



# 3

## Affected Environment

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#### **Overleaf:**

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Valley Creek is an essential resource that is valued for its quality and beauty, but that faces major threats.

#### **This Page:**

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Some of the park's historic buildings, such as the newly acquired Waggon seller House, suffer from deferred maintenance.



## Chapter 3: Affected Environment

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### 3.1 Introduction

This chapter describes the existing natural, cultural, and socioeconomic conditions at Valley Forge NHP and its environs. It provides basic information about current conditions to be used as context for comparing the potential impacts of each alternative, which are presented in Chapter 4: Environmental Consequences. Relevant impact topics were selected based on agency and public concerns, regulatory and planning requirements, and known resource issues. Those resources relevant to the site and proposed action are discussed below. Resources not considered within the context of this Draft GMP/EIS include ethnographic resources, Indian Trust resources, and environmental justice. Section 1.5 provides a brief discussion of these resources and why they were dismissed.

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### 3.2 Site History and Significance

#### 3.2.1 Pre-encampment

American Indians occupied the area in and around what is now known as Valley Forge NHP from circa 10,000-8,000 BP (before present) onward, enjoying the abundance of food and shelter offered by the river valley environment. The last native people to inhabit the area were the Lenape, known today as the Delaware. Europeans began to settle the region in the late 17th century and gradually displaced the natives. By the time of the encampment, most of the land in the vicinity had been cleared for agriculture, which was the primary occupation.

Within what is now the park, 18 landowners established fairly prosperous farms on the choice agricultural soils. Along Valley Creek, an iron works named Valley Forge was established, and a small industrial village including charcoal houses, a saw mill, grist mill, and company store grew up around it. The slopes of Mounts Joy and Misery were wooded and were frequently cut over to supply wood for charcoal-making to fuel the iron forge.

On arrival in December 1777, a Continental soldier would have seen an open, rolling landscape divided into many small crop fields and pastures by fences and hedgerows; woodlands and charcoal hearths on the mountains; and the smattering of structures in the Village of Valley Forge, including the ruins of the forges themselves-burned during a raid by the British three months earlier.

#### 3.2.2 Encampment

The winter encampment at Valley Forge is one of the most famous episodes of the American Revolution. The significance of the encampment lies both in its fact-based history and also its storied myth. The mythical narrative is important in its own right for it reveals something about our character in the heroic way we wish the Revolution to be remembered. The popularity of the myth also speaks to its usefulness. Valley Forge remains a touchstone-always ready to minister to a generation in crisis.



The history and mythology of the Valley Forge winter encampment is fundamental to the American identity. (*The March to Valley Forge*, William B.T. Trego, 1883. Courtesy of the American Revolution Center.)

The myth often obscures the actual history of the event, however. It tells us that it was the experience of tremendous suffering from cold and starvation during the encampment that forged a spirit of preternatural patriotism among Washington's men. Hardship did occur at Valley Forge, but it was not a time of exceptional misery in the context of the situation. The encampment experience could be characterized as "suffering as usual," for privation was the Continental soldier's constant companion. Likewise, patriotism did not peak during the relatively short six-month period at Valley Forge. Widespread devotion to the cause was an early war phenomenon for the most part. Steadfast patriotism found a long-term home among only a few Americans, most notably the veterans who served for the duration.

To fully appreciate the significance of what occurred at Valley Forge, the event must be placed in context of the entire American Revolution. Few Americans appreciate the scope of the war. Many do not realize that the war lasted for eight-and-a-half-years, was international in scale, or that the American army campaigned in areas as far flung as Canada, Georgia, and west of the Alleghenies.

The Valley Forge encampment occurred during the third year of the war. Early successes against a smaller British army had led some Revolutionary leaders to believe that the righteousness of their cause and a militia-type force composed of citizen soldiers would be enough to force the British from America. By the time of Valley Forge, however, most Americans realized that the Revolution would be a long, drawn-out affair.

While some refused to accept it, the nature of the war changed in July 1776 when a large contingent of English and Hessian troops reached America's shores and sought to crush the rebellion. By the fall, the British had pushed Washington's unevenly trained and outnumbered force to the brink of defeat and established control over New York City and the states of New York and New Jersey. Only Washington's bold Christmas night 1776 crossing of the Delaware River and subsequent victories at Trenton and Princeton, New Jersey, saved the cause from disaster.

In order to put the army on firmer footing, the Continental Congress allowed George Washington to recruit soldiers for longer enlistments, beginning in 1777. The men of this establishment formed the bulk of the professional force that would fight the rest of the war. After wintering at their strong hold in Morristown, New Jersey, Washington's forces prepared to meet the British with renewed fervor in the spring of 1777.

British strategy for the third year of the American Revolution included a plan to capture the patriot capital at Philadelphia. To accomplish this objective, the British Commander-in-Chief, Sir William Howe, set sail from New York City in July 1777 with nearly 17,000 of His Majesty's finest troops on board transport ships. The expeditionary force landed at the head of the Chesapeake Bay (now Elkton, Maryland). To oppose Howe, General Washington marched his 12,000-man army from New Jersey.

On the march south, Washington paraded the American army through Philadelphia to impress the various factions among the citizenry with the prowess of the patriot force. Though commonly conceived of today as a rag tag bunch of inexperienced fighters, by 1777, the Continental Army was battle-tested and capable of standing up to the British. While campaigning against superior numbers of professional soldiers, Washington's men fought hard and were often on the offensive. One observer of the march through the city that summer prophetically stated that

*[The men] though indifferently dressed, held well burnished arms, and carried them like soldiers; and looked, in short, as if they might have faced an equal number with a reasonable prospect of success.*

— Captain Alexander Graydon 24 August 1777

In the two key battles of the Philadelphia campaign, Brandywine and Germantown, the Americans fought with skill and courage. Though they lost both battles, as well as the capital at Philadelphia, the Continental Army emerged from these experiences with a confidence like that of an underdog sports team that had thrown a scare into the champion:

*... [the experience of the battle of Germantown] has served to convince our people, that when they make an attack, they can confuse and Rout even the Flower of the British Army, with the greatest ease, and they are not that invincible Body of Men which many suppose them to be.*

— George Washington to Major General Israel Putnam 9 October 1777

Yet work remained to be done. The army had difficulty executing complex large-scale maneuvers such as the orderly retreat. As a result, retreats could turn into panicked flights. Indeed, General Nathanael Greene believed that the troops had "fled from victory" at Germantown. As the campaign wound down through the months of November and December, Washington maintained strong offensive pressure on the British in the city.

With the British ensconced in Philadelphia, Washington and his general officers had to decide where to encamp for the winter. As he chose a site, Washington had to balance the congressional wish for a winter campaign to dislodge the British from the capital against the needs of his weary and poorly supplied army. By December 12, Washington made his decision to encamp at Valley Forge. From this location 18 miles northwest of Philadelphia, Washington was close enough to

maintain pressure on the enemy dwelling in the captured patriot capital, yet far enough to prevent a surprise attack on his own troops. From here the Continental Army could protect the outlying parts of the state, with its wary citizens and precious military stores, as well as the Continental Congress—which had fled to York, Pennsylvania.

Washington and his campaign-weary men marched into camp on December 19, 1777. The soldiers, while not well supplied, were not downtrodden. They exuded the confidence of men who knew that they had come close to beating the British in battle. They were cautiously optimistic about the future and resigned themselves to the task of establishing their winter camp.

The romantic image that depicts the troops at Valley Forge as helpless and famished individuals at the mercy of winter's fury and clothed in nothing but rags renders them and their commander a disservice. It would be difficult to imagine a scenario in which the leader of a popular revolution stood by while his men froze and starved. The winter of 1777-78 was not the worst winter experienced during the war, but constant freezing and thawing, and intermittent snowfall and rain, coupled with shortages of provisions, clothing, and shoes, made living conditions extremely difficult. Rather than wait for deliverance, the army procured supplies, built log cabins to stay in, constructed makeshift clothing and gear, and cooked subsistence meals of their own concoction.

Provisions were available during the early months of the encampment. For example, army records of the food shipped to camp in the month of January 1778 reveal that the men received an average daily ration of one-half pound of beef per man. The most serious food crisis occurred in February, when the men went without meat for several days at a stretch. Shortages of clothing did cause severe hardship for a number of men, but many soldiers had a full uniform. At the worst point in early March, the army listed 2,898 men as unfit for duty due to a lack of clothing. During this time, well-equipped units took the place of their poorly dressed comrades and patrolled, foraged, and defended the camp.

One of the most immediate remedies against the weather and a lack of clothing was the construction of log shelters by the men. Valley Forge was the first winter encampment where many thousands of men had to build their own huts. The officers formed the men into construction squads and instructed them to build cabins according to a 14-foot by 16-foot model. The army placed the 2,000-odd huts in parallel lines, and according to one officer, the camp “had the appearance of a little city” when viewed from a distance. Most agreed that their log accommodations were “tolerably comfortable.”

In addition to the huts, the men constructed miles of trenches, five earthen forts (redoubts), and a state-of-the-art bridge based on a Roman design over the Schuylkill River. The picture of the encampment that emerges from the army records and the soldiers' own writing is that of a skilled and capable force in charge of its own destiny.





The construction of log huts for basic shelter was one of the primary occupations of the army. Huts are now a symbol of the encampment.

The Continental Army's quick seizure and use of the land directly across the Schuylkill River offers an example of the extent of its capability. Once the bridge spanning the river was complete, the army made full use of the land north of the river as a vital supply link. The farms located on the north side provided forage for the Continental Army, the location of a camp market where farmers from this vicinity could sell their produce to the army, and the center for commissary operations. The bridge connection also made the camp more secure as patrols could range the country to the north and east to check British movements and intentions in that quarter.

Even though camp markets and the establishment of a center for commissary operations brought food and supplies into camp, the establishment of the winter camp so close to the British caused the men additional hardship. Instead of being able to focus on building the camp and obtaining much needed rest, the troops had to expend energy on security operations. The men spent extra-long hours on duty patrolling, standing guard, and manning dangerous outposts near the city and the enemy. Washington recognized the strain that this situation placed on his men and rewarded them with two months' hardship pay.

Perhaps the most notable suffering that occurred at Valley Forge came from a factor that has not been frequently mentioned in textbooks: disease was the true scourge of the camp. Men from far flung geographical areas were exposed to sicknesses from which they had little immunity. During the encampment, nearly 2,000 men died of disease. Dedicated surgeons, nurses, a small pox inoculation program, and camp sanitation regulations limited the death tolls. The army kept monthly status reports that tracked the number of soldiers who had died or were too sick to perform their duties. These returns reveal that two-thirds of the men who perished died during the warmer months of March, April, and May, when supplies were more abundant. The most common killers were influenza, typhus, typhoid, and dysentery.



General Washington constantly sought adequate food and clothing for his troops, but nearly 2,000 men died of disease during the encampment.

The army interred few, if any, of its soldiers who perished within the lines of the camp. Doctors dispatched the most serious cases to outlying hospitals, both to limit disease spread and also to cure those individuals who could be saved. The army buried the soldiers who died in these out-of-the-way care facilities in church graveyards adjacent to the hospitals. These scattered Southeastern Pennsylvania gravesites have never been systematically commemorated.

The scale of the Valley Forge encampment was impressive. The number of soldiers present ranged from 12,000 in December to nearly 20,000 in late spring as the army massed for the campaign season. The troops who came to camp included men from all 13 original colonies and regiments from all of them except South Carolina and Georgia. The encampment brought together men, women, and children of nearly all ages, from all walks of life, of every occupation, from different ethnic backgrounds, and of various religions. While most were of English descent, African, American Indian, Austrian, Dutch, French, Germanic, Irish, Italian, Polish, Portuguese, Prussian, Scottish, Spanish, and Swedish persons also filled out the ranks. The women present at Valley Forge included approximately 400 enlisted men's wives who followed the army year-round and a few general officers' wives who came on extended visits. Although most soldiers came from a Protestant background, Catholic and Jewish personnel also were among those in camp.

Civilians played a key role in the encampment. The local community was largely a Quaker one. Most of the nearby, prominent farm and industrial families were members of the Religious Society of Friends. These persons and their Scottish, Irish, and German neighbors assisted the army to varying extents as their sentiments ranged in degree from staunch patriot to fervent Tory. Distressed and haughty New England officers in camp leveled their most impassioned complaints at the locals who did not appear to support the cause. Whether or not these disaffected persons were Quakers or from some other religious affiliation, resolute patriots referred to them all as "Quakers," and persecuted some for not aiding the Continental Army. In spite of the resentment leveled at them, it was often the Quakers and other religious



societies such as the Bethlehem and Lititz Moravians and the Ephrata Cloister members who rendered valuable assistance to sick soldiers while many citizens stood aside. Within this civilian milieu, the army was able to stabilize its situation and concentrate on a much-needed training program.

Valley Forge was demographically, militarily, and politically an important crossroads in the Revolutionary War. Recent scholarship shows that a mix of motives was at play, particularly in the minds of men who enlisted in early 1777. Some of these men served out of patriotism, but many served for profit or individual liberty (as in the case of enslaved, indentured, and apprenticed peoples), and many more were coerced as most colonies, on the advice of Congress and pressure from General Washington, introduced conscription in 1777.

As well, the participants had different values, and especially different ideas about what words such as liberty, equality, slavery, and freedom actually meant in practice. Valley Forge provides a site for exploring this complicated story and examining the multiple perspectives of those involved there – from soldiers to citizens, officers to enslaved Americans, from women to American Indians – the encampment was a microcosm of a revolutionary society at war. Also important, the ideas and ideals held dear by Americans today were not forged at Valley Forge, but rather contested – not just between patriots and the British – but also among different Americans. Valley Forge and the Revolution put the United States on a long road to defining those ideals in ways satisfactory to all – a process still in the making.

Despite the difficulties, there were a number of significant accomplishments and events during the encampment. Because of its far-reaching consequences, the single most noteworthy achievement was the maturation of the Continental Army into a professional force under the tutelage of Friedrich Wilhelm Baron von Steuben. Baron von Steuben assessed the army and recognized that Washington's men needed more training and discipline. At the same time he realized that American soldiers would not submit to harsh European-style regulation.

Von Steuben did not try to introduce

*the entire system of drill, evolutions, maneuvers, discipline, tactics, and Prussian formation into our Army. I should have been pelted had I attempted it, and should inevitably have failed. The genius of this nation is not in the least to be compared with that of the Prussians, Austrians, or French. You say to your soldier [in Europe], "Do this" and he doeth it; but [at Valley Forge] I am obliged to say, "This is the reason why you ought to do that," and then he does it.*

— Baron von Steuben to Baron de Gaudy, 1787-88

Instead, von Steuben demonstrated to the men the positive results that would come from retraining. He provided hands-on lessons, and Washington's independent-minded combat veterans were willing to learn new military skills when they saw immediate results. Von Steuben remarked on how quickly Washington's men progressed in the retraining process, saying that it normally took two years to properly train a soldier. As spring wore on, whole brigades marched with newfound precision and crisply executed commands under the watchful eye of the baron.

Von Steuben's regulations extended beyond tactical instruction. The Inspector General also spelled out directives for officers and eventually wrote a complete



General Washington's political, organizational, and leadership skills meant that the Continental Army did not "starve, dissolve, or disperse" during the Valley Forge winter. (George Washington at Princeton by Charles Willson Peale. Courtesy of U.S. Senate Collection.)

military handbook. The army hereafter would be more cohesive, healthier, and highly efficient. A new professionalism was born.

The Commander-in-Chief's professional reputation also got a boost at Valley Forge. Two events that occurred during the encampment strengthened George Washington's authority. The first was the emergence of a group of critics who denigrated General Washington's leadership ability. The proponents of this movement, which became known as the Conway Cabal, suggested that General Gates, the victorious leader at the Battle of Saratoga, was perhaps more fit for the top command position. This splinter group of officers and congressmen blamed Washington for having lost the capital to the British and argued that he put the war effort in jeopardy. As winter wore on, the so-called cabal dissolved, bringing disgrace to and ending the careers of several of its leaders. Washington's authority was strengthened, as loyal supporters rallied to defend and exalt the Commander-in-Chief.

A second event that consolidated Washington's control was his successful campaign to have a congressional committee visit camp. The general lobbied Congress to confer with him in person in order to resolve some of the supply and organizational difficulties that had plagued the army during the 1777 campaign. The committee emerged from the Valley Forge meeting with a better understanding of the logistical difficulties Washington faced and more sympathetic to the army's requirements. The army reorganization was one of the most far-reaching consequences of the committee's work. Almost from the war's outset, Washington had argued for a large professional army. The public's disdain for standing armies limited his ability to raise a sizeable force. The reorganization of 1778 represented a compromise between civilian and military ideals. Realizing that the army existed at only a portion of its authorized strength, Congress consolidated regiments and created a more streamlined force. European recognition augmented congressional reforms.

French assistance was crucial to the success of the Revolution. Starting in 1776, vital French aid in the form of military materiel flowed to America. The efforts of American agents in France and the strong performance of the continentals at the Battles of Saratoga and Germantown convinced the French to do more than provide covert aid. At Valley Forge in the spring of 1778, the army joyously celebrated the formal French recognition of the United States as a sovereign power and valuable alliance with this leading European nation. Though it would take years to bear fruit at Yorktown in 1781, the alliance provided Washington with the formidable French naval assistance and additional troops he needed to counter British marine superiority.

In mid-June, Washington's spy network informed him that the British were about to abandon Philadelphia. The Commander-in-Chief rapidly set troops in motion: a small force marched in and took possession of the city. The majority of the army swiftly advanced from staging areas on the north side of the Schuylkill River and southeast of camp toward the Delaware River and New Jersey in order to bring on a general engagement. On June 28, at the Battle of Monmouth, New Jersey, Washington's men demonstrated their new battlefield skills, as they forced the British from the field. Monmouth hurt the British in the short term and provided the Americans with a long-term boost in confidence.

In the summer of 1778, Washington could claim that the war effort was going well. The army's decision to occupy Valley Forge and maintain strong offensive pressure on the enemy was a wise one. After they abandoned Philadelphia, the British had little to show for all of their past year's efforts. Thanks to the contributions of von

Steuben and others, the Continental Army was more unified than ever before. The expected arrival of the French greatly altered British war plans. Philadelphia was back under patriot control. Washington knew that for every year the war dragged on the Americans held the advantage. The British withdrawal from Pennsylvania protracted the war and played into his plans.

The success of Valley Forge also can be measured in longer-term gains. Many regard Valley Forge as the birthplace of the American army. The concepts of basic training, the professionalization of the officer corps, and the rise of the army's distinctive branches, such as the corps of engineers, all got their start here. The military lessons that von Steuben helped instill served Washington's veterans well. The Continental Army forced the British to retreat at the battle of Monmouth, New Jersey, in June 1778, and fought with skill in the southern campaigns that led to the victory at Yorktown in 1781. The "relish for the trade of soldiering" that von Steuben inspired in the men also enabled the army, despite continuing hardships and spiraling citizen apathy, to stick single-mindedly to their task until they secured independence in 1783.

The symbolic importance that Americans have attached to Valley Forge since the 19th century both complicates and enriches its authentic history. The establishment of Valley Forge as a memorial provides a place where generations of Americans have had the opportunity to discover and admire the Continental Army's sacrifices and achievements and to participate in commemoration of this history. The desire to commemorate began to shape the history of this place soon after the army marched out.

### **3.2.3 Post-encampment**

The scale and intensity of the encampment devastated the landscape of the Valley Forge area. By the time the army left in June 1778, every tree for miles around had been taken down for firewood or hut construction, as well as miles of farmers' fences and many outbuildings. The livestock and stores of the area's residents had been commandeered and consumed. The land itself was pockmarked with entrenchments, muddy military roads and paths, some 2,000 huts, offal and other refuse pits, and work areas.

Farmers quickly recovered, and within the decade the huts were largely gone; fields replanted; and woodlots re-sprouted. By the early 19th century, landowners on the north side, with its particularly exceptional agricultural soils, experimented with "scientific farming" to increase the yields of their fields, and became prosperous. On both sides of the river, farms were improved, farmhouses enlarged, and large barns and other outbuildings added, changing the scale of what had been modest farms at the time of the encampment.

At the Village of Valley Forge, a musket factory was established even before the revolution ended. In the 19th century, iron mills and later a steel mill were operated there, as well as textile factories; saw, paper, and grist mills; wharves and a towpath associated with the Schuylkill Navigation Canal; a rail line with freight and passenger stations; stone and sand quarries; a water bottling plant; and enterprises including a hotel, stores, blacksmiths, and a tannery. The thriving community included dwellings, religious institutions, and schools.



