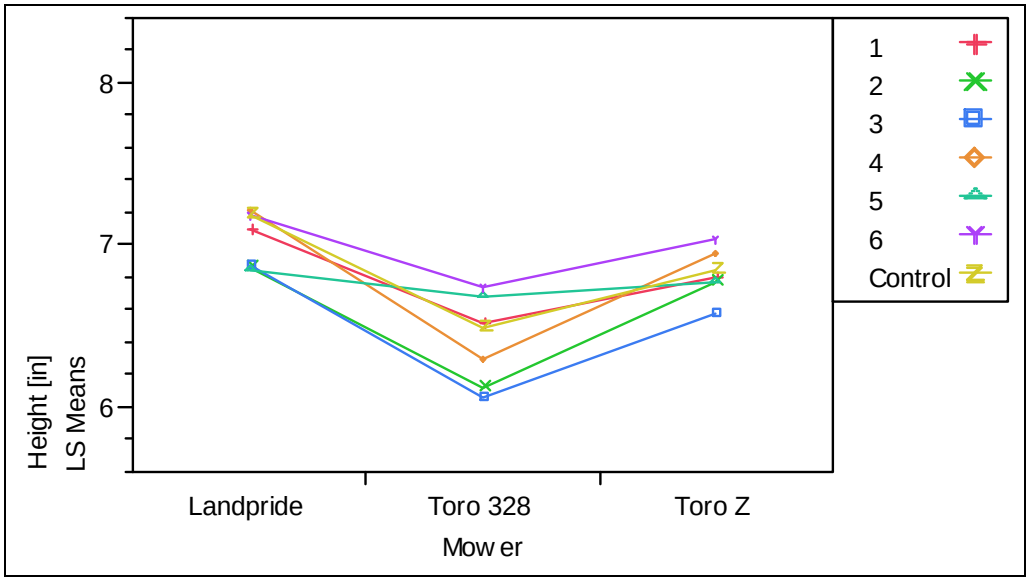
When averaged over all the lawns mixed, as seen below, the two upfront rotory mowers gave the best mowing. The Toro 328 mower mowed best in the June mowing (higher but dry) while the Toro Z Master was best in October (wetter conditions). The rear deck Land Pride was the worst cutting mower at both dates.



Mower	Date							Means height in inches
Landpride	06/20/2005	A*						7.73
Toro Z	06/20/2005	A						7.72
Toro 328	10/20/2005	A	B					7.34
Toro Z	6/10/2005		B					7.23
Landpride	10/20/2005		B					7.22
Landpride	06/10/2005		B	C				7.03
Toro Z	10/20/2005			C				6.74
Toro 328	06/20/2005			C	D			6.65
Toro 328	10/08/2005				D	E		6.29
Landpride	10/08/2005					E		6.14
Toro Z	10/08/2005						F	5.56
Toro 328	06/10/2005						F	5.36

*Levels not connected by same letter are significantly different.

There was a difference in mowing quality when one considers the mower and the grass mixture averaged over time. Not surprising, the rear rotary mower Land Pride had the poorest mowing on most grass mixes. Overall the Toro 328 had a slightly better cut on most mixes than the Toro Z Master.



Grass Mix	Mower						Mean height in inches
4	Landpride	A*					7.22
Control	Landpride	A	B				7.17
6	Landpride	A	B				7.17
1	Landpride	A	B	C			7.10
6	Toro Z	A	B	C			7.03
4	Toro Z	A	B	C			6.95
3	Landpride	A	B	C	D		6.87
2	Landpride	A	B	C	D		6.86
5	Landpride	A	B	C	D		6.84
Control	Toro Z	A	B	C	D		6.83
1	Toro Z	A	B	C	D		6.79
2	Toro Z	A	B	C	D		6.77
5	Toro Z	A	B	C	D		6.76
6	Toro 328	A	B	C	D		6.74
5	Toro 328	A	B	C	D	E	6.68
3	Toro Z		B	C	D	E	6.57
1	Toro 328			C	D	E	6.52
Control	Toro 328			C	D	E	6.48
4	Toro 328				D	E	6.29
2	Toro 328					E	6.11
3	Toro 328					E	6.06