On what had been the Grand Parade, a series of lime quarries were opened in the early 19th century, and the Village of Port Kennedy grew into a small mining and manufacturing center. An iron furnace and related industrial services powered a thriving village that grew to 400 people at its peak.

By the mid-19th century, only the farmhouses that had served as officers' quarters and the eroded remains of the earthworks remained as visible evidence of the huge encampment.

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### 3.3 Cultural Resources

*NPS Management Policies 2006* notes that “effective planning is based on an understanding of what a park’s cultural resources are, and why those resources are significant.” Information considered in decision-making must include the nature and types of cultural resources and their distribution, condition, significance, and local, regional, and national contexts. Figure 3-1 depicts some of the more noted cultural resources within park.

#### 3.3.1 Cultural Landscapes

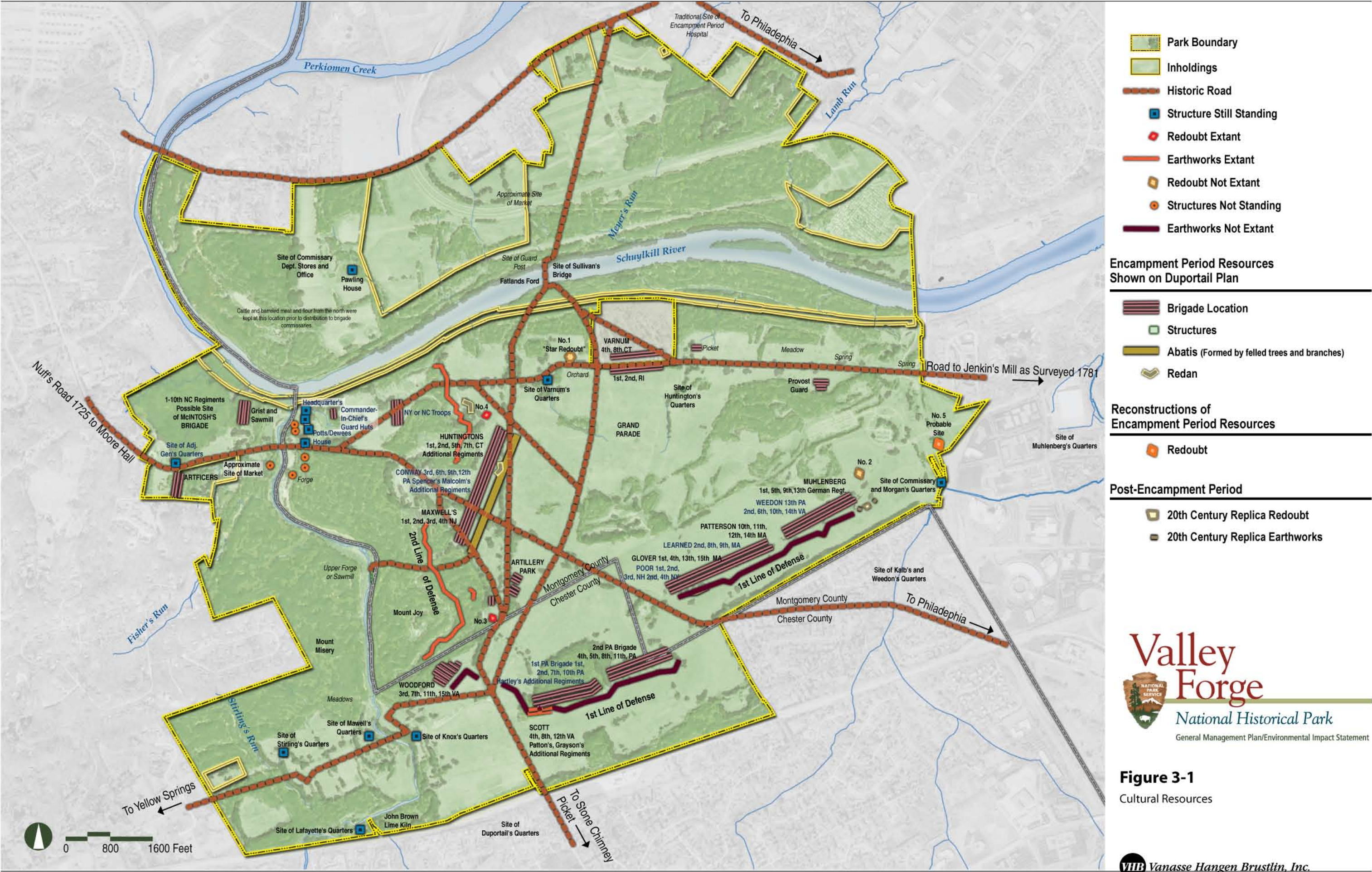
The cultural landscape of Valley Forge NHP primarily reflects two periods: the 1777-78 winter encampment of the Continental Army and the commemorative park overlay that began to develop in the late 19th century. The encampment landscape is nationally significant, while the commemorative landscape is significant at the state level. Additional layers of history are present in the park landscape: the park possesses state or local significance for its industrial, transportation, agricultural, conservation, and recreational associations. The numerous layers, as well as the current heavy vehicular traffic through the park and intense recreational use, impede the ability of the landscape to represent the significance of the encampment.

A Cultural Landscape Inventory (CLI) for the park was completed in 1999, documenting all known cultural and natural features that contribute to the National Register significance of the park. Four component landscapes were documented in more detail: the Village of Port Kennedy area; the Valley Forge farm cluster (Philander C. Knox estate, Lafayette’s Quarters, and Stirling’s Quarters); the Village of Valley Forge; and Walnut Hill (NPS 2001a).

A Draft Cultural Landscape Report (CLR) was completed in 2002, including both contextual research and cultural landscape documentation for the park. The report thoroughly described the evolution of the park through the use of narrative description and visual images; developed historic contexts for the park and identified their associated cultural resources; refined existing conditions documentation previously compiled in the CLI; and evaluated the significance and integrity of the landscape and its features according to National Register criteria (Susan Maxman Architects and John Milner Associates). The information presented in this section of the GMP/EIS is taken from the CLR.

Following completion of the GMP/EIS, a preservation treatment plan will be completed based on desired future conditions and interpretive plans for the landscape.











## Encampment Landscape

The encampment was a temporary military overlay upon an existing agricultural and industrial landscape that itself was based on a confluence of natural features and systems. Features such as heights, slope, and water were critical to the selection of sites for encampment fortifications, roads, and shelter. As is common with military sites from the revolution, many of the detailed elements no longer survive. The most critical landscape features, those that drew General Washington to this strategic site, remain, however, and have a high degree of integrity.

In December 1777, General George Washington entered his 12,000-man Continental Army into winter quarters in the hills near Valley Forge. The area presented a good strategic location for the army—only 18 miles from Philadelphia, too far for a feasible or surprise attack by the British, and situated between the British and the important supplies farther up the river. It was high ground, easily defensible, and with long views in all directions.

It is probable that French engineer Brigadier General Louis Lebeque dePresle Duportail planned and established the general lines of the camp. His 1778 map (Figure 3-2) is believed to be the most accurate of the few contemporaneous maps of the encampment. Brigades were arrayed in a large “C” shape around a broad valley that became known as the “Grand Parade,” where a great deal of the training took place. Behind defensive earthworks, soldiers erected log huts for themselves and their officers and established areas for food preparation, drilling, and sanitation. Recent excavations at the Pennsylvania Brigade describe a transect through what was likely a typical pattern. At the front line of the brigade encampment, between the defensive works and the first line of huts (for enlisted men) was an area that was the focus of intense activity during the encampment, including food preparation and consumption, trash disposal and latrines, recreation, musket ball manufacture and perhaps repair, and blacksmithing. A stone-surfaced road or pathway laid down during the encampment period probably became necessary after constant use reduced common pathways to mud.

Farther down the slope the officers’ huts were sited adjacent to an outdoor cooking area. In an area over 300 meters from the front of the brigade were found camp kitchens forming the rear line of the brigade (according to the plan published by von Steuben in 1778). This fairly complete archeological record presents the first holistic view of a Continental Army Brigade encampment layout (Valley Forge NHP 2002a).

The Duportail map suggests that about 30% of the area was wooded when the troops arrived. To establish and sustain the camp, every tree within a several-mile radius was cut and used for hut construction and earthworks or burned as fuel. The logging also provided clear defensive views of the river and the surrounding area. Wooden rail farm fences were dismantled and used, and hedgerows were sacrificed for fuel. Resident William Dewees, in petitioning Congress for restitution, wrote that:

*Your petitioner begs leave further to represent, that December following, His Excellency General Washington placed his Camp greatly upon your Petitioner’s Land: Whereupon the greatest part of his standing Timber, and all of his Fences, was and were destroy’d, which deprived your Petitioner of Power to erect New Building and rendered the Premises of less value than they previously were.*

When the army departed in June 1778, it left behind a scene of devastation. The land had been stripped of nearly everything usable or edible so that it was a “starved country.” Residents gradually reclaimed the area for agricultural use. Huts and earthworks were still present and usable the following December, when the Saratoga Convention Army, en route to Virginia, was quartered at Valley Forge. Just three years later, a traveler noted that while some of the better-constructed officers’ huts were inhabited, most of the huts were decayed or demolished for the use of the timber, and that the woods were beginning to be re-established in some places. General Washington himself visited the scene 10 years after the encampment and noted with pleasure that most of the fortifications were gone and that the land was largely recovered from its devastation and returned to productive agricultural use.

The encampment landscape retains integrity of landform, topography, views, and aspect, including Mounts Joy and Misery and the Grand Parade; natural systems and features, including the Schuylkill River, Valley Creek, and numerous springs; and circulation elements, such as Valley Forge Road (PA Route 23), Gulph Road, Baptist Road trace, Yellow Springs Road trace, and the river. More difficult to see but still present is physical evidence of the pre-encampment settlement patterns, including field boundaries, portions of some farm clusters, and remnants of the once-thriving iron forge industry. Much evidence remains of the military adaptations made to support the encampment and fortify the position, including portions of the inner and outer line defenses, the known sites of earthen forts and road systems, and various buildings and structures that were used for officers’ quarters, storage, or livestock. These are more than sufficient to convey the story of the encampment and its meaning. These landscape elements, combined with the archeological resources, historic structures, and museum objects and archives of the park, provide a complete physical record of this pivotal encampment. Archeological resources already have yielded, and will continue to yield, new and important information about this aspect of the site’s history.

### Commemorative Landscape



The early-20th century commemorative landscape included carriage roads along the old defensive lines, formal allées of trees, and monuments.

The park landscape most readily visible today reflects neither the wretched devastation that characterized most of the duration of the encampment nor the prosperous industrial village, farmsteads, and agricultural fields that were present both when the encampment began and also within a few years of its conclusion. Instead, the landscape today most closely reflects the state park commemorative period.

In 1877, local citizens formed the Centennial Association of Valley Forge to purchase Washington’s Headquarters and operate the building and surrounding grounds as a museum. It quickly became a popular tourist attraction. In 1893, the commonwealth of Pennsylvania established Valley Forge State Park, as well as a park commission to develop and oversee it. Between 1901 and 1915, a tour route system was constructed along (and sometimes over and through) the defensive lines, with monuments marking brigade and state regiment encampment locations. Redoubts and redans were reconstructed, and replicas of soldiers’ huts were erected and became a popular symbol of the encampment.

This approach to park development and commemoration was modeled on the example of Gettysburg. Unlike Gettysburg, however, where there was a clear and commonly understood mandate to preserve the battlefield just as it was in 1863, the Valley Forge commemorative landscape is the product of vacillation between the desire to restore elements of the landscape to encampment-period conditions and the desire to beautify the site in honor of its importance. A romanticized view of the past





Note:  
North orientation of the original map has been rotated for easier comparison with other maps in this document.



**Figure 3-2**  
Map of the Encampment Drawn by Brigadier  
General DuPortail

Source: DuPortail's Map of Valley Forge, (AM 602, page 8)  
Historical Society of Pennsylvania





led the park commission to alter or erase most of the characteristic agricultural and industrial elements, including most of the historic structures, fences, walls, hedgerows, and farm and village lanes. A reforestation program was implemented for Mounts Misery and Joy, and commemorative groves of dogwood and allées of oaks and lindens were planted. In a further deviation from preservation and restoration of the encampment landscape, paths, recreational trails, picnic areas, boating launches, observation points, and other park facilities were added in order to create a pleasurable recreational experience. Perhaps because of the lack of clear vision, none of the plans was ever implemented in full.

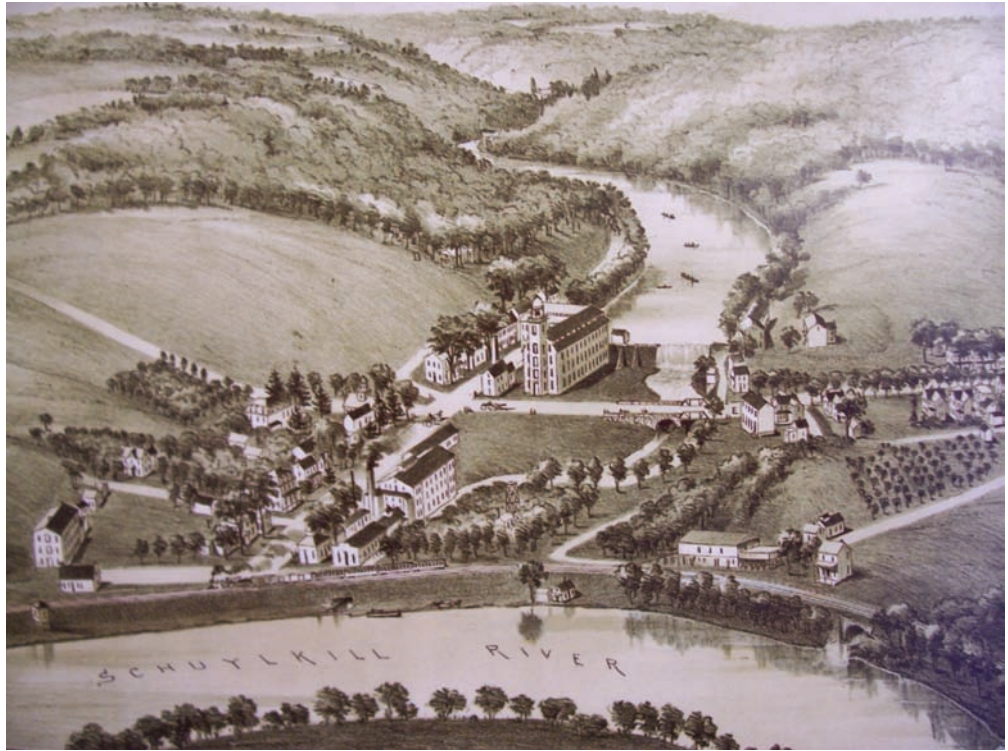
The park was transferred to the national park system in 1976. Since then, the NPS has acquired additional lands, including industrial inholdings south of the river, and demolished most of the industrial buildings. Little else has been changed in the ensuing years, however, and the landscape remains essentially as it was during state park times. The result is a cultural landscape at Valley Forge that is denatured: it is not easily comprehended, either as a historic scene or a commemorative design.

## Industrial Landscape

Valley Forge NHP contains the remains of two industrial villages: Valley Forge and Port Kennedy. During the mid-18th century, industry represented a locally modest component of a largely agricultural economy. The primary industrial development in the area was the series of iron forges that were established along Valley Creek to take advantage of the abundant waterpower afforded within a mile of its confluence with the Schuylkill River. These forges, which constitute some of the earliest industry in the region, were integrally linked to the landscape conditions of their surroundings. They were sited to take advantage not only of the waterpower of Valley Creek, but also the abundant supply of timber from the adjacent steeply sloped hillsides not suited for agriculture. The nearby Nutt's Road (present-day PA Route 23) provided connections from the French Creek ore mines to the northwest and to the markets in Philadelphia to the southeast.

Along Nutt's Road, the Potts family developed a merchant mill near the Isaac Potts House (presently known as Washington's Headquarters), along with sawmills and gristmills. While few of the features associated with these early forge complexes survive beyond the archeological record, other types of resources exist that help to convey the industrial history of this site. These include the alignments of early roads now referred to as Valley Creek Road and PA Route 23; broad spatial patterns of the wooded hillsides of Mounts Joy and Misery and other topographic features; the Schuylkill River and Valley Creek; and charcoal production sites including hearths, logging roads, and remnants of colliers' huts on Mount Misery.

The forges also were integrally linked to the Revolutionary War: Mount Joy Forge and the materials stored there as a magazine for the Continental Army were partially destroyed by the British Army in September 1777 when they passed through the area en route to Philadelphia. The Village of Valley Forge area possesses integrity to this early industrial sub-period, particularly for the qualities of location and association. Although the forges and many of the detailed elements of the early industrial period have been lost, the archeological record has the potential to contribute greatly to the knowledge and understanding of the period. Aboveground resources retain sufficient fabric to convey important aspects of the history of the site within this context.



The scene of the encampment continued to evolve. During the 19th century, the Village of Valley Forge became a thriving industrial town. (Library of Congress Geography and Map Division.)

Industry declined in the area in the latter part of the 19th century and ultimately disappeared due to economic adversity and acquisition of much of the area by the state for inclusion within Valley Forge State Park. Although the majority of the village was lost due to state park development, the area possesses integrity as an industrial village, particularly for the qualities of location and association. Numerous aboveground features survive from the late 18th and 19th century industrial period, including dwellings, quarry sites, traces of roads, the rail line, and Valley Creek, which generated the waterpower critical to many of these industrial endeavors. There is also a great potential for archeological resources to yield important information about this aspect of the site's history.

Port Kennedy was another locally important village that grew in response to industry. Abundant sources of high quality dolostone (limestone) were discovered within the Grand Parade area and to its east during the late 18th century, and development of an attendant industry began during the early 19th century. The stone excavated from the local quarries was shipped to markets throughout the Mid-Atlantic region, particularly Maryland and the Delaware peninsula, for use in construction and agriculture. During the middle decades of the 19th century, the Port Kennedy quarries may have been one of the largest limestone quarry and processing operations in the country. In the 1850s, an anthracite-powered iron furnace was established overlooking the river, taking advantage of the availability of coal brought by the canal. The furnace office and three of the duplex workers' houses survive today. The thriving industrial complex and village that evolved during the 19th century was an important component of the regional economy. The village was home to some 400 people during its heyday and contained schools, churches, a hotel, various commercial enterprises, a railway station, and numerous homes.



Like the industries in the Village of Valley Forge, the limestone-based industry at Port Kennedy began a decline during the latter part of the 19th century. While other industrial activities such as the Ehret Magnesia Plant replaced the limestone industry, they were not sufficient to support the village. The community was no longer viable by the 20th century. The emerging Valley Forge State Park slowly acquired land within the village. Many of Port Kennedy's features were razed by the state park commission, which saw the village as incongruous to restoring the historic scene of the encampment. Construction of the four-lane, limited access US 422 destroyed most of the rest of the village.



The 19th century Ehret Magnesia Company operated from a factory built at the center of what had been the encampment's Grand Parade.

The most obvious remnants of the industrial heritage of the Port Kennedy area include broad spatial patterns, topographic features, the Schuylkill River, an extensive system of limestone quarries and a few kilns, and various 19th century transportation networks including roads, rail lines, trace roads, and features surviving from the Schuylkill Canal, which was utilized to ship much of the iron and lime produced within the area. Also remaining are a small collection of buildings associated with the village's 19th century industrial history. The area possesses integrity as a 19th century industrial landscape, particularly for location and association, due to the surviving landscape features and the potential of archeological resources to yield important information about this aspect of the park's history.

## Transportation Landscape

The landscape retains significant features that reflect its association with transportation. The river itself was the first means of transportation, used for rafting in the 17th and 18th centuries. Early roads, including Nutt's Road (PA Route 23), Baptist Road, Gulph Road, and the road to Yellow Springs survive. Although paved and widened in most cases, their alignments are remarkably intact. Historic road traces and ford, ferry, and bridge sites associated with 18th century European settlement survive.

Nineteenth century transportation developments include the establishment of the Schuylkill Canal as well as rail lines on either side of the river. These systems supplanted the difficult roads and the seasonally limited river rafting. They supported the growth of the region by allowing reliable shipment of agricultural and industrial goods and raw materials. Surviving features include traces of the towpath and the canal prism; archeological remains of locks and dams; two train stations; railroad bridges and tunnels; a railroad right-of-way now used as a trail; and an operating rail line.

## Agricultural Landscape

Valley Forge's farmsteads made contributions to both the local economy and to advancing the science of agriculture. The park's agricultural significance is associated primarily with portions of the lands north of the Schuylkill River and the area in the southwest corner of the park referred to as Valley Forge Farm.

For three centuries, the Valley Forge area was dominated by agriculture. Well suited to farming due to prime soils, potable water sources, and readily available transportation on the river, the area witnessed early historic settlement by various immigrant groups of European descent and enslaved Africans. During the early settlement period, the land south of the river was characterized by small, subsistence-level farms. Farms on the north side were generally larger. Some of the patterns established during the early 18th century remain in evidence today.

Agriculture within this region helped to support the local population of the surrounding counties and the city of Philadelphia. During the late 18th and 19th centuries, as farmers were able to expand their operations beyond subsistence agriculture, southeastern Pennsylvania – along with neighboring New Jersey and the Delmarva Peninsula – grew into the country's primary grain-producing region. It remained an important producing region until superceded by the Midwest during the mid-19th century. The Walnut Hill and Valley Forge Farm areas supported the significant activities and advances in agriculture that occurred during the early 19th century.

Walnut Hill is located north of the Schuylkill River on the peninsula formed by the river and the Perkiomen Creek. It was owned during the Revolutionary War period by Henry Pawling II and located directly across the river from the main encampment area. The site was integral to the encampment and is the probable site of the market and commissary that served the army. The use of Fatland Ford and the construction of Sullivan's Bridge – erected during the encampment as a critical connection between the north and south sides – facilitated troop movements, delivery of stores, posting of sentries, and use of fields to pasture the army's horses. Buildings there were used as officers' quarters and for storing and dispensing supplies and food.

The farm came into the hands of the Wetherill family in 1826, who enlarged the Pawling house into a mansion, added numerous agricultural structures, and positioned the farm to take full advantage of the expanding markets and the availability of canal, and later railroad, transportation. As noted by James Kurtz in his study of the Walnut Hill property:

*During this period, new methods of farming, animal husbandry, land stewardship, and labor use were initiated. The development of city markets for produce and meat, improved field yields resulting from an awareness of soil fertility, and surplus capital investment brought about a new era in agriculture.*

*The existing Wetherill-era barn, corral, and associated structures represent an outstanding example of the buildings used in state-of-the-art, large-scale farming and animal husbandry practices of the 19th century.*

*This transition period from self-sufficient to commercial agriculture is exemplified by the agrarian sites in the region, especially the Wetherill-era structures and archeological deposits at the Walnut Hill Estate, Fatland Farm, and Meadow Grove. The Wetherill family was at the forefront of*

*agricultural innovation. As gentleman farmers, they provided the capital for the establishment of the farms. For labor, they relied on hired hands and possibly tenant farmers (Kurtz 2001).*

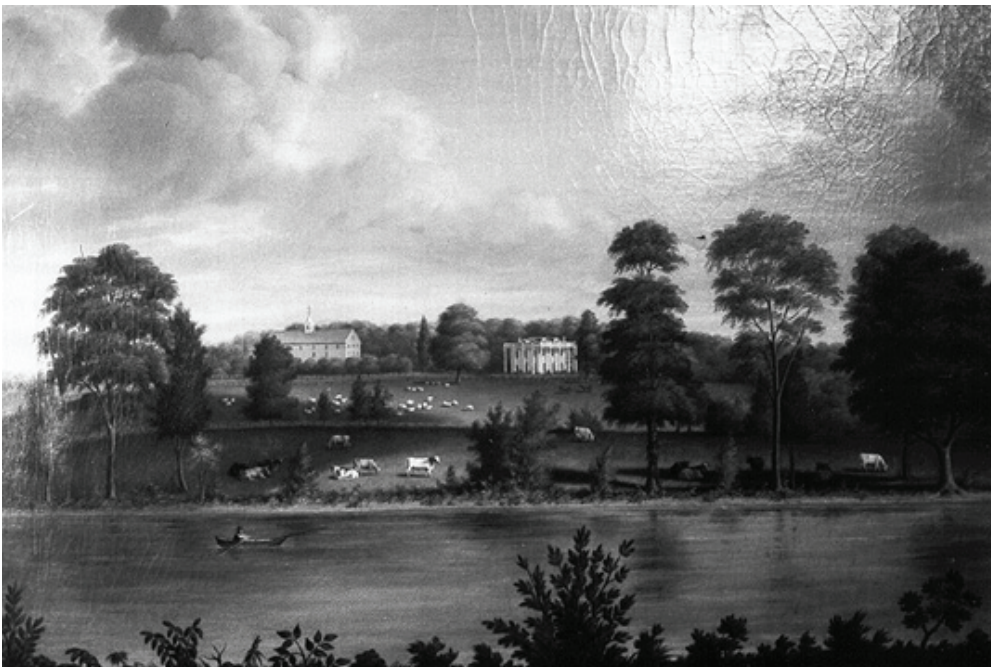
Walnut Hill retains the majority of its primary agricultural landscape features spanning the shift from initial, subsistence agriculture during the early settlement period to “scientific farming” and commercial agriculture in the second quarter of the 19th century. These features include field patterns, roads and road traces, the family dwelling, a tenant house, large barn, spring house, and other outbuildings, fencing, and woodlots.

The landscape from this period has been affected by 20th century modifications made to the property as a suburban estate and by the loss of landscape features west and south of the Walnut Hill mansion. The relationship between the farmstead and the river floodplain, formerly utilized as a meadow or pasture, was compromised by the establishment of large, earthen impoundment basins along the Schuylkill River in 1948. Archeological evidence of this period likely survives, with the potential to yield important information about this period.

The Valley Forge Farm area exhibits a long history of agricultural land use and is significant at the local level. Between the early 18th century settlement and the mid-20th century, the area evolved from subsistence-level agriculture undertaken on relatively small parcels of land, to commercial-scale agriculture, and subsequently to gentleman farming that included breeding and training livestock and horses. The Valley Forge Farm landscape includes numerous features and patterns dating from the 18th through the 20th centuries and exemplifies the evolution of southeastern Pennsylvania agricultural history. These features include field patterns, barns and other outbuildings, farmstead dwellings, roads and road traces, a former ford site, hedgerows, fencing, and ornamental and garden features. Archeological evidence of additional features likely survives. This evidence has the potential to yield important information about this significant period.



Although the land was part of the encampment, the Philander Chase Knox house, outbuildings, and setting at the Valley Forge Farm also are significant as an example of gentleman farming on Philadelphia's Main Line.



Walnut Hill, site of the commissary operation during the encampment, became a remarkably prosperous farm in the 19th century and is significant as part of the park's agricultural history.



Valley Forge Farm also includes remnants of industrial features constructed to support agriculture such as a quarry and late 18th and/or early 19th century limekilns. These features were most likely established to provide local farmers with burnt lime for field improvements.

### **Recreational Landscape**

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The park landscape possesses significance at the state level for its association with recreation beginning *circa* 1828 when the first known public event, “Harvest Home,” was held to honor the 50th anniversary of the encampment. For many years, public events such as patriotic celebrations and political rallies drew on the symbolic associations of the site. The attractive setting and the celebratory nature of many of the events led to a growing appreciation of the area as a destination for outings, particularly after the Reading & Philadelphia Railroad made it possible to travel there inexpensively and rapidly.

Soon after a 217-acre portion of the current site became Pennsylvania’s first state park in 1893, formal interventions in the landscape were made to accommodate visitors seeking to enjoy the park. Picnic areas were built at Washington’s Headquarters and later at other locations. As the park gained in popularity, the commonwealth continued to acquire lands and to enhance visitor access and opportunities for enjoyment. Tree-lined drives were built for use by carriages and later paved and widened for automobiles. Bridle and pedestrian paths, boating facilities, and an observation tower were constructed.

Many of these early features, including campgrounds, the observation tower, boating facilities on the formerly impounded Schuylkill River and Valley Creek, and additional picnic areas, shelters, and restrooms were removed over the years. The integrity of the recreational landscape is diminished, particularly integrity of materials, workmanship, and design. The recreational features are closely tied and interwoven with the park’s commemorative features and history. Recreation at the site is a product of a particular approach to commemoration and would not exist without the site’s commemorative history.

The types and composition of recreational facilities have changed greatly since the early park period. In the final years of state park management, facilities such as the two paved trails, Betzwood boating access, model-airplane field, and additional parking lots were added, further blurring both the encampment and commemorative period landscapes.

#### **3.3.2 Historic Buildings and Structures**

The park contains 81 historic buildings and numerous individual structures (ruins, monuments, markers, statues, roads, earthworks, walls, and other man-made features) that reflect its history and contribute to the significance of the park. The 81 historic buildings were constructed between the mid-18th century and the mid-20th century. Of these, 12 historic buildings have been identified as ones that were standing, in whole or in part, at the time of the encampment. These are primarily domestic structures with a few associated outbuildings. An additional three buildings are probable encampment period, but have not been definitely confirmed as such.

Non-encampment historic buildings relate to later activities and include farmhouses, estate dwellings, small village residences, barns, and sundry outbuildings.

In addition to the 12 encampment-era buildings, there are two additional buildings that are associated with the sites of officers' quarters. The *circa* 1816 Maurice Stephens House is thought to have been built on the site of an earlier building that was used as Huntington's Quarters. The Philander Chase Knox Residence is associated with the site of Maxwell's Quarters but was constructed circa 1783 and subsequently greatly altered in a series of building campaigns extending into the 20th century. Historical research in primary source materials has left some doubt about the accuracy of these associations.

Many of the 66 post-encampment historic buildings have state and local significance in their own rights. For example, the Philander Chase Knox Residence is significant as an example of the Pennsylvania farmhouse type of the Colonial Revival style of the early 20th century. The Walnut Hill barn is an outstanding example of the buildings used in state-of-the-art, large-scale farming practices that developed in the mid-19th century.

There are 40 historic monuments and memorials in the park—structures that commemorate an individual, group, event, or an idea. The state park commission invited the governments of each of the 13 states (former colonies) to erect monuments on the sites that had been occupied by their brigades. All the states except Connecticut have done so. Some monuments mark sites associated with the encampment. For example, the National Memorial Arch (a national historical landmark is sited on the high point of Gulph Road – the road on which the Continental Army marched into encampment. The Sullivan's Bridge monument marks the site of the bridge over the Schuylkill River that Washington ordered built. Other monuments commemorate the contributions of individuals or groups, for example the equestrian statue of General Wayne, the statue of Baron von Steuben, the memorial to patriots of African descent, and the memorial to unknown soldiers.

Park buildings and structures are intended to be maintained through cyclic maintenance funding programs and rehabilitated when necessary through the line-item construction program. Neither source provides sufficient funds for the preservation of historic buildings and structures, which require a great deal of specialized craftsmanship and currently rare materials. Due to the inability of the NPS to fund the appropriate levels of treatment and maintenance for the buildings, new sources of funding are being sought.

The park was successful in competing for federal funds through the Save America's Treasures Program at the National Trust for Historic Preservation in order to stabilize six of the encampment-related buildings. Matching funds were secured in 2001. Additional fundraising efforts between 2001 and 2003 resulted in funds beyond the basic match being secured from corporate donors, granting institutions, and the commonwealth of Pennsylvania. This funding was used to complete structural stabilization activities including re-roofing five structures and mitigating water infiltration around foundations. Beyond basic stabilization measures, there is a pressing need for extensive rehabilitation of most of the nine encampment-era buildings.

For the non-encampment era buildings, there is competition for scarce NPS funds. Valley Forge NHP receives donated maintenance services from local community organizations. Although small in relation to the many outstanding maintenance needs throughout the park, these donated materials and services are making noticeable improvements.

### ***Encampment-period Historic Buildings***

- David Potts House
- Henry Pawling portion of Walnut Hill Estate Mansion
- Knox's Quarters
- Lafayette's Quarters
- Masonry Springhouse at Meadow Grove
- Maurice Stephens Springhouse
- Mordecai Moore House
- Steuben Memorial Information Center (national historic landmark)
- Stirling's Quarters
- Stirling Springhouse
- Varnum's Quarters
- Washington's Headquarters (national historic landmark)
- David Potts Barn\*
- Horseshoe Trail South\*
- Washington's Stable\*

\* probable encampment period



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***Buildings included in the Save America's Treasures Program***

- David Potts House
  - Maurice Stephens House
  - Lafayette's Quarters
  - Maxwell's Quarters
  - Stirling's Quarters
  - Washington's Headquarters and Stable
- 



Outside funding such as grants from Save America's Treasures is essential to maintaining and preserving historic buildings in the park, such as General Varnum's Quarters.

The array of monuments and earthworks demand the same maintenance attention. A good deal of maintenance is handled by skilled and trained park employees. However, some monuments require attention beyond what employees are able to provide. The National Memorial Arch is a case in point. Repair of a major structural deficiency in the arch was too large a problem for maintenance staff to handle. Fortunately, a donor provided the specialty services to effect the \$1.5 million structural stabilization and masonry preservation. Recently, smaller donations have permitted remedial work to take place on the von Steuben monument. The Pennsylvania Columns have been identified for much needed preservation work beyond the abilities of the park to handle. Funding to repair the Massachusetts Monument was received in FY 2005.

The sheer number and different types of buildings and structures strain the park's financial and staff resources. The park gradually is attempting to bring the resources into better condition through various means. The task is enormous even with the assistance of partners and donors. Basic condition assessments have been made on every building and structure in the last two years, confirming the magnitude of stabilization, preservation, and maintenance that will be required to bring these buildings and structures back into stable condition. See Appendix D for a complete list of historic buildings and their condition.

The List of Classified Structures (LCS) is the NPS' official list of historic structures for each park. At Valley Forge NHP, maintenance of the list has not kept pace with recent acquisitions or with reassignment of some features to archeological status. Therefore, this GMP is not based on the LCS.

### 3.3.3 Archeological Resources

The archeological heritage of Valley Forge NHP is both vast and of enormous significance. The park's archeological resources document every major period of its occupation and are critical to a full appreciation and interpretation of the site's rich history. These archeological sites range over 8,500 years of human history. Of special concern are the sites and structures shaped by the encampment of the Continental Army. These archeological resources, hereafter called the encampment resources, are of the highest significance for the park, since they represent the richest material memory left to us from the participants. They inform us in many different ways about the lifeways, foodways, military regimen, and social behavior of the Continental soldier. Scientifically, they are priceless and of immeasurable value. But beyond all of that is the simple power they project: for they are the actual participants in an event that is seminal not only to our national history but for the entire world. This place marks the actual site where a radically different approach to government was implemented by military force and sudden change.

Archeological resources in national parks are recorded in the Archeological Sites Management Information System (ASMIS). Valley Forge NHP's ASMIS is under reorganization and completion is projected for 2006. It correctly lists 557 sites within the park.

Until the establishment of the national historical park, relatively little archeological investigation had been undertaken at Valley Forge. Beginning with a survey of the park by the University of Pennsylvania's Museum Applied Science Center for Archeology in the late 1970s and continuing in the 1980s with the work of Valley Forge Archeological Team Director James Kurtz, a large amount of data was compiled. Although the great majority of the sites found during this period of intense activity have yet to be fully understood and delineated, research recently completed at the site of the Pennsylvania Brigade has demonstrated conclusively that the encampment archeological resources contain the potential for a future harvest of data that is of inestimable value to the nation's cultural legacy and the edification of the public, residing beneath a commemorative landscape of great power and serenity.

The *Archeological Overview and Assessment* (in three volumes) details the range and value of these resources. The third volume, *Brigade Areas and Encampment Resources* (Valley Forge NHP 2002), concentrates only on the sites of the encampment resources, and the results change the way historians/researchers look at these sites. In particular, the recent excavations of the Pennsylvania Brigade indicate that the encampment resources are present in both quality and quantity beyond what was previously believed.

The eastern area of the park has not been studied; however, archeological surveys conducted in 2004 and 2005 would contribute to a future overview and assessment for this area. The archeological collections housed in the park also are highly significant resources and possess both scientific and interpretive values of outstanding importance.

#### **Pre-Contact Occupation**

Most scholars divide the pre-contact past into three major periods based on shifts in the ways American Indians lived: Paleo-Indian, Archaic, and Woodland. Since the early Archaic Period (10,000-8,000 BP), American Indian peoples occupied the park lands; therefore, Valley Forge NHP contains archeological materials associated with



the Archaic and Woodland periods. Because there has been no specific effort to survey the park for pre-contact sites, only 19 sites from the pre-contact periods are known based on the most current archeological assessment (Kurtz 2001). These sites were studied as the result of mitigation activities conducted on the north side of the Schuylkill River, and future surveys designed to specifically locate pre-contact sites could greatly increase the number of known sites.

The greatest number of pre-contact sites and artifacts at Valley Forge date from throughout the Archaic Period (10,000-2,800 BP). These sites are concentrated along the river terraces and upland flats. The debitage (waste rock fragments created by the production of stone tools) from the Archaic is also known from most of the encampment sites themselves and is seen in low densities throughout the upland areas of the park as well. Subsurface testing during an archeological survey by John Milner Associates, Inc. for the Philadelphia Electric Company in 1983 located the most important pre-contact site found to date in the park. Situated on the north side of the Schuylkill River, it consisted of materials dating from the Early Archaic up to the Early Woodland Period of Occupation (10,000 to 3,000 BP) and contained within a 30-inch-deep deposit. The site yielded 15 diagnostically identified projectile points and a fairly rich cluster of fire cracked rock, river cobbles, and debitage that formed a pre-contact hearth.

At a nearby site, more Archaic and Woodland materials were recovered, including some Early Woodland pottery shards identified as Marcey Creek. Artifacts also found in this project consisted of a grooved axe, Late Archaic Brewerton side-notched projectile points, and stone debitage. James Kurtz also reports that according to interviews he conducted with about 30 “collectors,” just to the north of the above sites much pre-contact material emerged during the earthmoving within the right-of-way for the construction of the US 422 curve (Kurtz 2001). In all likelihood, the park area south of the river possesses similar sites, and indeed, pre-contact materials found there reinforce this conclusion.

The pre-contact data that has been recovered to date contain the potential to address a variety of research topics, such as the understanding of the pre-contact cultural sequence of the Schuylkill Valley and the relationships of the Schuylkill Valley inhabitants with those of the Delaware River Valley to the east. The lack of a general park-wide pre-contact survey, however, has made the assessment of local-level settlement and occupation patterning difficult. It is clear that pre-contact resources exist here in large numbers, and they need protection from construction or maintenance activities and the creation of illegal trails by mountain bikes.

### **Pre-encampment Period (1681-1777)**

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The early settlement period of the park is represented by three primary topics of importance: industry, agriculture, and transportation. There are rich archeological components for all of these. Each of the historic houses and farms in the park is accompanied by substantial archeological resources. These resources range from associated trash pits and middens to architectural ruins, refilled cellars, and house sites. Two forge archeological sites, the earliest of which gave the park its name, were first excavated in the 1920s and need to be re-assessed and surveyed. The first forge may date to the first quarter of the 18th century and the earliest mill to the mid-18th century. By the time of the encampment the area had been intensely occupied with a well-established industrial village, a flourishing charcoal iron industry, and a series of prosperous farmsteads. An impressive group of charcoal hearths and associated collier huts have been discovered but have not been archeologically tested.

The 1929 excavations of the earliest Lower Forge revealed “all of the walls.” This was the building burned by the British in the fall of 1777 and also seen on the Duportail map. A space 85 feet long by 45 inches wide and 5 feet deep was excavated with a clam shovel. The overlying silt went down to a depth of 17 feet, with 6 feet more needed to reach the bottom of the wheel pit. Additional investigations were never conducted at these lower ruins, and the likelihood of preserved archeological deposits is high. The remains of the later Lower Forge, built after the Revolutionary War on top of the earlier site, were removed in 1921.

Another forge – the Upper Forge – also may have been burned by the British. It was first excavated in the 1930s. Its remains were reburied and are preserved in place. The site deserves re-examination.

Pre-encampment deposits are present in all of the known 18th century buildings that were used by Washington’s staff officers and brigade commanders during the encampment. Excavations at the Isaac Potts House, which was occupied by General Washington, did not reveal a great deal of pre-encampment activity, but in 1986 the digging of a drainage swale uncovered a fairly substantial trash deposit that contained much pre-encampment and encampment period materials. This deposit was protected and sealed and is available for future research. Both the domestic and the industrial remnants of the pre-encampment period are largely subsumed in archeological deposits that also contain later material. Some exist as discrete deposits that clearly antedate the Revolution, while the majority represents the earliest date of occupation in a series of more complex strata. Adjacent to the site of Washington’s Headquarters are the remnants of at least one mill building from the pre-encampment period. This archeological foundation(s) is currently eroding out of the streambank at Valley Creek and is the subject of a preservation action to record it prior to its inevitable loss.