*Levels not connected by same letter

APPENDIX C

CORNELL NUTRIENT ANALYSIS LABORATORY
G01 Bradfield Hall, Ithaca, NY 14853
Phone: (607)255-4540; Fax: (607)255-7656
Email: soiltest@cornell.edu; Web: http://cnal.cals.cornell.edu

Directions for Soil Sample Collection

1. Obtain a soil test kit and full information.

Cornell soil sampling kits may be obtained from local county Cooperative Extension offices or by contacting Cornell Nutrient Analysis directly. Each kit includes a submission form to be completed by the grower, a mailing bag with an attached envelope for sending in the soil sample, a plastic liner bag to contain the soil, and a submission form.

2. Establish a regular sampling time.

For most crops, the soil should be sampled every 2 to 3 years. For soils under intensive use, as in high-value cash crops or where nutritional problems persist, the soil should be tested prior to planting each crop. Soil samples may be taken at any time during the year, however avoid extremely wet soil conditions unless absolutely necessary. It is suggested that any given field be sampled at about the same time of the year.

3. Use proper sampling tools.

There are two important requirements. First, that a uniform slice be taken to the desired depth (usually the plow layer), and second, the same depth and volume of soil be taken from each spot sampled. A soil probe or augur is best; if not available use a garden spade or shovel. The technique for using a spade is to dig a hole to the sampling depth, cut a 1/2 inch thick slice of soil from the face of the hole, and trim both vertical sides of the slice so as to obtain a strip of soil about 1 inch wide from top to bottom. Do not use galvanized tools or containers because of probable zinc contamination.

4. Sample to the proper depth.

Cultivated agronomic crops and home gardens: Soil samples are ordinarily taken to the tillage depth. This depth is usually 6-10 inches but may be deeper. The tillage depth is important since lime and fertilizer are mixed within the tilled layer.

No-till or minimum till crops: it is best to take a small sample from the 0-1 inch depth and another sample from 1-8 inch depth. The surface and the normal depth sample should be placed in separate plastic bags labeled clearly as "surface 0-1 inch" and "normal depth 1-8 inch", and sent to the laboratory in the same outer cloth bag with one submission form.

Lawns and pastures: a sample from the upper four to six inches of soil is satisfactory. Thatch and other visible plant residue should be removed.

Tree and fruit crops: for deep-rooted tree crops, two samples should be sent to the laboratory: (a) a surface soil sample from the 0- to 8-inch depth, and (b) a subsoil sample from the 8- to 24-inch depth. The two samples are needed because these crops obtain many of their nutrients from the subsoil. The samples should be sent in separate mailing bags, with separate, completed submission forms. To keep these two samples together for analyses and recommendations, record the bag numbers for both samples on each submission form.
Greenhouse and potting soils: each batch of soil and growth-medium mixture should be sampled separately.

5. Obtain a representative sample.

Each soil sample sent to the CNAL should be a composite consisting of the soil from cores taken randomly at several places across the field. The purpose of this sampling procedure is to minimize the effects of any local non-uniformity in the soil. Cores or slices of soil, from about 10-20 locations over the area, should be taken for each soil sample. The soil cores should be mixed well in a paper or plastic bag or plastic bucket. Metal containers, i.e. galvanized metal will contaminate the sample. Small, unusual areas should be avoided when the intent is to estimate the fertility level of the field. Areas that should be avoided include: dead or back furrows, near windbreaks, trees, fence lines, old manure and lime pits, wet spots, areas near lime rock roads, or boundaries between slopes and bottomland. To trouble-shoot a small area with poor crop growth, a separate sample of the unusual area is needed.

6. Prepare the sample for submission to the laboratory.

DO NOT SEND WET SAMPLES TO THE LABORATORY. They may leak in the mail, provide inappropriate results, and delay analysis. If it is necessary to sample wet soil, spread the sample in a thin layer on an aluminum pie pan or on a clean sheet of wrapping paper or waxed paper, and allow to dry out at room temperature. Do not use heat to hasten drying. A fan blowing across the sample usually speeds drying. In a wet sample, rapid

biological transformations of the amounts and forms of soil nutrients (particularly forms of inorganic nitrogen) can occur. Drying is an effective means of preserving the field chemical characteristics of the soil sample. Place about two-thirds to one pint of the composited sample in a plastic bag and close, then enclose in the cloth bag supplied with the kit. The plastic bag should contain sufficient soil to fill at least 2/3 of the bag. Tie the cloth bag securely with the drawstring.

7. Fill out the appropriate submission form.

The submission form appropriate for your crop must be completed and sent along with the sample to the laboratory. The recommendations may not be accurate if the submission form is not filled out properly. Seal the completed submission form into the envelope. Do not detach the envelope from the bag.

- Form A: Standard Soil Fertility Test for Commercial Field Crops
- Form F: Standard Soil Fertility Test Package For Commercial Fruit Crops and Christmas Trees
- Form H: Standard Soil Fertility Test Package For Home Gardens
- Form I: Illinois Soil N Test (ISNT) and Loss-On-Ignition (LOI) For Corn
- Form P: Pre-Sidedress Nitrate Test (PSNT) For Field Crops and Vegetables
- Form RS: Research Soil Analysis
- Form T: Standard Soil Fertility Test Package For Commercial Turf
- Form V: Standard Soil Fertility Test for Commercial Vegetable Crops

Additional submission forms for download are available on our website: http://cnal.cals.cornell.edu.

8. Mail it in.

Send the sample and submission form to the laboratory. Print your name and complete address on the envelope. Check the type of submission form enclosed. Apply correct postage and mail; several samples can be packaged together in a carton and sent by mail or UPS, at less cost per sample than when sent individually.

9. Follow recommendations and keep records.

Complete the blocks below and keep this sheet for your records. Do not send this page to the laboratory. Study your fertilizer recommendations carefully. If you have any questions, discuss them with your local Cooperative Extension agent. The name, address, and phone number of your Cooperative Extension agent is printed on your laboratory report. Make soil test results a part of your field records. Then you will know when soil fertility levels rise or fall. For questions concerning the status of your sample, contact the Cornell Nutrient Analysis Laboratory. Please indicate client's name, county, date sample sent to laboratory, field name and sample bag number.

Client name	County

Sample bag number	Sample identification	Date sampled
		Month / Day / Year

County	Telephone	County	Telephone	County	Telephone
Albany	(518) 765-3500	Hamilton	(518) 548-6191	Rockland	(845) 429-7085
Allegany	(716) 268-7644	Herkimer	(315) 866-7920	St. Lawrence	(315) 379-9192
Broome	(607) 772-8953	Jefferson	(315) 788-8450	Saratoga	(518) 885-8995
Cattaraugus	(716) 699-2377	Lewis	(315) 376-5270	Schenectady	(518) 372-1622
Cayuga	(315) 255-1183	Livingston	(716) 658-3250	Schoharie	(518) 234-4303
Chautauqua	(716) 664-9502	Madison	(315) 684-3001	Schuyler	(607) 535-7161
Chemung	(607) 734-4453	Monroe	(716) 461-1000	Seneca	(315) 539-9251
Chenango	(607) 334-5841	Montgomery	(518) 762-3909	Steuben	(607) 776-9631
Clinton	(518) 561-7450	Nassau	(516) 228-0426	Suffolk	(631) 727-7850
Columbia	(518) 828-3346	Niagara	(716) 433-8839	Sullivan	(845) 292-6180
Cortland	(607) 753-5077	Oneida	(315) 736-3394	Tioga	(607) 687-4020
Delaware	(607) 865-6531	Onondaga	(315) 424-9485	Tompkins	(607) 272-2292
Dutchess	(845) 677-8223	Ontario	(585) 394-3977	Ulster	(845) 340-3990
Erie	(716) 652-5400	Orange	(845) 344-1234	Warren	(518) 623-3291
Essex	(518) 962-4810	Orleans	(585) 798-4265	Washington	(518) 746-2560
Franklin	(518) 483-7403	Oswego	(315) 963-7286	Wayne	(315) 331-8415
Fulton	(518) 762-3909	Otsego	(607) 547-2536	Westchester	(914) 285-4620
Genesee	(716) 343-3040	Putnam	(845) 278-6738	Wyoming	(585) 786-2251
Greene	(518) 622-9820	Rensselaer	(518) 272-4210	Yates	(315) 536-5123
NY city	(212) 340-2900				