### **Encampment Period (1777-78)**

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The archeological remains associated with the encampment make up the core of the park’s cultural resource base. Not only are they historically significant since they detail the army’s occupation of Valley Forge in many different ways, but their preservation is surprisingly good. Most of the encampment resources are found in the plow zones of the farmsteads upon which the army established its temporary home. Some of the encampment areas, however, are sited on sloping ground that does not appear to ever have been plowed.

The establishment of the location of the camps is assisted by the survival of very few primary resources: the 1778 map of the camp attributed to Louis Duportail, Washington’s Chief Engineer (see Figure 3-2), and a few later, and partially derivative, maps. Parallel lines drawn on the Duportail map indicate the positions of the brigades. Although the brigades’ actual locations are not labeled, a list of the brigades making up the outer line is included. The brigades were housed in two basic defensive lines, the inner and the outer. The Duportail map does not specify the location of any specific brigades in the inner defensive lines, but later maps and other documents have approximately established their locations. Subsequent archeological activity over the course of half a century has amply demonstrated the accuracy of the Duportail map in ascertaining the general location of the brigades at Valley Forge.

Until the Valley Forge Center for Cultural Resources project in the Pennsylvania Brigade area, beginning in 2000, the archeological practice simply was to find huts and their related trash deposits. Even then the huts were never fully excavated; only

their hearth areas were totally uncovered. The excavations at Conway's Brigade in the 1980s unearthed several "complete" huts, but they were somewhat compromised because the area had been plowed. Their central depressions were found, although these had been truncated, and the rough outlines of these depressions were plotted and recorded. A generation of amateur archeologists in the 1960s used metal detectors to discover numerous huts and pits, but because the goal of their search was to locate Revolutionary War objects, no attention was paid to non-object bearing strata or features. The first professional archeologists to work in the park (Cotter 1966) also concentrated on the discovery of huts and related materials. The recent excavations at the site of the Pennsylvania Brigade area, for the first time, sought to uncover evidence of the complete layout of a brigade.

The research design of the Pennsylvania Brigade project included mapping surface depressions indicative of hut locations and opening up larger area excavations in three sectors of the camp. A virtual transect was investigated, cutting across the brigade from the entrenchments on the forward line to the support areas in the rear. In the course of excavations intended to investigate the enlisted man's housing, a major and perhaps highly significant discovery occurred. At the very front line of the brigade encampment, between the first line of huts (enlisted men) and the defensive works, a large and rich assemblage of material and features was uncovered. This area was obviously the focus of intense activity during the encampment, as evidenced by a large outdoor firepit with surrounding pits and artifact scatters containing military objects, faunal remains, and other features. This discovery suggests that activities such as food preparation and consumption, trash disposal and latrines, recreation, musket ball manufacture and perhaps repair, and blacksmithing occurred here. The recovery of a number of British military buttons, taken into account with documentary evidence, strongly suggests that British uniforms were being converted for the use of the Continental Army. A stone-surfaced road or pathway also was found, which, based on archeological scrutiny, was definitely laid down during the encampment period. Three huts were excavated farther down the slope and into the wooded area, adding to our cumulative knowledge of hut construction, spatial extent, and design. One of the officer's huts excavated was sited adjacent to an outdoor cooking area. Artifacts found in the huts included tea bowl fragments (some of porcelain), glass vessels, bottles, and cuff links, forming an assemblage distinctive to their class and not seen in the enlisted man's artifact groups.



The recent archeological excavation of part of the Pennsylvania Brigade area revealed intriguing information about soldier life during the encampment, and suggested that a great deal more is to be discovered.

Many of the artifacts recovered had special stories to relate. For example, a great many British regimentally marked buttons were found in the "work area" at the front of the brigade. Some of the regiments, like the King's Eighth, were not in the area and the buttons probably represent captured uniforms. On the other hand, many of the cufflinks found were of a type commonly employed by the British officers throughout the second half of the 18th century. These were based on the design of Spanish silver coins and have been found in British Army camps in New York City and elsewhere. Very few smoking-related objects have been found in the brigade area, reflecting the difficulty in getting tobacco from the south during the war. The third area tested, over 300 hundred meters from the front of the brigade, consisted of two well preserved, large, circular earth features. These were camp kitchens and formed the rear line of the brigade (according to the plan published by von Steuben in 1778, see photo on page 2-7). This, along with associated ash piles, trash pits, and graveled platforms and pathways, enabled a fairly accurate depiction of the depth of a brigade encampment for the first time. All of the above information combines to depict a more holistic view of a Continental Army Brigade encampment layout than previously known.



Although the other brigade areas are mostly in subsequently plowed areas, they also possess great significance and research/interpretative potential. Sites such as Glover's, Learned's, Patterson's, Weedon's, and Muhlenberg's Brigades all are located along the section of the outer line defenses east of the National Memorial Arch that now is maintained as lawn and meadow. The potential for archeological data recovery is high, based on previous experience at Muhlenberg's and Conway's Brigades in the 1980s. Unplowed sites also remain to be explored. Varnum's Brigade, on the inner line defenses and partially resting in the wooded areas around the chapel grounds, appears to be very well preserved. Areas such as the Artificer's Regiment, the Artillery Brigade, and Woodford's Brigade have not been located, but it is highly likely they have not been obliterated. The inner line entrenchment area is in very good condition and needs to be tested and researched. Most of the outer line entrenchment has been obliterated but may be relocated through archeological research. The forts and redans were plowed away or awkwardly reconstructed during the early 20th century, which may give them a lower archeological status. Yet, even here, opportunity exists to fully understand them through a concerted effort of archeological testing and research.

A remaining archeological problem is the location of the commissary, thought to be located north of the Schuylkill River. One site possesses archeological deposits which clearly date to the 18th century and encampment period. Three excavation units at this site provide only a glimpse into what must be a very complex archeological area; however, the material and burned features suggest an extensive yet short occupation and indicate that a small farmstead existed here at the time of the encampment. This might be one of the areas associated with the market or commissary of the encampment. The topography, site formation, and artifact concentration would have been suitable for this speculation. The site is worthy of more interest and research attention.

In all, the encampment period archeological materials are fairly stable and have only been impacted in the past by construction of utility lines, park facilities such as roads and recreational facilities, or improper maintenance. In addition, there have been recent cases of illegal digging by relic hunters, so vigilance must remain high.

### **Post-encampment Period (1778-present)**

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Archeologically, this period is the richest since the material was deposited by a largely industrial society where objects were created in mass quantities for the first time in history. The Village of Valley Forge was a substantial industrial center during the first half of the 19th century, and there are a plethora of sites relating to iron manufacturing and other enterprises such as a grist mill, a cotton mill, and textile and paper industries. Mill housing completed the urban landscape, and most of this still exists as archeological resources. Valley Forge was one of the earliest industrial communities in the western world, formed as early as its English and European cousins. Although threatened by stream bank erosion in some areas, its archeology is fairly complete, and the 19th century town of Valley Forge is rich in buried domestic and industrial archeological resources. The industrial archeological remains here represent a highly significant resource related to the early iron industry in America. With deposits relating to one of the earliest rolling and slitting mills and steel furnaces in the eastern United States and its associated community of worker houses, the area west of Valley Creek in particular is extremely important (Valley Forge NHP 2001a).

A good example of the full story of industrial development dating from the end of the 19th century can be demonstrated by examining the Colonial Springs/Slab

Tavern/Fisher Complex. These structures are clustered around a spring that flows out of the northern slope of Mount Misery. The ruins, extensively tested by Kurtz, include the remains of an elaborate farmstead, a water bottling plant, an ice house, a warehouse, and several dwellings, the most notable being the “Slab Tavern,” which is incorporated into a later 19th century building. Some tradition associates the “Slab Tavern” with Baron von Steuben; however, the significance of this impressive complex rests more firmly on its status as a broadly diverse group of ruins replete with their archeological deposits reflecting a whole range of usages. The industrial revolution resources are of great value, and can be integrated in context with others of the Schuylkill Valley, particularly in concert with Hopewell Furnace National Historic Site and the Schuylkill River Valley National Heritage Area.

Water and rail transportation facilities were introduced to the Valley Forge landscape from the first quarter of the 19th century to the first quarter of the 20th century. The archeological deposits left behind by these activities include the remains of quarries, stone tunnels and terrace walls, railroad beds and equipment, canal dams, tow paths and locks, and various lodgings, dwellings and support structures. Most of this material was surveyed by James Kurtz (2001), and the archeological resources are intact.

In 1984, the NPS acquired the magnificent agricultural plantation of Walnut Hill, north of the Schuylkill River. This was the site of Henry Pawling’s farmstead, which may have been used as the site for the Continental Army’s commissary. But it was also a sprawling and prosperous farm where a later owner, Samuel Wetherill, Jr., practiced the latest methods of “scientific agriculture.” After his purchase of the plantation in 1823, Wetherill and his descendants improved their holdings with many impressive structures. Agricultural activity here was financially rewarding, and numerous technological improvements changed the emphasis of these farms from largely self-sufficient endeavors to ones that took advantage of the new transportation network and the growing urban populations of southeastern Pennsylvania. Large archeological deposits are known from all of this activity. The estate could tell a great range of stories, from prehistoric to the present.

By the early 19th century and continuing into the 20th, the Schuylkill River also provided an attractive avenue of transportation for these new plantations. The Schuylkill Navigation Company, established in 1815, produced a canal network flanking the river that endured throughout the century. Numerous archeological vestiges of this system survive in the park, including portions of locks, towpaths, stables, taverns, barns, and even portions of the canal itself. All of these have related archeological material. Stone tunnels for the railroad also suggest an additional area for industrial archeological investigation.

### **Park Era (1893-present)**

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Since the establishment of the state park in the late 19th century, the landscape has been aggressively modified for the purposes of memorialization and commemoration. These activities probably displaced a great amount of encampment period and other archeological resources. Although no effort has been made to archeologically check these areas (with the exception of the archeological investigation of two marked graves which both turned out to be negative) these more recent deposits are present and should be noted and documented. For example, during recent work at the site of the Pennsylvania Brigades the curbing of an early 20th century road was unearthed. At the Waterman Monument there likely are substantial archeological memories of how it was erected.

### 3.3.4 Archives and Collections

Valley Forge NHP's unexhibited archives and collections are stored in seven different locations in the park. In five of them, the lack of appropriate storage space with appropriate environmental controls to ensure the protection of the artifacts and archives threatens their long-term preservation. The material deterioration of objects and paper is largely an effect of the environment. The five inadequate storage spaces are characterized by little or no environmental controls for temperature, humidity, and fire suppression. Proper security also is lacking at the five facilities. Work space to allow the handling and cataloging of the archives and objects, as well as work space for the use of researchers, is absent from all the facilities, nor would it be possible to provide staff to supervise the use of these materials if outside researchers could be accommodated.

Valley Forge NHP archival collections contain rare and unique items, some of which are specific to the encampment at Valley Forge. The most significant archival collection at the park is the John F. Reed Manuscript Collection, which contains rare 18th century manuscripts, broadsides, pamphlets, books, and artifacts. In this collection is the well-known letter written at Valley Forge by General George Washington to the Continental Congress on December 23, 1777, in which he writes that unless they receive the necessary provisions, the army will starve, dissolve, or disperse.

Archival records produced in the day-to-day management of Valley Forge by the Centennial and Memorial Association of Valley Forge (1878-1893), the commonwealth of Pennsylvania (1893-1977), and NPS (1977-present) are invaluable in today's management of Valley Forge NHP cultural and natural resources. Papers from private individuals and other assembled collections also are present in the collections. In all, the archival collections number approximately 164,100 items. Some are stored in the vault, but most are stored in unstaffed space in a basement, where they are threatened by the lack of environmental controls to maintain temperature and humidity within suitable conservation ranges.

Surveys and partial inventories/finding aids exist for a portion of the archival collections; however, the entire archival collection requires processing and cataloging. Only 9% of the archives are cataloged at this time. Until this is completed, the archives are vulnerable to loss or damage and remain inaccessible to researchers and park staff. Only a portion of the natural resource management archives are catalogued.

The core of historic objects at the park are from the George C. Neumann Collection of American Revolutionary War memorabilia. At the time it was acquired for the NPS in 1978, it was the largest single private collection of Revolutionary War artifacts known in the world, consisting of nearly 1,500 items, including 80 shoulder weapons (muskets and rifles), 350 swords, 330 auxiliary edged weapons (polearms and bayonets), and 680 pieces of military accouterments and accessories. These are not only American-made but also British, French, Dutch, Spanish, and German. This study collection focuses on the military and everyday needs of the common soldier during the War for Independence. This collection is stored in the vault of the Welcome Center, where there are good environmental controls and good security.

A large number of period historic objects were transferred to the NPS from the commonwealth of Pennsylvania. Some of these artifacts are used to furnish Washington's Headquarters and Varnum's Quarters, which are both open to the public. In all, the total historic objects at Valley Forge NHP number approximately 21,986 items. Additional furnishings that are representative examples of 18th century



furnishings, not necessarily related to Valley Forge, are stored at the Dewees House, which is no longer open to the public. They were relocated here after they were damaged by water at the Steuben Memorial Information Center, which in addition to a leaking roof lacked proper environmental controls and security. There is the potential to use these furnishings if other historic buildings in the park are opened to the public.

The period of most intensive archeological study at the park, and with the most unique historical significance, is the encampment period. Extensive archeological work has been completed that documents various aspects of the encampment, including domestic life, military training, and demographic patterns. Archeological research complemented and supplemented gaps in the historic record and provided valuable information regarding the life and work of soldiers and associated cultural groups during the encampment. While the excavated artifacts provide the major research potential of the Valley Forge archeological collections, the presence of related primary records from the excavations and associated archival information greatly increases the range and depth of collections research and interpretation. Few of the brigade areas have been excavated, and the potential for future archeological findings is great.

The largest number of archeology items in the park collections dates from the 19th and early 20th centuries. In total, there are approximately 175,000 archeological items from this period. Most of the archeological collection is stored on the mezzanine of the Welcome Center: there are no environmental controls, and security is relatively low. Large industrial archeological artifacts from the Village of Valley Forge are stored in the basement of the former Valley Forge railroad station, also without environmental controls.

Architectural fragments from historic buildings in the park are stored in a barn, with no environmental controls and low security. Natural history archives largely contain data from the past three decades and cover all relevant natural resources as well as management records. The archives are in good condition but need to be housed in appropriately conditioned space. The small library collection also needs to be rehoused. Natural history specimens are stored at a number of universities, with many still to come to the park. A herbarium collection is stored in a closet.

The Horace Willcox Memorial Library – the park library – contains more than 6,000 books and periodicals on the American Revolutionary War with an emphasis on the Valley Forge encampment. Materials also are available on the political, social, and industrial history of the area. The library contains numerous NPS studies and reports on the resources, administration, and history of the park. The range and depth of the library collection is considerable and would be extremely difficult, if not impossible, to recreate today.

The library collection is one of the largest in the NPS. There is little room in its current location for growth, and the programmed purchase of additional books for the library ceased in the 1990s because of space constraints. The library is housed in the book room of the Philander C. Knox home. With no environmental controls and minimal security, this historic structure is not adequate for the long-term preservation of these resources. The library is now squeezed into approximately 940 square feet.

The library is staffed irregularly by the park archivist. Base funds and donated funds are used to purchase supplies and materials for the library. Over the years, the Friends of Valley Forge NHP have purchased books and furnishings and funded the rebinding of books.

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## 3.4 Physical and Natural Resources

The physical and natural resources at Valley Forge were significant contributors to its selection as the site of Washington's encampment for the Continental Army in 1777. The site provided many strategic advantages including defensible terrain and expansive views of the surrounding environs necessary to prevent sneak attacks, and a navigable waterway for the transport of people and goods. Trees on the site also provided raw materials for the construction of many huts and other buildings, as well as fuel needed to support the encampment through the difficult winter.

Following the decampment of the Continental Army, the area gradually reverted back to cultivated fields and wooded lots. During the 19th century, two villages and numerous industries developed, and two railroads and the Schuylkill Canal were built through what had been the encampment area. More recently, the Valley Forge area has undergone urbanization in the form of residential, commercial, and industrial development. Below is a descriptive summary of the existing physical and natural conditions found at Valley Forge NHP.

### 3.4.1 Climate

The southeast region of Pennsylvania has a humid, continental climate characterized by warm summers and moderately cold temperatures. The normal mean annual temperature in the Philadelphia region (1961-90) is about 54°F with mean monthly temperatures ranging from 30°F in January, the coldest month, to 77°F in July. Average annual precipitation is approximately 46 inches, which is fairly evenly spread throughout the year. Slightly higher amounts of precipitation occur in the summer between May and August as a result of thunderstorms. The average annual snowfall is 30 inches.

### 3.4.2 Topography

From a historical perspective, the hills and ridgelines found at Valley Forge NHP were critical to George Washington's selection of the site for the encampment, as they provided excellent defensive positions for the Continental Army. Located in southeastern Pennsylvania, Valley Forge NHP is in the Piedmont physiographic province. Topography on the site is flat to rolling with elevations ranging from 80 feet near the Schuylkill River to approximately 530 feet on Mount Misery.

Within the park, the Schuylkill River serves as a geographic divider. The north side of the park is located on a broad river valley bordered by steep to gentle slopes. Topography south of the Schuylkill River is generally steeper, particularly in the western portion of the park where Mounts Misery and Joy, divided by Valley Creek, are the highest points. Mount Misery is the eastern terminus of a several-mile long ridge that forms the northern rim of Pennsylvania's Great Valley. East of these hills, the "Grand Parade" is a broad valley edged by prominent ridgelines (Figure 3-3).

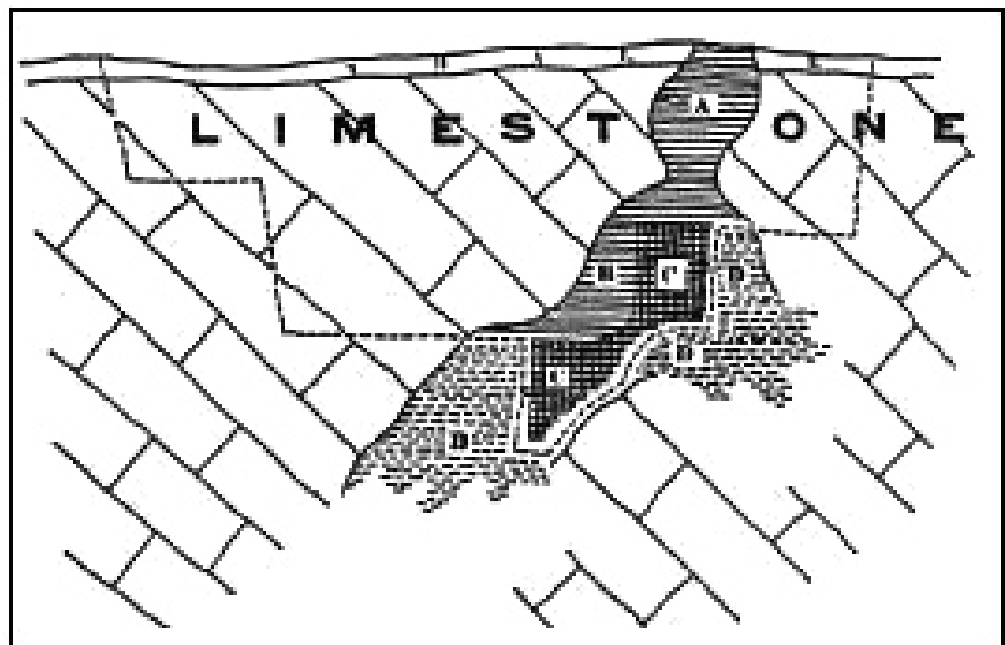
### 3.4.3 Geologic Resources

Three basic rock types are found at Valley Forge NHP, typically based on topographic location: red beds – sandstones and shales – form a terrace in the northern portion of the park (the Stockton Formation); erosion-resistant quartzite underlies Mounts Misery and Joy (Chickies, Antietam, and Harpers Formations); and dolostone fills the valley areas (Ledger Formation). Along the southern edge of the park and just north of the PA Turnpike, a fault line of fracture and displacement in the earth's crust extends east to west (PA Geological Survey 1993).

The Grand Parade is one such valley filled with dolostone, a calcium carbonate rock that is easily dissolved by surface or ground water. The valley is drained by underground channels that have dissolved over the years. Known as karst topography, it is characterized by underground drainage, sinkholes, and caverns. The park is speckled with these caves and sinkholes, which over the years have been mined, excavated for research purposes, filled in for public safety, or remain unexplored.