CORNELL NUTRIENT ANALYSIS LABORATORY

G01 Bradfield Hall, Ithaca, NY 14853
Phone: (607)255-4540; Fax: (607)255-7656
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H

USE FOR HOMEGARDENS ONLY

(Fruit, Vegetables, Ornamentals, Trees, and Lawn)

STANDARD SOIL FERTILITY TEST (CNAL 1030 Package): Test cost $15.00 per sample

Grower name (please print):			Representative name:		
Business name:			Business name:		
Street or Road. No.:			Street or Road. No.:		
City:	State:	Zip:	City:	State:	Zip:
Phone:	Fax:		Phone:	Fax:	
Email:			Email:		

SOIL INFORMATION (*Required*)

Sample Identification	Soil Bag Number	Date Sampled	County

Environment	Topography	Texture	Soil Drainage
[ ] Sunny	[ ] Hilltop	[ ] Sandy	[ ] Excellent
[ ] Mostly sunny	[ ] Hillside	[ ] Loamy	[ ] Good
[ ] Mostly shady	[ ] Valley floor	[ ] Silty	[ ] Fair
[ ] Shady	[ ] Plain	[ ] Clayey	[ ] Poor

FOR ALL CROPS (*Required*)

Crop Grown	Recommendations required for (Check one)
[___|___|___] Crop code (Place crop code from back of the sheet)	[___] Maintenance after planting
_____ Variety	[___] Establishment of plants

FOR TREES AND SHRUBS

Age/Size	Location	Pruning	Type of tree
[___|___] Age (Years)	[ ] Fertilized lawn	[ ] None	[ ] Dwarf
[___|___] Height (Feet)	[ ] Unfertilized lawn	[ ] Less than 1/4 canopy	[ ] Semi-dwarf
[___|___] Trunk diameter (In.) at 4 ½ ft. height.	[ ] other	[ ] 1/4 to 1/3 canopy	[ ] Full size
		[ ] More than 1/3 canopy	

FOR LAWNS

Grass species (Check one)			Irrigation
[ ] Kentucky bluegrass	[ ] Bentgrass	[ ] Other grass name or variety	[ ] None
[ ] Annual bluegrass	[ ] Zoysia		[ ] Occasional
[ ] Fine fescue	[ ] General lawn mixture		[ ] Scheduled
[ ] Red fescue	[ ] Shady lawn mixture		[ ] Rate in inches/week

OPTIONAL TESTS

Enclose check made payable to Cornell University for the total cost of optional tests requested

Test	Cost per sample($)	Payment for optional tests
[ ] Nitrate (Morgan extractant)	$5.00	[ ] Check enclosed
[ ] Soluble salts	$5.00	[ ] Paid Cooperative Extension Office
[ ] Boron (Hot water)	$10.00	
[ ] Cation exchange capacity (2030)–Direct method (Amm. Acetate)*	$20.00	[ ] Account Number
[ ] Total metals (EPA 3051-6010)-Nitric acid digest*	$40.00	_____
** No interpretations and recommendations will be provided. Please allow a minimum of 2 weeks for test results.*		

GENERAL SOIL TEST INFORMATION
Standard tests and lime requirement are determined on all samples and are included with the purchase of the soil bag. **Standard Fertility Test Package includes:** pH, exchange acidity (lime requirement), organic matter, and Morgan extractable phosphorus, potassium, calcium, magnesium, aluminum, iron, zinc, and manganese. **Sample Submission Instructions:** Place about 1 cup of your well-mixed soil sample into the plastic bag enclosed within the pre-paid cloth bag, tie securely and label. Fill out the submission form, fold and place into an envelope, put the envelope in a box with soil samples and send it to Cornell Nutrient Analysis Laboratory at G01 Bradfield Hall, Ithaca, NY 14853. Additional submission forms for download are available on our website: http://cnal.cals.cornell.edu.