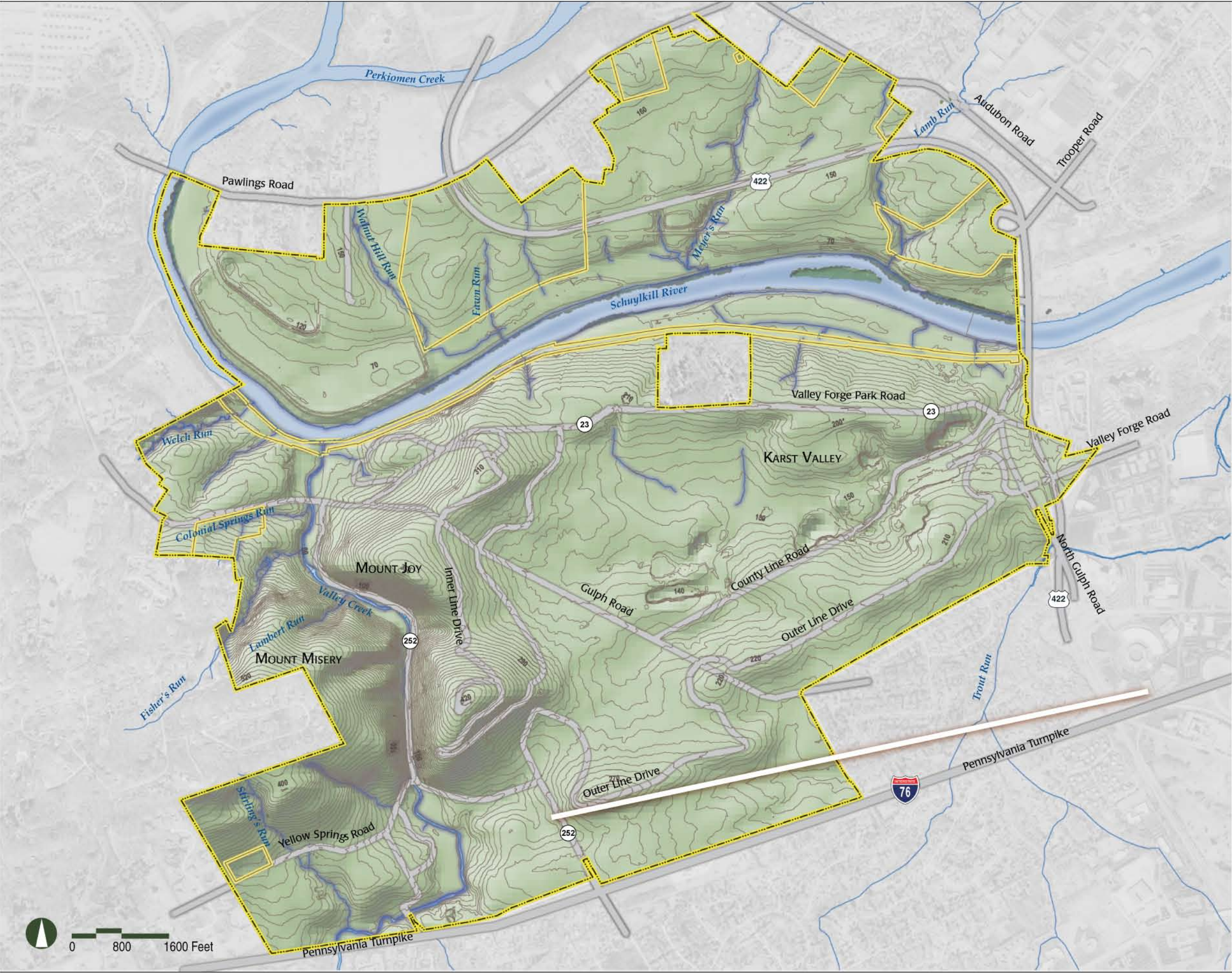
The dolostone in the valley has few impurities and was mined for use in agriculture and for its magnesium content. The former Village of Port Kennedy, located in the eastern portion of the park, developed as an industrial center for quarrying and transportation of the minerals during the 19th century. Approximately a dozen quarries were opened. Subsequently the Ehret Magnesia Company manufactured asbestos insulation in a plant built within one of the largest quarries. The company disposed of its manufacturing waste by dumping it in the quarries and an intermittent stream that drains into the Schuylkill River. (See Section 1.6.1: Asbestos Release Site for a more detailed discussion on the quarries and asbestos waste.)

During the blasting of dolostone quarries at the Village of Port Kennedy, quarrymen discovered numerous caves and caverns. In 1871, workers discovered an ancient sinkhole that contained fossils of plants and animals. Throughout the late 1800s, local archeologists and paleontologists (Wheatley, Cope, Mercer) excavated the fossiliferous deposit and collectively recovered over 1,200 specimens of 14 plant, 9 insect, 5 reptile, 1 bird, and 33 mammal species dating to the Great Ice Age, over 750,000 years ago (late Pleistocene) (Daeschler, et al. 1993). Excavation of the deposit ceased when the volume and rate of incoming water were greater than that which could be pumped from the dig site. The Ehret Magnesia Company later pumped manufacturing wastes into this quarry, and the precise location of the remaining unexcavated deposit was lost.



Researchers recently rediscovered the location of the “bone cave,” a significant paleontological site in which rare, late Pleistocene specimens were found.





- Park Boundary
- Inholdings
- 10-Foot Contours
- Fault Line
- Water Resources

**Valley Forge**  
National Historical Park  
General Management Plan/Environmental Impact Statement

**Figure 3-3**  
Topography  
Source: Park GIS Data and USGS 1981 Pennsylvania Geological Survey





The “lost Port Kennedy Cave” became a well-known story in the paleontological community. In 2003, a literature search to rediscover the location of the deposit was performed by Dr. Ted Daeschler of the Academy of Natural Sciences in Philadelphia and Matthew LaManna, a University of Pennsylvania graduate student. After being “lost” for 110 years, the location of the deposit was rediscovered and confirmed in 2004 using geophysical surveying techniques performed by a team of graduate students from the University of Pennsylvania (Bechtel, et al. 2005).

Quarrying here also exposed a rarely seen, important geologic feature, called an angular unconformity, between the dolostone and red bed rock types. During the Cambrian Period (545-495 million years ago), dolostone was laid down in horizontal layers. Subsequent mountain-building activities forced the folding of these rock strata to a 30° incline. As time passed, additional sediments were deposited and eroded. Approximately 400 million years of geologic history is missing between the dolostone and overlying Triassic (248-206 million years ago) red beds.

The wall of another dolostone quarry, now occupied by the lower Welcome Center parking lot, contains a rich deposit of trace fossils called stromatolites. These are the remains of matted layers of silt trapped by the sticky surfaces of ancient cyanobacteria. They are evidence that cyanobacteria inhabited the Valley Forge area when it was under shallow, tidal waters during the Cambrian Period. These wavy layers can be seen on about 400 square feet of the quarry wall. Today, this site is considered to be in poor condition, threatened by weathering, ease of accessibility, evidence of damage from carving into the fossiliferous areas, lack of resource monitoring, and lack of documentation about these trace fossils. No specimens have been collected from this deposit.

The park’s third paleontological site is unusual because it is found on stone used in a building: the restroom in the lower Welcome Center parking lot. Rocks from a local quarry were used on the façade of the restroom, and some of these rocks were identified as containing trace fossils of *Skolithos* worm burrows. The presence of *Skolithos* burrows often indicates the boundary between the Precambrian and Cambrian Periods. Although the rocks did not originate at Valley Forge, the NPS considers them a paleontological resource to be protected. The trace fossils are in excellent condition and are easily accessible to the public (PA Geological Survey 1993).

### 3.4.4 Soils

Soils in the area are predominantly moderately well-drained silt loams derived from weathered limestone, schist, gneiss, and quartzite. Considerable portions of the soils within the park are categorized as Class I or Class II soils for agriculture. Class I soils have few limitations that restrict use, while Class II soils have moderate limitations which may impact the selection of plants.

According to the soil survey of Montgomery County (U.S. Department of Agriculture Soil Conservation Service [USDA-SCS] 1967), the primary soil south of the Schuylkill River is Duffield silt loam. This soil type extends from Valley Forge NHP to Willow Grove, PA. Erosion hazards range from moderate to severe in this series. The soil offers few limitations for residential development and supports general farming activities as well. If the soil were used intensively for septic tank release, the groundwater could be contaminated.

The dominant soils southwest of the Schuylkill River are Edgemont Channery loam and Edgemont very stony loam. Both are scattered throughout a band stretching



from Valley Forge to west of Bryn Athyn, PA. Erosion hazards range from moderate to severe within these soils. Due to the high rock content and steep slopes, these soils have limited development possibilities. They are, however, able to support a number of general farming activities including field crops, fruit, and pasture (USDA-SCS 1967).

The dominant soils north of the Schuylkill River are varied and include

***Penn-Lansdale sandy loams:*** These soils have moderately rapid permeability and low to moderate moisture capacity. Erosion hazards in this series range from moderate to severe. The soil is capable of supporting general farming activities (planting), which in turn can protect the soil from erosion hazards.

***Lawrenceville silt loam:*** Permeability is moderately slow through the subsoil, thus impeding water movement and root development. Erosion hazards are severe and development may be hindered due to erosion from poor permeability.

***Birdsboro silt loam:*** Generally these soils are moderately permeable with a high level of moisture availability. These conditions provide it with few limitations for farming uses. Erosion hazards range from slight to severe, depending on the slope. Development has few limitations as well; however, in some small areas permeability is slow and a high water tables exists.

***Readington silt loam:*** Permeability is moderately slow, and the level of moisture availability is moderate to high. Erosion hazards range from slight to severe, depending on the slope. The soil varies in acidity but is well suited for planting. Development is possible; however, it is limited by slow permeability and a seasonally high water table.

***Bowmansville silt loam:*** This soil is poorly drained and typically found within floodplains. Floodplain regions have limited development possibilities but are valuable when retained as open space, bird sanctuaries, or wildlife habitats (USDA-SCS 1967).

### Hydric Soils

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Hydric soils typically support the growth and regeneration of wetland vegetation and are thus important in determining the potential location of jurisdictional wetlands<sup>1</sup>. By definition, “a hydric soil is a soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part” (USDA 1991). The only soils designated by the USDA as hydric within Valley Forge NHP are Bowmansville silt loam and Readington silt loam.

The Bowmansville soils are located in small pockets north of the Schuylkill River, while the Readington soils are spread out across the north side of the park. Small pockets of Readington soils also exist along the southern shore of the Schuylkill River.

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<sup>1</sup> An area that meets the criteria established by the U.S. Army Corps of Engineers (USACE) for a wetland (as set forth in their Wetlands Delineation Manual). Such areas come under the jurisdiction of the USACE for permitting certain actions such as dredge and fill operations.

## Prime Farmland Soils

Prime farmland is one of several designations made by the USDA to identify important farmland in the United States, which contribute to the nation's short-and-long-range needs for food and fiber. In general, prime farmland has an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, an acceptable level of acidity or alkalinity, an acceptable content of salt or sodium, few to no rocks, and permeable soils (designated as prime farmland soils by the USDA).

Prime farmland soils can be used for crops, pasture, or woodlands but are still considered prime farmland soils. Within Valley Forge NHP, prime farmland soils include Edgemont channery loam, Penn silt loam, Penn-Landsdale complex, Birdsboro silt loam, and Readington silt loam.

The Edgemont soils are located primarily west of Valley Creek. These soils are also scattered along the western shore of the Schuylkill River. The Penn silt loam and Penn-Landsdale complex are also located along the southern shore of the Schuylkill River, but also exist in numerous locations north of the river as well. The Birdsboro soils are also located north of the Schuylkill River. Finally, the Readington silt loams are located in numerous locations north of the Schuylkill River, with a few small pockets located along the river's southern shore.

### 3.4.5 Surface Waters and Groundwater

The predominant water body in Valley Forge NHP is the Schuylkill River, the largest tributary to the Delaware River. Valley Creek, a tributary of the Schuylkill River, is a relatively narrow stream running north through the western portion of the park. Fourteen additional named streams also flow through the park and are described below. Other surface waters on the site include vernal pools and approximately 80 acres of wetlands, which are discussed in Section 3.4.7: Wetlands. Figure 3-4 depicts noted water resources within the park boundaries.

Surface waters in the vicinity of Valley Forge have been affected for decades by development activities and industry. Water quality has been impacted by a variety of factors including excessive runoff and the release of toxins from hazardous waste sites. Despite Pennsylvania's high level of acid rain pollution, water quality in and around Valley Forge is not affected by the rain because watersheds that are composed primarily of limestone, as is the south side of Valley Forge NHP, have a nearly endless acid neutralizing ability. This derives from the buffering that occurs as the acid comes in contact with the limestone's basic properties.

However, through time, precipitation and groundwater drain through cracks and crevices in the carbonate bedrock, slowly dissolving the rock to form an underground network of conduits that often produce karstic features on the surface (i.e. sinkholes, caves, springs). Surface contamination can easily infiltrate the groundwater via these open conduits. As such, the quality of groundwater in these karst (carbonate) landscapes is particularly sensitive to land use practices such as agriculture.

Water quality concerns have been documented for both the Schuylkill River and Valley Creek for many years. In both cases, Valley Forge NHP comprises only a portion of a larger watershed, making water quality improvements and restoration efforts within the park itself challenging. Declines in regional water quality have direct implications to Valley Forge NHP. Increases in water pollution can overwhelm natural mitigation

processes. When these natural processes are no longer capable of maintaining healthy waters, plants and animals living within or alongside water bodies are adversely impacted. These impacts can lead to the harm or loss of species; the dominance of undesirable, exotic or invasive species; migration of other species that rely on the waters for drinking or feeding; and an overall loss of park-like aesthetics. Additional impacts may occur as the region continues to develop. Increases in impervious surfaces and modifications to stream geometry can increase the rates at which water passes through rivers and streams. Higher rates of flow can increase erosion, leading to conditions described above as well as more physically damaging results to the park.

### Schuylkill River

The 130-mile-long Schuylkill River is Valley Forge's most important water resource. It was the first river in Pennsylvania to be designated as a Pennsylvania Scenic River, and it also is the spine of a state and nationally designated heritage corridor. Approximately three miles of the river flow easterly through the center of Valley Forge NHP. The condition of the river mostly depends on activities not controlled by NPS and that take place beyond the park boundary. Examination is important, however, to understand what actions the NPS could take both within the park and working with outside partners to achieve common goals.

The entire Schuylkill River watershed covers approximately 1,916 square miles, most of which is located upstream of Valley Forge NHP. The park constitutes only 0.3% of the watershed. Land use patterns within the watershed vary among forested, agricultural, and urban, becoming increasingly urbanized from upstream to downstream. Within the park, the riverbanks are largely forested. These varying land covers benefit and impact water quality in different ways based on their pollutant loads, absorption ability, and runoff rates. A total of 34.32 miles of the Schuylkill have been defined as impaired<sup>2</sup> by the DEP, including the three miles of river that flow through the park. The listing is due to PCB and chlordane contamination from outside the park.

Changes in the rate of stream flow are monitored by the U.S. Geological Survey (USGS). These rates are used in determining water supply issues and the health of the watershed. The USGS has 10 active monitoring stations along the Schuylkill. In Montgomery County, the river is measured at Pottstown. In 2000, the annual mean flow was 1,964 cubic feet per second or cfs. The maximum annual base flow recorded at this point occurred in 1952, when the flow was recorded at 3,050 cfs.

### Valley Creek

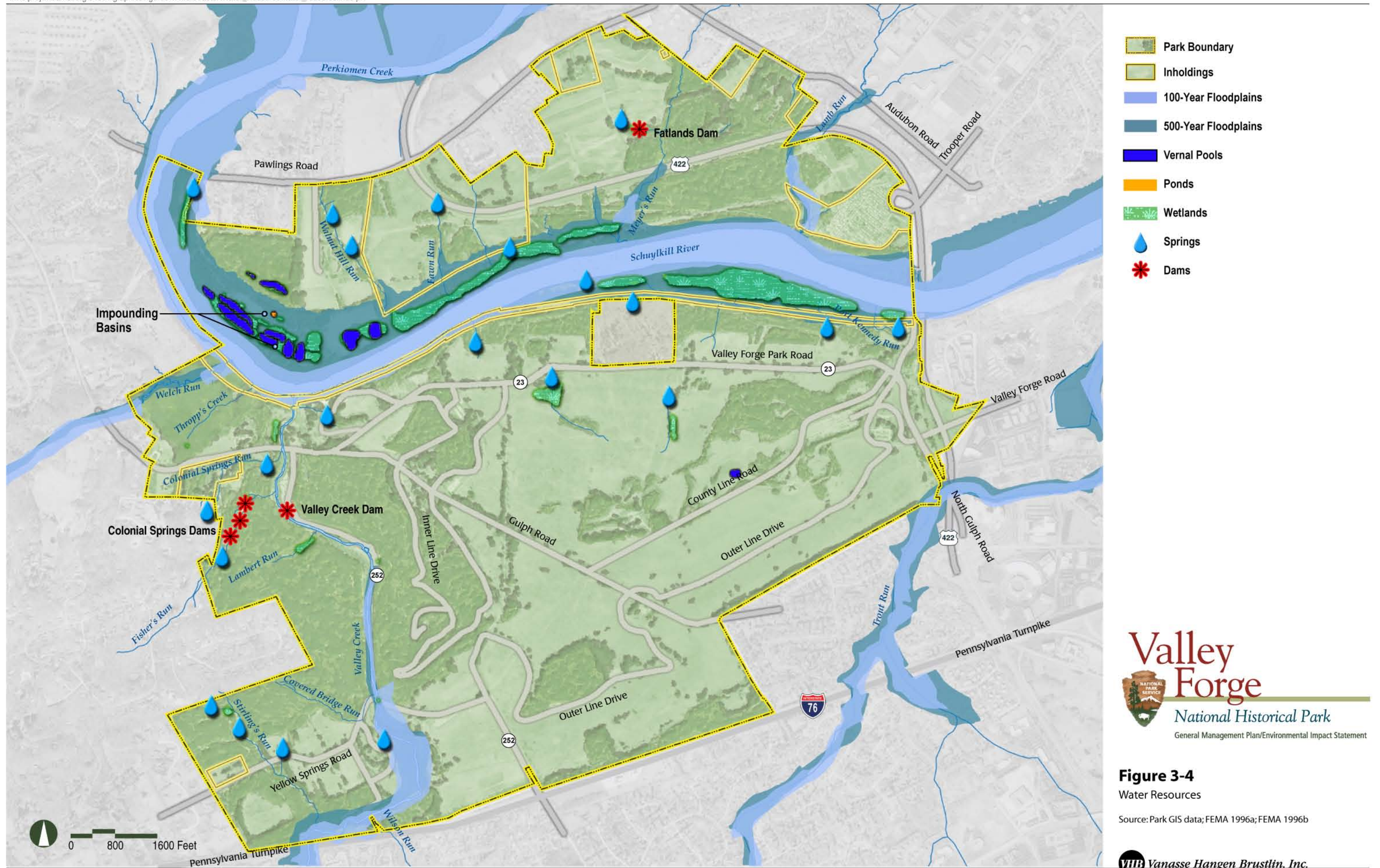


Valley Creek suffers the effects of excessive stormwater runoff from land upstream of the park, threatening natural and cultural resources, as with this recent flash flood.

Valley Creek, a perennial tributary to the Schuylkill River, is an essential natural resource within the park. Approximately 23-square-miles in size, the Valley Creek watershed holds the highest stream classification categories from both the DEP (Exceptional Value) and the Pennsylvania Fish & Boat Commission (Class A Trout Stream). About one square mile of the watershed lies within the park. As with the Schuylkill River, the condition of the creek mostly depends on activities not controlled by NPS and that take place beyond the park boundary. Examination is important to understand what interests pertain to NPS and what actions NPS could take both within the park and working with outside partners to achieve common goals.

2 A "303(d) listed or impaired waterbody" is legally defined as a waterbody that does not meet water quality standards for designated uses because of pollutants, pollution, or unknown causes of impairment.





**Figure 3-4**  
Water Resources

Source: Park GIS data; FEMA 1996a; FEMA 1996b





The Exceptional Value designation – Pennsylvania’s most protective stream designation – is based on water quality parameters including dissolved oxygen, pH, alkalinity, fecal coliforms, color, total dissolved solids, and temperature (Clough, Harbour and Associates LLP 2003). Designated in 1993, Valley Creek is the most urbanized watershed in Pennsylvania to have achieved the Exceptional Value classification (Cahill et. al. 1997). As a result of the designation, no additional development that would degrade the stream is permitted in the watershed. Conversely, the stream also is 303(d) listed by the commonwealth because of PCB contamination, turbidity, sedimentation, nutrients, and flow alteration.