ORNAMENTALS AND TREES							
Code	**Crop Name**	**Code**	**Crop Name**	**Code**	**Crop Name**	**Code**	**Crop Name**
ALG	Azalea	SAG	Beautybush	SAG	Hemlock	SAG	Sassafras
ALG	Bayberry	SAG	Birch, white	SAG	Grapeholly	SAG	Spiraea
ALG	Chokeberry	SAG	Bittersweet	SAG	Honeylocust	SAG	Spruce
ALG	Franklinia	SAG	Boxwood	SAG	Honeysuckle	SAG	Sweetgum
ALG	Holly	SAG	Chastetree	SAG	Hornbeam	SAG	Sweet shrub
ALG	Inkberry	SAG	Chestnut	SAG	Hypericum	SAG	Sycamore
ALG	Leucothoe	SAG	Clematis	SAG	Ivy	SAG	Tulip tree
ALG	Mountain laurel	SAG	Coralberry	SAG	Jetbead	SAG	Tupelo
ALG	Pine Oak	SAG	Cotoneaster	SAG	Juniper	SAG	VA creeper
ALG	Paxistima	SAG	Crabapple	SAG	Larch	SAG	Viburnum
ALG	Pieris	SAG	Cotoneaster	SAG	Lilac	SAG	Vinca
ALG	Rhododendron	SAG	Crabapple	SAG	Linden	SAG	Walnut
ALG	Sheep laurel	SAG	Cyprus	SAG	Magnolia	SAG	Wayfaring tree
ALG	Sourwood	SAG	Daphne	SAG	Maple	SAG	Weigela
ALG	Spicebush	SAG	Deutzia	SAG	Mockorange	SAG	Willow
ALG	Winterberry holly	SAG	Dogwood	SAG	Oak, English	SAG	Wisteria
FLA	Flowering annuals	SAG	Enkianthus	SAG	Oak, Scarlet	SAG	Witch hazel
PER	Perennials	SAG	Euonymus	SAG	Oak, Turkey	SAG	Yellowwood
ROS	Roses	SAG	Firethorn	SAG	Pea shrub	SAG	Yew
SAG	Abelia	SAG	Fir	SAG	Pine	SPB	Spring flower bulb
SAG	Almond	SAG	Forsythia	SAG	Plum flowering	SUB	Summer flower bulb
SAG	Ajuga	SAG	Germander	SAG	Privet	TRT	Christmas tree, topdress
SAG	Arborvitae	SAG	Ginkgo	SAG	Quince		
SAG	Ash	SAG	Goldenchain	SAG	Redbud	TRE	Christmass tree, establishment
SAG	Barberry	SAG	Hawthorn	SAG	Rose of Sharon		

LAWN			
		Code	**Crop Name**
		LAW	Lawn

VEGETABLES AND FRUITS					
Code	**Crop Name**	**Code**	**Crop Name**	**Code**	**Crop Name**
APR	Asparagus	HRB	Herbs	STR	Strawberry
BLB	Blueberries	LET	Lettuce	SQS	Summer squash
CAR	Carrots	MVG	Mixed vegetables	SQW	Winter squash
CBS/CBP	Cabbage seeded/transplanted	POT	Potato	TOM	Tomatoes
GRA	Grapes	RSP	Raspberries	TRF	Tree fruits

MISCELLANEOUS	
Code	**Crop Name**
IDL	Idle land*
OTH	Crops not listed*
* - No interpretation and recommendations will be provided.	

COMMENTS