The park lies at the bottom of the Valley Creek watershed. Only the last two miles of the creek flow through the park, and most of the watershed is located upstream of park boundaries, primarily in Chester County. While much of the watershed is undeveloped, agricultural practices, industrial discharges, and urban/residential stormwater runoff have impacted water quality in the stream. Inadequate stormwater management, water temperature management, and extremely high levels of flooding are the greatest threats to the Valley Creek watershed (Valley Creek Restoration Partnership 2004).

The population within the Valley Creek watershed more than doubled between 1980 and 1990, going from 15,600 people to 39,000 (NPS 1996). Increased development associated with population growth, including housing, industrial and commercial development, and roadway expansion increases impervious cover, pollutant loads, and surface water temperature. Impervious cover prevents precipitation from infiltrating the ground and also prevents pollutants from being buffered by natural ground cover. Influxes of runoff from impervious surfaces have been detected at temperatures as high as 140°F. During storms, precipitation rushes from impervious surfaces, accumulates pollutants, and washes them into the nearest river or stream. This occurs at a much higher rate of speed than it would in natural conditions, which causes increased rates of flow in the water body, increases streambed erosion, and inhibits the water’s natural pollution abatement abilities. The influx of warm waters into this coldwater limestone stream has severely detrimental effects on its biological components.

To monitor stream flow, the USGS installed a stream gauge in Valley Creek in 1983 near the park boundary, 100 feet upstream from the Pennsylvania Turnpike bridge. Based on data from this gauge, annual mean stream flow in 2002 was 20.7 cfs (USGS 2003). The flood produced by Hurricane Floyd in 1999 produced the greatest flows ever recorded in the Valley Creek watershed. Stream discharge and velocity at the height of the storm were 6,280 cfs and 9 feet per second, respectively (Valley Forge NHP 2001b). A real-time precipitation gauge was installed in 2005 and will allow for correlation analyses of precipitation amounts with flow rate and stream height. Later this year (2005), an optical turbidity meter will be installed to detect the concentration of suspended solids (sediments) in the water column.

See Section 3.4.6: Floodplains for further discussion of Valley Creek’s floodplain and stormwater management.

### **Other Surface Waters**

The four streams on the park’s north side are tributaries of the Schuylkill River. Two—Myers Run and Lamb Run—rise from beyond the park boundary and were 303(d) listed in 2004. Development upstream, lack of stormwater management, and poor erosion controls contribute to their 303(d) listing. These streams also are subject to severe flooding, resulting in streambank destabilization. In fall 2004, the volume and rate of stormwater during a hurricane destabilized masonry abutments in



a railroad bridge that had stood in place for over a century, as well as gabions located at the confluence with the Schuylkill River.

Also on the north side, Walnut Hill Run and its tributary, Fawn Run, rise within the park boundary, but suffer from severe sedimentation, much of it due to recent construction of sewer and water lines along Pawlings Road. They flow into the Fatlands Island wetland, posing a risk of additional sedimentation to the wetland.

On the south side of the park, five streams flow down Mount Misery into Valley Creek. Stirling's Run originates within a residential neighborhood and receives additional spring-fed water within the park. Covered Bridge Run is a highly modified intermittent stream that is severely impacted by stormwater runoff from the residential neighborhood. Fisher's Run and Colonial Springs Run rise beyond the park boundary and are spring-fed streams with steep gradients. Two historic dams here are in danger of collapse, which would release dam debris and accumulated sediments into the stream. Lambert Run rises within the park boundary and is a steep, small stream that runs most of the year. All streams on Mount Misery are subjected to sedimentation due to the complete loss of ground cover from heavy browsing by white-tailed deer within the forest.

Only 100 feet of Wilson Run flows through the park before converging with Valley Creek, and it is severely affected by excessive stormwater runoff from upstream.

In the northwest corner of the park, Thropp's Creek and Welsh Run flow into the Schuylkill. The banks of these creeks are highly eroded, and the bottoms are sedimented.

Trout Run, in the southeastern corner of the park, is rapidly deteriorating, and its banks are severely eroding, again due to the effects of poorly controlled stormwater runoff. Uncontrolled runoff from the PA Turnpike in particular has caused gulying within the park, as well as severe damage to the historic Ivy Hollow house, and contributes to flooding of the Glen Hardie neighborhood through which Trout Run flows.

Port Kennedy Run rises just north of PA Route 23 and flows into the Schuylkill. Several springs along its length contribute to its flow. The run is within the Asbestos Release Site and is severely impacted by asbestos wastes, as well as excess stormwater runoff from nearby roads within and beyond the park.

### **Groundwater**

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The groundwater system in the region is determined by the underlying geologic resources. Rocks of the Stockton Formation form a complex, heterogeneous, multi-aquifer system. Water occupies most of the open space in the rock formations below the water table. These spaces occupied by water constitute the groundwater reservoir (USGS 1996).

The USGS has monitoring wells installed across the country to monitor groundwater levels. The monitoring well in Montgomery County reported groundwater levels from August 1997 through October 2001. The average depth of water below the ground surface was 10.37 feet. A similar monitoring well exists in Chester County. This well reported data from September 1996 through October 2001. The initial reading at the well was 9.96 feet below the surface. This measurement ranged as deep as 12.12 feet and as shallow as 7.67 feet during the reported monitoring (USGS 2003).

Issues associated with groundwater relate to both water quantity and water quality. Like surface waters and floodplains, groundwater quality has been affected by human activity. Historic water quality concerns documented for groundwater in the area

include contamination by organic chemicals from industrial spill; storage tank leakage; leachate contamination; and discharge from septic systems, lagoons, and waste disposal sites. Recent groundwater sampling within the park by the USGS and EPA has detected contaminants from these sources surrounding the park; however, the levels are below the EPA maximum level concentration.

Groundwater quantity is affected by the increase in impervious surface area, water withdrawals, and precipitation. With the increase in impervious surface area throughout the watershed, the ability of precipitation to recharge groundwater reserves has been reduced. In Pennsylvania, about 30% of annual precipitation on average infiltrates the ground surface to recharge groundwater aquifers (Fleeger 1999). According to previous studies, groundwater is also lost by infiltration into the regional Valley Forge sewage system. Another source of groundwater depletion may be from two high-capacity wells in the watershed (NPS 1996). In 1980, the Delaware River Basin Commission recommended that the entire Valley Creek watershed be designated as a groundwater protected area. Under this designation, the commission limits the quantity of water that can be withdrawn on a daily basis.

### **3.4.6 Floodplains**

Human activity has extensively modified the floodplains within the park over time, through farming; dredging; and construction of dams, wells, impounding basins, canals, rail lines, roads, and power lines. However, based on Federal Emergency Management Agency (FEMA) mapping, the Schuylkill River and Valley Creek still retain both 100- and 500-year floodplains to some degree (Figure 3-4).

#### **Schuylkill River**

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Extensive floodplains are located along the Schuylkill River through the park. On the south bank, the 100-year floodplain generally lies between the railroad and the river. On the north side, the floodplain slopes gently up to an escarpment forming the edge of the upper river terrace. In addition, smaller floodplain areas are found on the north side along several tributaries of the Schuylkill, including Lamb Run. Elevations of the 100-year floodplain for the Schuylkill River range from 81-92 feet, based on the National Geodetic Vertical Datum of 1929 (NGVD). Poorly drained, deep, alluvial soils comprise the surface layer within the floodplain areas (FEMA 1996a, FEMA 1996b).

In the 1940s, a series of impounding basins were built along the Schuylkill as part of the Schuylkill River Reclamation Project. The basins were installed to remove coal silt from the river. Two of these basins were located below Walnut Hill in what is now the park. By the mid 1980s, these impoundments were no longer needed, but the massive stone and earthen walls remain, lessening the area's ability to function as a floodplain. Additionally, deposits of coal silt remain on the surface of most of the floodplain, ranging in depth from one to over five feet.

#### **Valley Creek**

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Floodplains are also found along Valley Creek, ranging in elevation from 96 to 120 feet NGVD with the largest floodplain located in the southwestern portion of the park (FEMA 1996a, FEMA 1996b). However, the floodplains are generally not as expansive as those along the Schuylkill River due to the steep slopes surrounding Valley Creek through much of the park. In fact, the lack of a floodplain in the most narrow parts of the stream corridor (near its confluence with the Schuylkill River) is one reason why Valley Creek is undermining PA Route 252 (Valley Forge NHP 2001b).

Within the park, in the area between the covered bridge and the confluence with the Schuylkill, most of the creek's former floodplain is filled with the sediment that accumulated behind historic dams and one existing 20th century dam. The sediments greatly reduce the capacity of the floodplain to accommodate stormwater, and also contribute to ongoing sedimentation.

For approximately one-third of its length through the park, Valley Creek is bounded on both sides by steep hills – Mount Misery and Mount Joy. Given the high volume of stormwater flowing into the park and this steep topography, the creek within the park is particularly susceptible to the effects of increased runoff, including flooding, streambank erosion, and pollution.

Floods and destabilized streambanks endanger significant resources within Valley Forge NHP, including the following

- grist mill foundation and encampment-era structure near Washington's Headquarters – threatened with exposure and erosion: the streambank in front of Washington's Headquarters is eroding at a rate of about one foot per year (Valley Forge NHP 2001b)
- cultural landscape in front of Washington's Headquarters – compromised by high, eroding streambanks
- historic and prehistoric resources adjacent to Knox's Quarters – threatened with loss of integrity and destruction from collapsing streambanks
- Upper Forge archeological site – threatened with exposure and destruction from erosion and high streamflow
- Lafayette's Sycamore – destabilization and erosion of the bank threaten to collapse the park's oldest tree (an official William Penn tree and an encampment-period tree)
- recreational fishery – various threats to one of the two best stretches of the recreational fishery in the watershed
- rare wildlife – rare crane fly and crayfish occur in Valley Creek within the park
- existing stabilization structures – gabions, retaining walls, and the dam are being destabilized; most of the large riprap placed adjacent to Washington's Headquarters in 2003 was transported downstream; riparian buffers are frequently inundated with floodwaters and require time-consuming repairs
- Norfolk and Southern Railroad Bridge – erosion of embedded footings and masonry structure
- historic steps and pedestrian walkway from Washington's Headquarters to Schuylkill River – destroyed
- sewer and water mains along entire length of creek in park – threatened with exposure and failure
- Valley Creek Trail – erosion caused part of the trail to fall into Valley Creek in 1991; numerous repairs were required following recent severe floods (Hurricanes Ivan and Jeanne, September 2004)
- pedestrian footbridge across Valley Creek – structure washed downstream and footings were displaced during Hurricane Floyd (1999); bridge has not been replaced



- covered bridge – during severe flooding, floodwaters peak above the base of the bridge and threaten to destabilize this historic structure
- sewer main – the 30-inch Valley Forge Sewer Authority sewer main that runs under PA Route 252 carries eight million gallons per day (mgd) of raw sewage at 20 psi; if the stream bank were to deteriorate and expose the line, there is the potential for the line to break and release raw sewage into the stream; because the line is a force main line, there would be no way to shut it off and stop the flow
- PA Route 252 – portions of the road were undermined by stream erosion in 1990 and slid into the creek; the road was again undermined in 1999; in the most threatened segment of the road, riparian resources were removed from the streambank in an effort to stabilize it; the riparian zone was replaced with riprap, masonry walls, cement, and other materials designed to support the road; this leads to an increased rate of pollutants entering the stream via runoff from the road; despite these measures, the streambank threatens to fail again

To address streambank destabilization, the NPS works with other governments and partners. The restoration of a woody riparian buffer upstream from the covered bridge was completed in 2004. Two projects are under consideration including streambank stabilization downstream from the covered bridge to protect PA Route 252 and streambank stabilization in front of Washington's Headquarters where encampment-period building foundations are being washed away.

Most important, the park participates in two processes to remediate conditions upstream and prevent impacts downstream in the park. The inter-jurisdictional *Valley Creek Integrated Stormwater Management Plan* will provide a model stormwater management ordinance for adoption by each municipality in the watershed, as well as recommendations for stormwater management and watershed restoration (see Section 1.6.9: Valley Creek Integrated Stormwater Management Plan). The NPS and the PA Fish & Boat Commission together form the Trustee Council that provides grants for watershed restoration projects. Funding derives from a Superfund settlement (see Section 1.6.10: Valley Creek Restoration Plan). The park participates in the Valley Creek Restoration Partnership that formed to implement such restoration recommendations.

### 3.4.7 Wetlands

Within Valley Forge NHP, vegetated wetlands are found primarily within low areas near the Schuylkill River (Figure 3-4). Many of these depressions, located on the north side of the river, are remnants of the impounding basins originally made to remove coal silt from the Schuylkill River. The wetlands described below were identified from a review of park literature (Newbold 1994) and GIS data, including the National Vegetation Classification inventory (Lundgren, et al. 2002), as well as field observation.

#### South Side

The largest wetland in Valley Forge is located within the floodplain on the south bank of the Schuylkill River, between the railroad tracks and the river. Roughly 4,500 feet long and 600 feet wide at its widest, this wetland is almost entirely forested. Species in this wetland include tulip tree<sup>3</sup>, spice bush, wild black cherry, slippery elm, lesser celandine, garlic mustard, and false nettle.

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3 Latin names for species discussed in the following sections are listed in Appendix I.

Just east of the large south side wetland described above is a small depressional wetland opposite the Port Kennedy Train Station. In the spring, dominant species include lesser celandine and garlic mustard. In the fall, the ground cover is stilt grass, nettles, and sedge.

South of the Maurice Stephens House is a small, spring-fed wetland characterized by Indian hemp, common milkweed, sedges, and watercress.

South of the General Varnum's Quarters building lies a small, triangular, emergent wetland. Spring-fed, it is characterized by standing water throughout the year. Cattails, numerous sedges, and rushes are predominant wetland species.

A spring-fed woodland seep is located near the park boundary on Mount Misery upslope from Lord Stirling's Quarters, and it drains into Stirling's Run. Tulip poplar and various oak species are dominant in the tree canopy, while the shrub layer is absent. Skunk cabbage and jack-in-the-pulpit are abundant in the herbaceous layer. Ferns, a few sedges, and grasses are also present.

### North Side



Valley Forge NHP contains some of the most extensive wetlands in the Schuylkill River corridor, such as Fatland Island wetland, as seen from the River Trail.

The largest wetland on the north side of the river is on Fatland Island, a former island once located within the Schuylkill River channel. This mixture of emergent and forested wetland is long and narrow, paralleling the river for a distance of approximately 4,800 feet with an average width of 200 feet. The floodplain forest is dominated by sycamore and white ash. Emergents include a variety of sedges, smartweed, garlic mustard, lesser celandine, false nettle, mannagrass, and spike rush. Shrub species documented for this wetland include box elder and hackberry.

A wooded slough is located approximately 100 feet southeast of the Pawlings Road parking area (northwest corner of the park). Newbold (1994) speculated that it was "caused by a back channel of the Schuylkill River which formed an island between itself and the river." Silver maples, green ash, and sycamores are dominant tree species. Other characteristic species include box elder, spicebush, false nettle, and stilt grass. Garlic mustard and lesser celandine dominate in the spring, and stinging nettles, smartweeds, and sedges dominate in the fall.

### Vernal Pools

Two impounding basins are located on the north bank of the Schuylkill River, southwest of the Walnut Hill barn. Both the upper and lower basins were constructed during the mid-1940s as part of the Schuylkill River Project, an effort to desilt the Schuylkill River. Water was pumped from the river and deposited into the lower basin, the silt settled out, and the relatively clean water was returned to the river. During the late 1980s, coal silt was removed from the lower basin and sold by the commonwealth, leaving a series of nine pits. Two depressions in the upper basin and the nine pits in the lower basin retain water and support wetland vegetation through the summer in non-drought years.

The two largest vernal pools are located immediately south of the Walnut Hill barn. Tree cover is limited and when these pools are full, the vegetation surrounding them includes clovers, grasses, and goldenrods. Typically, these pools are dry in fall and entirely disappear. In the spring, dominant species include a wide variety of sedges and rushes. In the fall, the ground cover is stilt grass, nettle, and a variety of sedges. Seeds from river birches found in the basins are collected by the American Forestry

Association and propagated for sale in their *Famous & Historic Trees* catalog (American Forests 1993; NPS 1992). The remaining vernal pools in the impounding basins are inhabited by ground clovers, chickweeds, and sneezeweed.

A smaller vernal pool is located on the south side of the park within the Keene Quarry. Vegetation surrounding the pool includes clovers, grasses, and goldenrods.

### 3.4.8 Vegetation

Once European settlers arrived in the area, the original forest was progressively cleared for agriculture, with 59% forest cover still evident in 1760 (Rhoads 1989). By the time the Continental Army arrived in 1777, most trees on the south side of the river had been cut. Almost every remaining tree was cut during the encampment for shelter and firewood.

Today, vegetation within Valley Forge NHP is a mix of different forest communities, grassland, riparian areas, and cropland (Lundgren, et al. 2002). Cropland is now limited to a small area on the north side of the park (Figure 3-5). The predominant vegetative communities within the park and the invasive species that are threatening these communities are discussed in greater detail below.

### Forests

Together, the forest alliances in Valley Forge NHP make up the largest percentage of park property - approximately 34%. A total of 18 different forest communities have been delineated within the park. In descending order, the largest of these are

- Modified Successional Forest (VAFO-type) – 456 acres
- *Liriodendron tulipifera* [tuliptree] Forest Alliance – 374 acres
- *Quercus alba* [white oak] Forest Alliance – 204 acres
- *Quercus prinus* [chestnut oak] Forest Alliance – 186 acres
- *Platanus-Fraxinus* [sycamore-ash] Floodplain Forest – 170 acres

The Modified Successional Forest type, which includes several sub-types, incorporates forests with white ash, black walnut, and American elm. For the less common sub-types, dominant canopy species may also include tree-of-heaven, black locust, eastern red cedar, and oriental bittersweet. Typical subcanopy species include box elder, American elm, flowering dogwood, black cherry, and sassafras. This common forest type is found throughout the park on areas with a history of disturbance such as abandoned farmland and forest gaps (Lundgren, et al. 2002). It is particularly common in the eastern and northern portions of the park where forest cover is more fragmented.

The *Liriodendron tulipifera* [tuliptree] Forest Alliance is most common in the western portion of the park, south of the Schuylkill River, although it is also found scattered throughout the park. While tuliptree is dominant in many stands, black oak and white ash are co-dominant or sub-dominant in others. Other trees found in this alliance include red maple, red oak, and sassafras. Heavy deer browsing has greatly reduced the shrub layer below 5 feet in height, the height reachable by white-tailed deer. Shrub species included in this forest association include dogwood, spicebush, black haw and mountain laurel; however, they are declining and in many cases missing from this alliance due to the heavy browsing by white-tailed deer (Lundgren, et al. 2002).



The two oak communities, *Quercus alba* [white oak] Forest Alliance and *Quercus prinus* [chestnut oak] Forest Alliance, are both found on moderate to steep slopes, making up the predominant forest groups on Mount Misery and Mount Joy. Dominating both alliances are the dry oak species: white oak and chestnut oak. In the *Quercus prinus* alliance, black gum and scarlet oak may be co-dominants. This list is larger for the *Quercus alba* alliance: red maple, sweet birch, tuliptree, beech, scarlet oak, and sassafras. The shrub layer for the *Quercus prinus* alliance is often moderate to dense stands of mountain laurel or young black gum. Typical tall shrubs in the *Quercus alba* alliance include flowering dogwood, witch hazel, and mountain laurel (Lundgren, et al. 2002). As with other forest alliances within the park, shrub species are declining and in many cases missing from this alliance due to heavy browsing by white-tailed deer.

Located primarily along the floodplain of the Schuylkill River and Valley Creek, the *Platanus-Fraxinus* [sycamore-ash] Floodplain Forest is characterized by a mix of green ash, sycamore, and silver maple. This community may also have black walnut, box elder, and river birch present. Common species in the subcanopy include green ash, box elder, silver maple, and American elm. Shrub species included in this forest association are typically spicebush, multiflora rose, and raspberries. Shrub species also are declining and in many cases missing from this alliance due to heavy browsing by white-tailed deer.

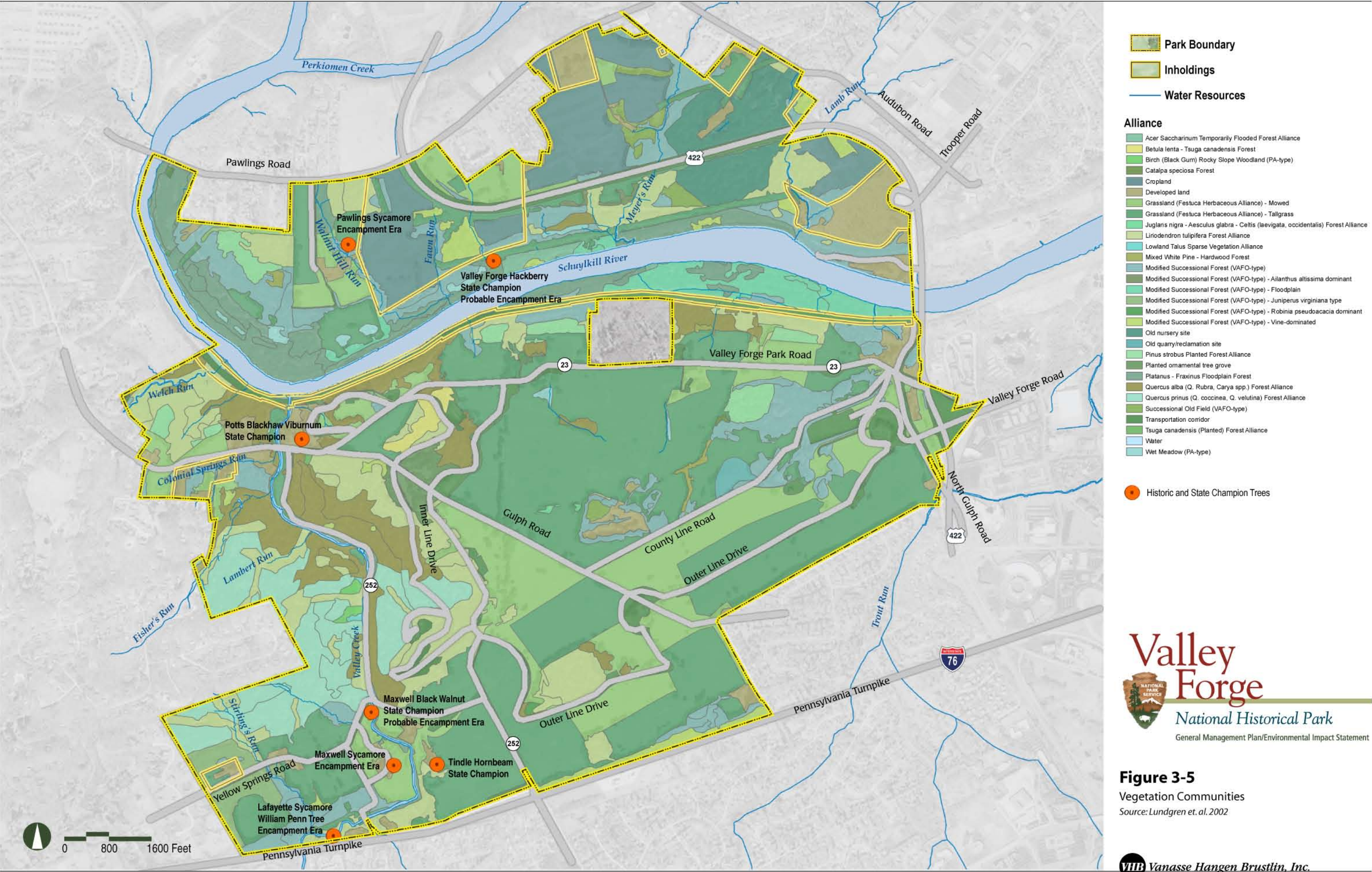
Other smaller vegetation alliances found within Valley Forge NHP include Successional Old Fields Pine Plantation, *Acer saccharinum* [silver maple] Temporarily Flooded Forest Alliance (found only along the northern shore of the Schuylkill River), Mixed White Pine Planted Forest, and *Catalpa speciosa* Forest.

Thirty paired white-tailed deer exclosures were erected within forests in the park in 1992 to measure the extent of white-tailed deer browsing. Each pair comprises one 9-square-meter space enclosed by a tall fence and one 9-square-meter space with no fencing, used for comparison. An additional 10,000-square-foot exclosure was erected in the forest at Walnut Hill. Each exclosure and comparison plot is regularly surveyed for the number, size, and range of vegetative species present. Within the exclosures, the typical species expected for each association are present. Outside the exclosures, the forest floor is essentially bare. No tree, shrub, or herbaceous seedlings above 50 centimeters (except for exotic species) are present outside exclosures - no forest regeneration is occurring at all.



High levels of browsing by white-tailed deer prevent the growth of all species except exotic invasives, which white-tailed deer do not eat. The fenced enclosure seen in the left foreground protects a variety of native species. Outside the fence, only Japanese stilt grass is found on this forest floor.





**Figure 3-5**  
Vegetation Communities  
Source: Lundgren et. al. 2002







## Grasslands

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After forested lands, grasslands (*Festuca herbaceous alliance*) comprise the second largest percentage of park property – almost 32% (1,330 acres). This particular vegetation community is further subdivided into mowed lawn and tall grass. Prior to implementation of the *Field Management Plan* in 1992 (Valley Forge NHP), approximately 1,050 acres of mowed lawn were maintained south of the Schuylkill River. In 2005, 914 acres of former lawn are now managed as tall grass meadows. The establishment of tall grass meadows meets several management objectives, including a return to a landscape more suggestive of the small grain agriculture prior to the arrival of the Continental Army and a good habitat for birds and small mammals. Common graminoid species within the tall grass community include redtop, broom sedge, panic grass, sweet vernal grass, orchard grass, tall fescue, red fescue, and purple top (Lundgren, et al. 2002). Broom sedge and purple top are native species.

Tall grass meadows provide refuge and nesting habitat for songbirds, small animals, and other park fauna. Some of the highest bird species richness counts occur in grassland habitat. Specific examples of wildlife that are dependent on grasslands and other successional habitats include field sparrow, grasshopper sparrow, eastern meadowlark, northern bobwhite, northern harrier, milk snakes, and northern brown snakes. The greatest threat to grassland vegetation is the presence of invasive species, which often out-compete native vegetation for light, nutrients, and space.

## Riparian Areas

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Riparian areas throughout the park include the lands abutting rivers, streams, ponds, and wetlands. These areas are ecologically important in terms of providing critical habitat to a variety of plant and animal species. Many of the plant and animal species of concern found within the park (see Section 3.4.10: Rare, Threatened, and Endangered Species) rely on riparian habitat for their continued survival, including the Great Egret (state threatened bird), the bald eagle (federally threatened bird), American bittern, common musk turtles, common mud turtles, queen snakes, wood frogs, and a rare crayfish. Possum haw, a state endangered plant, is associated with wetland and riparian areas in the Valley Creek watershed, which are threatened by streambank destabilization and sedimentation. Alliances within riparian areas include *Acer saccharinum* [silver maple] Temporarily Flooded Forest Alliance, the *Plantanus-Fraxinus* [sycamore-ash] Floodplain Forest, and wet meadows (PA-type).

## State Champion and Historic Trees

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A state champion tree is a tree that is particularly impressive or an unusual example of a species due to its size, shape, age, or other trait that epitomizes the character of the species. Four state champion trees are located within Valley Forge NHP

- Maxwell Black Walnut near the covered bridge
- Valley Forge Hackberry on the River Trail
- Tindle American Hornbeam in front of Knox-Tindle House
- Potts Blackhaw Virburnum behind Potts-Deweese House

Several trees within the park are noted as encampment-period trees, meaning that they are believed to have been present during the 1777-78 encampment at Valley Forge. When a portion of the Tredyffrin sewer line that runs through the park was repaired in the 1970s, two large sycamores were removed. These trees had 265 and

285 rings respectively. The Pawlings Sycamore on the north side of the park, near Walnut Hill, also is an encampment-period tree and recognized as the oldest tree in Lower Providence Township (see photograph on back cover of this document). The Lafayette Sycamore is believed to be the oldest tree in the park and is an official William Penn tree (meaning it was growing when William Penn set foot in Pennsylvania in 1682). It has a 22-foot circumference and has been estimated to be 323 years old. Figure 3-5 depicts the state champion and historic trees found at Valley Forge NHP.

### **Invasive Species**

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One of the largest threats to the park's flora is the ever-growing population of exotic (non-native) invasive species. The prevalence of invasive plant species has been a concern for several decades. Invasive species exhibit rapid and prolific growth and therefore out-compete native vegetation for space, light, water, and nutrients. As a result, they tend to displace native vegetation. The absence of native vegetation results in degraded habitats for native animals. Exotic invasives can alter entire ecosystems and threaten biodiversity, if kept unchecked.

Thirty-five percent of the plants identified in a 1985 flora and fauna study were found to be exotics (Cypher et al. 1985). As of early 2001, 20 miles of forest edge and 900 acres of woodlands were infested with invasive vines and shrubs. The most problematic invasive species in the park are

- Mile-a-minute, along the north and south bank and floodplains of Schuylkill River
- Canada thistle, dispersed in small pockets through the park
- Japanese knotweed, along the north bank of the Schuylkill River
- Japanese barberry, spread throughout Mount Joy and other areas
- Japanese hops, along Valley Creek and other areas
- Crown vetch, near the Welcome Center and Valley Forge Farms
- *Miscanthus*, at numerous locations in the park
- Oriental bittersweet, found along many woodland edges

At Valley Forge NHP, exotic invasive species colonize the bare ground left by severe heavy browsing by white-tailed deer. White-tailed deer evolved to eat native plants, and rarely browse the exotics that plague the forest. This selective browsing has exacerbated the spread of the exotics.

#### **3.4.9 Wildlife**

The diversity of riparian and terrestrial habitats at Valley Forge NHP provides foraging opportunities, breeding habitat, and shelter for a variety of wildlife species. The agricultural fields and tall grass meadows support small mammals, white-tailed deer, and birds. Forested areas provide valuable habitat for larger mammals such as fox, opossum, and white-tailed deer, as well as migrating songbirds and raptors. Wetlands and floodplains provide habitat for marsh and shore birds, waterfowl, osprey, herons, and small reptiles and mammals. The naturally reproducing trout population in Valley Creek indicates a healthy riverine system that also provides recreational opportunities within the park.

Records of wildlife sightings have been kept in the park since the 1970s, and comprehensive inventories have been conducted since 1999. Rigorous inventories recently completed include a three-year bird survey completed in 2001 and a herpetofaunal (reptile/amphibian) survey completed in 2002. Single-year surveys have

been completed for fish (2003) and small terrestrial mammals (2004), and a single-year survey of bats is currently underway (2005). A single year survey for rare, threatened, and endangered species is anticipated to begin within the next three years.

## Birds

Beginning with authorization of the national historical park in 1976, the NPS conducted field observations and produced a checklist of bird species observed within the park by staff, members of the Audubon Society, and volunteers. This “Bird Sightings List” includes 220 bird species. Of those, 77 are confirmed as having bred in the park. According to the list, birding “hot spots,” particularly good areas to watch birds, are the top of Mount Joy, along the Valley Creek Trail, and along the Schuylkill River Trail. The complete Bird Sighting List is included in Appendix I.

Pennsylvania State University completed a three-year bird inventory in the park between May 1999 and May 2001. Valley Forge NHP was one of six national park units in Pennsylvania to be inventoried by the university over the same time period. A combination of survey methods was used: point-count, vehicular-road, diurnal raptor and vulture, riparian bird, and owl surveys. Of the six units, the highest number of species was recorded at Valley Forge – 163 species total, including 6 species previously not documented within the park (alder flycatcher, common raven, grasshopper sparrow, horned lark, northern saw-whet owl, vesper sparrow). While no federally endangered or threatened bird species were observed, 22 species of special concern were documented (Table 3-1).

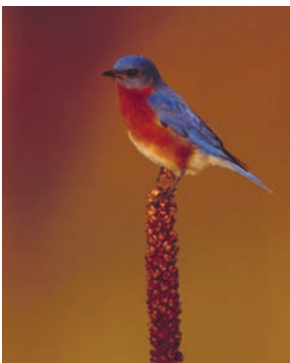
The highest number of bird species (123) was recorded during the 2000-01 spring migration season. Of the 11 species classified as “abundant,” 9 were permanent residents. While a variety of migratory species were observed, permanent residents were more prevalent in both forested and herbaceous habitat during spring migration. Despite the high species richness during this time, transient species were not prevalent at Valley Forge NHP during spring migration (Yahner 2001). The 15 most prevalent species observed during spring migration were

- Blue Jay: permanent resident
- Cedar Waxwing: permanent resident
- Carolina Chickadee: permanent resident
- American Robin: permanent resident
- Northern Cardinal: permanent resident
- Red-Bellied Woodpecker: permanent resident
- Tufted Titmouse: permanent resident
- European Starling: permanent resident
- Canada Goose: permanent resident
- Eastern Meadowlark: permanent resident
- Common Grackle: permanent resident
- Red-Eyed Vireo: long distance migrant
- Wood Thrush: long distance migrant
- Barn Swallow: long distance migrant
- Red-Winged Blackbird: short distance migrant



**Table 3-1 Bird Species of Special Concern**

Scientific Name	Common Name	Status
<i>Anas rubripes</i>	American Black Duck	Audubon Watchlist
<i>Dendroica caerulescens</i>	Black Throated Blue Warbler	Audubon Watchlist
<i>Vermivora pinus</i>	Blue Winged Warbler	Federal Management Concern
<i>Wilsonia canadensis</i>	Canada Warbler	Audubon Watchlist
<i>Dendroica cerulea</i>	Cerulean Warbler	Federal Management Concern
<i>Dendroica pennsylvanica</i>	Chestnut Sided Warbler	Federal Management Concern
<i>Sturnella magna</i>	Eastern Meadowlark	Federal Management Concern
<i>Spizella pusilla</i>	Field Sparrow	Federal Management Concern
<i>Ammodramus savannarum</i>	Grasshopper Sparrow	Federal Management Concern
<i>Asio otus</i>	Long Eared Owl	State Imperiled
<i>Seiurus motacilla</i>	Louisiana Waterthrush	Federal Management Concern
<i>Cistothorus palustris</i>	Marsh Wren	State Imperiled/Vulnerable
<i>Colaptes auratus</i>	Northern Flicker	Federal Management Concern
<i>Circus cyaneus</i>	Northern Harrier	Federal Management Concern
<i>Aegolius acadicus</i>	Northern Saw Whet Owl	State Vulnerable
<i>Pandion haliaetus</i>	Osprey	State Threatened
<i>Podilymbus podiceps</i>	Pied Billed Grebe	State Vulnerable
<i>Melanerpes erythrocephalus</i>	Red Headed Woodpecker	Federal Management Concern
<i>Buteo lineatus</i>	Red Shouldered Hawk	Federal Management Concern
<i>Catharus fuscescens</i>	Veery	Federal Management Concern
<i>Hylocichla mustelina</i>	Wood Thrush	Federal Management Concern
<i>Helmitheros vermivorus</i>	Worm Eating Warbler	Federal Management Concern



The blue bird is one of many bird species that commonly breed in the park since hundreds of acres of tall grass meadows were established.

During the 1999-2000 breeding season, a total of 91 species were observed. Again, most of the species categorized as “abundant” and “common” were permanent residents. Samples taken in forested areas found some long-distance migrants, such as red-eyed vireo, wood thrush, and ovenbird, to be prevalent along with permanent residents. However, permanent residents dominated samples taken in herbaceous habitat areas. Of the most prevalent migrants, most were edge specialists. A small number of migrants were grassland specialists, including the bobolink and red-winged blackbird (Yahner 2001).

Using point count survey data collected during the 1999-2000 breeding season, bird species richness was determined for various habitat types at Valley Forge NHP. Bird habitat guilds used to differentiate habitat were as follows: 1) deciduous mixed forest, 2) herbaceous grass/agriculture, 3) riparian wetland, 4) riparian forest, 5) water, and 6) other. Large numbers of species were observed within herbaceous grass/agricultural habitats at Valley Forge Farm.

Several factors contribute to the diversity of birds observed at Valley Forge NHP

- the park's overall size – 3,452 contiguous acres
- the diversity of habitat types – riparian areas, deciduous forests, wetlands, tall grass meadows, rough lawns
- the large size and contiguous nature of these various habitat types
- the fact that the park is surrounded by development, making the park an oasis

One factor that appears to contribute to the limited number of ground-nesting or shrub-nesting species is the high deer population. Browsing of the understory cover greatly reduces the amount of habitat available for nesting of certain bird species. Densities of such species as the black-billed cuckoo, hooded warbler, and white-eyed vireo will continue to remain low within the park unless the herbaceous and shrub layers are restored (Yahner 2001). Other impacts to ground-nesting species include feral cats and other small mammals that prey on these species. Ground nests are also disturbed by direct and in-direct impacts from human activities. Humans may trample through the understory, damaging or destroying the habitat. Also, noise from human activity may keep ground-nesting species from inhabiting the area. If the layers were restored, recreational use would have to be managed to limit disturbance of nesting areas from people and animals.

## Amphibians and Reptiles

West Chester University conducted a herpetofaunal inventory throughout Valley Forge NHP over a 2½ -year period from September-November 1999, February-November 2000, March-November 2001, and February 2002. A combination of methods was used, including coverboards, drift fence arrays, substrate surveying in forests and streams, aquatic trapping, basking turtle surveys, and anura calling surveys. Based on these surveys, 29 species were documented in the park, including seven species previously not recorded within the park. The species collected include seven salamanders, eight frogs and toads, six turtles, and eight snakes (Appendix I).

Over two-thirds of the herpetofauna collected at Valley Forge were supported by just two of the surveyed habitat types – wetlands (including ponds and vernal pools) and lowland forests. Considered as the herpetofauna “hot spot” within the park, the northern floodplain of the Schuylkill River was found to have both habitat types interspersed together. The northern floodplain has a mix of vernal pools, former impounding basins, and vegetated wetland areas. The other five habitat types surveyed also are necessary to support all the species in the park: upland forest, tall grass meadows, Valley Creek, Schuylkill River, and runs (other streams or drainages). The 29 species varied widely in their patterns of habitat use (Tiebout 2002).

Salamanders comprised almost three-fourths of the total herpetofauna found during the surveys, with the red-backed salamander and the northern two-lined salamander being the two most common species encountered. None of the species found during the survey are listed as rare, threatened, or endangered at the state or federal level. However, some of the species found in the park appear to be rare or limited to a restricted geographic range within the park, making these species vulnerable to local extinction: eastern newt, slimy salamander, wood frog, Fowler's toad, common musk turtle, common map turtle, northern brown snake, and eastern milk snake (Tiebout 2002). While not found during the inventory completed through February 2002, the redbelly turtle, a state-threatened species, also has been documented within the park (Cypher et al. 1985).



Valley Forge NHP provides a range of habitats and serves as a refuge for herpetofaunal species of high conservation value, such as this box turtle.

A panel of herpetologists subsequently convened and determined that 9 of the 29 species found within the park have high conservation value based on five evaluation criteria: keystone species, habitat specialists, large area requirements, persecuted, and water quality sensitive. The seven species with the highest conservation value are

- Northern Dusky Salamander
- Longtail Salamander
- Northern Red Salamander
- Common Map Turtle
- Eastern Box Turtle
- Queen Snake
- Northern Copperhead

Given surrounding development pressures and the diversity of critical reptile/amphibian habitat available, the park serves as an important refuge for these species that are otherwise rare, declining, or threatened elsewhere in Pennsylvania (Tiebout 2002).

### **Mammals**

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Since 1979, 30 species of mammals have been observed at Valley Forge NHP (Appendix I). White-tailed deer, red foxes, grey squirrels, and woodchucks are among the most frequently observed mammals during the day. White-tailed deer, raccoons, and bats are among the most frequently observed mammals during the night. Other species less often observed by park visitors but abundant in the park include white-footed mice, northern short-tailed shrews, striped skunks, and Virginia opossums. Mammal inventories conducted during the past two years have detected coyote, a weasel species (ermine or long-tailed), long-eared bats, and red bats. Vagrant black bears have been sighted in the park in 1998 and 2003, but none are known to inhabit the park.

Of the mammal species that occur at Valley Forge NHP, white-tailed deer have been studied the most intensely. Since 1986, the park has conducted annual counts to estimate the population growth rate, and since 1997 counts have been conducted to estimate the total population. In 1997, 772 deer were estimated to inhabit the park. As of May 2005, the population of white-tailed deer is estimated at 1,241 individuals. The park comprises five square miles, thus the approximate white-tailed deer density within the park is 250 individuals per square mile. There is no commonly-agreed on standard for appropriate density. Research in Pennsylvania forests, however, shows that many trees are able to regenerate at densities of fewer than 20 white-tailed deer per square mile, herbaceous vegetation needs densities of fewer than 10 white-tailed deer per square mile. Full recovery of herbaceous and shrub species may require even lower densities (Latham 2005). The annual survival rate for white-tailed deer in the Valley Forge area is relatively high, estimated at 83%. Typical annual survival rates for adult female white-tailed deer elsewhere in the United States vary from 65-85% (Lovallo and Tzilkowski 2003).

Studies have been completed to understand how deer move through the area. In the Valley Forge area, the home ranges of white tailed deer averaged 0.1-0.2 square miles. White-tailed deer in the Valley Forge area have home ranges that are comparable to other populations of urban-suburban white-tailed deer, including those in southern Illinois and Bloomington, Minnesota, where home ranges average 0.1-0.34 square miles. Large natural and manmade landscape features, such as the Schuylkill River, PA Turnpike, and the Norfolk & Southern Railroad are significant obstacles and limit the home ranges of some white-tailed deer. Smaller landscape



features such as Valley Creek or two-lane roads have little influence on home ranges of white-tailed deer in the Valley Forge area.

The continued growth of both the white-tailed deer and human populations in the Valley Forge area present a number of issues. Intense grazing of vegetation occurs within the park and surrounding communities, and is preventing forest regeneration. White tailed deer frequently cross the roads in the park as well as the community, causing collisions. White-tailed deer are the keystone species for deer ticks, which carry Lyme disease.

## Fish

Based on several fish surveys, 35 fish species have been recorded within the park (Appendix I). The PA Fish & Boat Commission electroshocked the Schuylkill River within the park in October 2004 and detected a total of 10 species. Four were new species records for the park: American shad, common carp, channel catfish, and flathead catfish.

The 2004 survey of fish in the park's stretch of Valley Creek detected a total of 18 species. Blacknose dace, tessellated darters, and white suckers are the most abundant fish species in Valley Creek. Despite the increase in impervious surfaces and increased temperature of runoff from these surfaces throughout the watershed, a high species richness is supported by the influx of cold groundwater from the limestone valley through which the stream flows.

Valley Creek, a Class A Trout Stream, also supports a wild trout population that has grown since the PA Fish & Boat Commission imposed a "catch and release" policy on trout in 1984 as a result of PCB contamination. According to the commission, trout biomass inside the park exceeds 80 kilograms per hectare (kg/ha), making fishing inside the park the best in the Valley Creek watershed (NPS 2001b). Mean Valley Creek watershed trout biomass peaked in 1990, when it averaged 67 kg/ha and declined by 40% to 40 kg/ha in 2002. However, brown trout home ranges are limited, and the total biomass of brown trout in the watershed has declined from 25% to 12% since 1993. Valley Creek is at risk for losing its designation as a Class A Trout Stream due to this decline in brown trout biomass (Valley Creek Restoration Partnership 2004). Since trout have a relatively high dissolved oxygen requirement (6 parts per million), efforts to maintain good water quality are vital to the continued health of the trout population in Valley Creek.

A 2004 survey of three small streams in the park (Myers, Lamb, and Trout Runs) detected a total of 18 species. Of these, the creek chubsucker was a new species record for the park. Green sunfish, pumpkinseed, white sucker, blacknose dace, spotfin shiner, and smallmouth bass were the most abundant fish detected in these streams.

## Invertebrates

A 1994 survey of butterflies identified approximately 70 different species of butterfly within Valley Forge NHP. Many species of swallowtails, whites and sulphurs, brushfoots, and skippers are common in the park during all but the coldest months (Valley Forge NHP 1996) (Appendix I).

Water pollution and stream bank erosion has impacted invertebrate health and habitat. A clear sign of pollution was the dominance of leeches and black fly larvae in fall 1992 and winter 1995, respectively. These species thrive on the inorganic conditions that are created by pollution (Valley Forge NHP 1995). The DEP



Valley Creek supports a large population of naturally reproducing brown trout. Continued good water quality is vital to their survival.

reported that the stretch of Valley Creek within the park is one of only two stretches that had the highest macroinvertebrate diversity and the most pollution sensitive species (Valley Creek Restoration Partnership 2004).

Despite these negative impacts, a rare crayfish, *Cambarus acuminata*, was recently found in Valley Creek within the park. This is the only known population of this species in Pennsylvania and the northernmost report of this species in the United States.

### 3.4.10 Rare, Threatened, and Endangered Species

To date, the only federally listed species confirmed to occur within Valley Forge NHP is the bald eagle. In addition, 28 species observed within Valley Forge NHP are state-listed as endangered, threatened, rare, candidate rare, and candidate at risk. These species include 7 vascular plants, 18 bird species, 1 fish, 1 reptile, and 1 crustacean. Table 3-2 summarizes these species and their status.

**Table 3-2 Special Status Species**

	Scientific Name	Common Name	State Status	Federal Status
Plant	<i>Acorus americanus</i>	Sweetflag	PA Endangered	NFS
	<i>Galium trifidum</i>	Sweet Scented Bedstraw	PA Rare	NFS
	<i>Ilex opaca</i>	American Holly	PA Threatened	NFS
	<i>Lupinus perennis</i>	Lupine	PA Rare	NFS
	<i>Woodwardia areolata</i>	Netted chainfern	Candidate PA Thr.	NFS
	<i>Rotala ramoior</i>	Tooth Cup	PA Rare	NFS
	<i>Vernonia glauca</i>	Tawny Ironweed	PA Endangered	NFS
	<i>Viburnum nudum</i>	Possum Haw	PA Endangered	NFS
Bird	<i>Accipiter gentiles</i>	Northern Goshawk	Candidate Rare	NFS
	<i>Anas crecca</i>	Green Winged Teal	Candidate Rare	NFS
	<i>Botaurus lentiginosus</i>	American Bittern	PA Threatened	NFS
	<i>Casmerodius albus</i>	Great Egret	PA Threatened	NFS
	<i>Catherarus ustulatus</i>	Swainson's Thrush	Candidate Rare	NFS
	<i>Circus cyaneus</i>	Northern Harrier	Candidate at Risk	NFS
	<i>Cistothorus palustris</i>	Marsh Wren	Candidate Rare	NFS
	<i>Colinus virginianus</i>	Northern Bobwhite	Candidate at Risk	NFS
	<i>Empidonax flaviventris</i>	Yellow Bellied Flycatcher	PA Threatened	NFS
	<i>Falco peregrinus</i>	Peregrine Falcon	PA Endangered	NFS
	<i>Fulica americana</i>	American Coot	Candidate Rare	NFS
	<i>Haliaeetus leucocephalus</i>	Bald Eagle	PA Endangered	Threatened
	<i>Nyctanassa violacea</i>	Yellow Crowned Night Heron	PA Endangered	NFS
	<i>Nycticorax nycticorax</i>	Black Crowned Night Heron	Candidate at Risk	NFS
	<i>Pandion haliaetus</i>	Osprey	PA Threatened	NFS
	<i>Podilymbus podiceps</i>	Pied Billed Grebe	Candidate Rare	NFS
	<i>Protonotaria citrea</i>	Prothonotary Warbler	Candidate Rare	NFS
	<i>Spiza americana</i>	Dickcissel	PA Threatened	NFS
Crustacean	<i>Cambarus acuminata</i>	Crayfish	PA Rare	NFS
Reptile	<i>Pseudemys rubriventris</i>	Redbelly Turtle	PA Threatened	NFS

NFS = No Federal Status

The status and distribution of these species and their essential habitats within Valley Forge NHP are largely unknown. Efforts are underway to determine this information so that management and protection of these species can be addressed. Threats to these species could intensify as annual visitation and recreational uses in Valley Forge expand, as construction and development plans within the park are implemented, and as urban sprawl further limits distribution of these species in southeastern Pennsylvania. A project to perform species-specific surveys and compile management recommendations for their protection is planned.

Eagles are sighted within the park each year, with approximately 10 reports received annually over a two-month period, and are known to feed on fish from the Schuylkill River within the park. Typically, sightings of a single bald eagle occur along US 422 near Pawlings Road, feeding along the Schuylkill River, and on the Grand Parade behind the Maurice Stephens House. In 2004, a pair of bald eagles established a nest within two miles of the park's western boundary but did not produce young. In 2005, the same pair produced two eggs; both offspring have survived.

One of the state-endangered plants, Possumhaw viburnum (*Viburnum nudum*), was reported in the park in 1993. It is believed that all individuals of the species except one that is physically protected from white-tailed deer browsing have since disappeared (Podniesinski 2001).

The state-listed rare plant, toothcup (*Rotala ramosior*), occurs on the north side of the park, one of 12 known locations in the commonwealth as of 1994 (Newbold 1994). Its status as of 2005 within the park is unknown. It is possible that this species will be removed from the state list because it is a tiny plant now seen more frequently, as it has been the subject of recent searches (Podniesinski 2001).

### 3.4.11 Air Quality

The NPS does not operate an ambient air monitor in Valley Forge NHP. The commonwealth of Pennsylvania, however, has operated an acid deposition monitor in the park for over 20 years, and a mercury deposition monitor since 1999. Representative data from outside the park can also be used to describe park air quality. The most comprehensive monitoring facility in the area is located at the state armory in Norristown, Pennsylvania. This facility monitors five criteria pollutants: carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), ozone (O<sub>3</sub>), sulfur dioxide (SO<sub>2</sub>), and particulate matter. There is another ozone monitor at the New Garden Airport in Chester County.

Both Chester and Montgomery County have been identified by the EPA as non-attainment areas for one-hour and eight-hour concentrations of ozone. These counties are within attainment for other criteria pollutants. In 2003, these conditions resulted in 181 days when air quality was considered "good" in Chester County (air quality was measured 264 days in 2003). Of the remaining 83 days, only 6 days were considered unhealthy. The pollutant recorded at the highest level within the county was most commonly ozone (176 of 264 days).

In Montgomery County, air quality was considered "good" 296 out of 365 days in 2003. Of the remaining 69 days, 6 were considered unhealthy. The highest recorded pollutants throughout the year were ozone and particulate matter.

Both counties' concentrations of eight-hour ozone concentrations are classified as "moderate" by the EPA. Mitigation efforts are designed to improve eight-hour concentrations by 0.138 to 0.160 parts per million (ppm). Both counties' concentrations



of one-hour ozone have been classified as “severe 15.” This designation implies that the area must reach attainment within 15 years, an effort that requires mitigation efforts to be designed to improve conditions by 0.180 to 0.190 ppm (EPA 2004).

### 3.4.12 Soundscapes

Natural soundscapes exist in the absence of human-caused sound, and the natural ambient soundscape is the aggregate of all the natural sounds that occur in park units, together with the physical capacity for transmitting natural sounds. At Valley Forge NHP, no area of the park is farther than 2,000 feet from a road or railroad. Because the park is surrounded by development and riddled with through-traffic, natural soundscapes do not exist within the park. An examination of existing sound levels is important, however, to assess the impacts of proposed traffic improvements and the placement of vegetated buffers to minimize excessive noise levels.

Noise measurements related to traffic studies were conducted at Valley Forge NHP in August 2001 and March 2003. Equivalent noise levels ( $L_{eq}$ ) represent average sound levels from a sound energy standpoint expressed in decibels on the A-weighted scale (dBA). Highly significant highway noise was noted in several locations along exterior and interior portions of the park. Within 300 feet of PA Route 23, noise levels remained relatively constant ranging from 49 dBA at night to 58 dBA during rush hour. These sounds are comparable to the indoor sound of a dishwasher in the next room. Another sampling point was taken between PA Route 23 and the Norfolk & Southern Railroad corridor. This point experienced a noticeably wider range of sound levels, 46-75 dBA. This higher range is attributed to rail noise. The relatively quiet Schuylkill River corridor was regularly affected by rail noise. The louder noises are comparable to someone shouting within one meter of the listener.

High noise levels were also identified close to Pawlings Road. Within 100 feet of the road, sounds ranged from 58-65 dBA. These levels were slightly exceeded at the western approach to the park (67 dBA).

Measurements taken along Outer Line Drive ranged from 49 to 55 dBA during peak hours. Although Outer Line Drive has relatively low traffic levels, field observations indicate that the noise impacts are a combination of local sounds with noise from other sources, such as the PA Turnpike. The southern portion of the park was identified as having a much narrower range of noise levels, from 53 to 54 dBA, attributed to the closeness of the turnpike. Turnpike noise at Lafayette’s Quarters is particularly intrusive.

### 3.4.13 Lightscapes

NPS *Management Policies 2006* direct the service to preserve, to the greatest extent possible, the natural lightscapes of parks, which are natural resources and values that exist in the absence of human-caused light. Natural lightscapes are not found at the park due to surrounding development and roadways that cross the park. Lightscape conditions at Valley Forge NHP are typical of suburban communities near major cities.

Night sky viewing and star gazing is a common recreational use in the park throughout the year. Additionally, the Delaware Valley Amateur Astronomers host “star parties” in the southwestern portion of the park near the PA Route 252 overpass of the PA Turnpike. These public events are held each month from March through October. Local amateur and expert astronomers congregate to enjoy star gazing. A group of night-time bike riders also congregate at Valley Forge NHP on full moon nights. Horseback riders explore the park on full moon nights and during special celestial event evenings. Trail walking and hiking also are popular in the evening hours.

There are two primary sources of light pollution from beyond the park boundary. Land to the northeast, east, and southeast of the park is highly developed and emanates a constant glow, visible from many vantage points in the park. Although dark-sky fixtures and more strategic usage of night lighting could reduce the magnitude of light somewhat, the large number and variety of usages would make it difficult to reduce by a great degree. The Valley Forge rest stop on the turnpike is located immediately south of the park, and this point-source is the single intrusion in an otherwise dark sky to the south. Its lighted commercial signs and parking lot lights are fully visible even on gray afternoons, and are highly visible from Outer Line Drive and Wayne Statue, which is positioned on one of the highest vantage points in the park. Although there have been substantial improvements to the light pollution that occurs in this area, this location remains the most immediate contributing external point-source of light pollution to viewing the night sky within the park. Light pollution from the rest stop could easily be remediated by the use of dark-sky fixtures and screening of lighted signs.

On the north side of the park, views southward toward the Schuylkill River are dark, while views to the north encompass low levels of residential lighting. The river corridor itself is one of the darkest areas of the park - depending on one's vantage point, the only visible light is from vehicles on PA Route 23 and the US 422 bridge. Views west from the park are relatively dark, with only occasional point-sources of residential or vehicle lights visible.

Within the park, artificial light point-sources also contribute to light pollution. Various structures and monuments are illuminated each night throughout the year, including the Washington Memorial Chapel, Welcome Center, and the National Memorial Arch. A few parking lots are dimly lit for part of each evening, including the lower Welcome Center lot, Ranger Station lot, Maintenance lot, and Betzwood lots. One street lamp is located near the covered bridge. Vending machines located at various parking lots throughout the park remain lighted throughout the night and project quite a bit of light.

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## 3.5 Visitor Use and Experience

Even before the state park was established in 1893, Valley Forge was a popular summer tourist attraction, particularly for visitors who were fascinated by the ties to George Washington. After establishment, the park became a place to not only learn about early American history, but also to enjoy picnics and strolls, and to take in the scenery. By the 1930s it was estimated that nearly one million annual visitors were coming to the park and concerns were expressed about the impact of visitation on the historic resources and landscape of Valley Forge. In the later half of the 20th century, as the area around Valley Forge experienced tremendous growth and development, the park became an increasingly popular place for area residents to enjoy the outdoors. During this time, active recreational uses such as walking, jogging, and biking became especially common pastimes. This trend has continued, and because few park interpretive activities are targeted for recreational visitors, the majority of park visitors avail themselves of the park's recreational, rather than cultural or natural opportunities.

### 3.5.1 Visitation and Visitor Use

Since Valley Forge does not operate as a "gated" attraction, it is difficult to obtain an accurate total visitor count. Attendance levels are determined using a model that

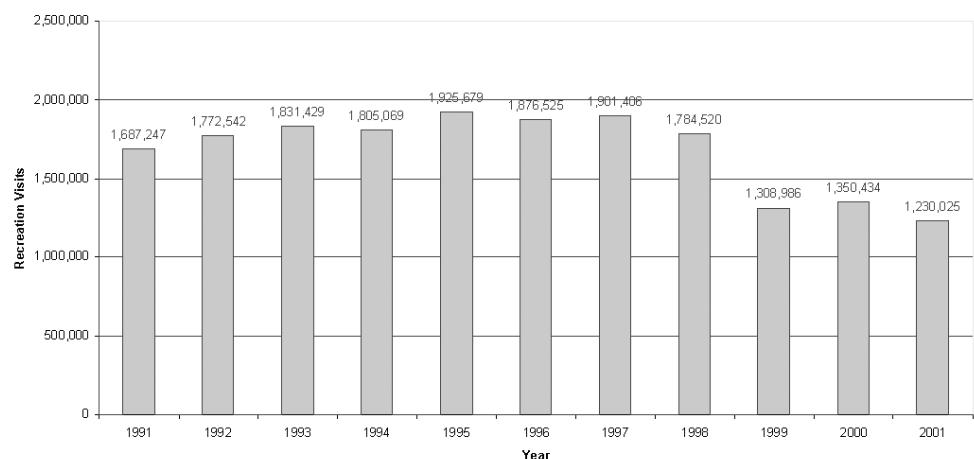
combines data collected from a variety of sources. The NPS develops two types of visitation estimates: recreation visits and non-recreation visits. Recreation visits include those who come to the park for recreational or cultural/educational purposes and excludes drive-through visitors such as area residents commuting to work. Non-recreation visits include government personnel, through-traffic (such as commuters), trades-persons, and persons residing within park boundaries. Non-recreation visits are not included in the following discussion.

At Valley Forge NHP, recreation visits are determined using a mathematical formula that incorporates two variables

- the number of people visiting the Welcome Center (hand counted) multiplied by seven (this factor is assumed to include visits that do not include a stop at the Welcome Center, and was developed through park-wide sampling in 1990)
- data gathered by a traffic counter located near the Betzwood picnic area, divided by two in order to adjust for people entering and leaving the park; this number is multiplied by a persons-per-vehicle factor of three

While these visitor estimates attempt to get at an order of magnitude for visitation, they fail to provide accurate attendance levels. Readers should bear this in mind when reviewing the visitor use statistics for Valley Forge. Using these formulas, the Public Use Statistics Office of the NPS estimates that Valley Forge NHP saw a total of 1.1 million recreation visits in 2004. Over the past 10 years, annual attendance numbers range from a high of 1.93 million in 1995 to the 2004 low, indicating a net decline during this period (Table 3-3). While attendance figures do not present precise information in terms of absolute numbers, they have followed a consistent estimation protocol that makes it possible to make relative observations. Visitation figures for January through June of 2005, as compared to the same six months in 2004, show a 29% increase in visits, however, and it is not possible to predict future visitation with certainty, if all current factors remain as is.

**Table 3-3 Recreation Visits\* to Valley Forge NHP**



\* Note: "Recreation visits" in this sense include all visitors coming to the park for recreation, education, and/or enjoyment of cultural/natural resources.

Source: University of Idaho, 2002



In 2001, Valley Forge NHP conducted its first visitor study in 15 years. This study sampled 755 visitors at six locations in the park over a seven day period in August. The numbers are not statistically precise and the study results do not necessarily apply to visitors during other times of the year. However, they do provide useful indications about park visitation during the peak summer season. Some of the relevant information that emerged from this study includes

- A substantial percentage of visitors are recreational users of the park who come regularly. About two-thirds (66%) of all visitor groups had at least one person who came to the park at least once a month.
- The two most popular activities among visitors are walking/running and visiting historic structures: active recreation is by far the most popular use of the park.
- Groups with frequent visitors are apt to bring along infrequent guests, however. Of all individuals surveyed, 55% had only come to the park once in the past year.
- The park is used year-round. Even though the questionnaire was administered during the summer, over 50% of respondents said that they also use the park in the spring and fall, and 42% use it in the winter.
- The overwhelming majority of park users come just for the day, as just 32% stay overnight. Among those staying overnight, most stay fewer than three nights in the area. Nearly three-quarters of overnight visitors stay in hotels and cabins, and just 15% stay with friends and family.
- Prior to the establishment of the Encampment Store, very little money was spent in the park itself. The average traveling party spent \$143 during its visit to the area, but just 11% of that spending occurred within the park's borders. Nearly half of all visitors to the park did not spend any money during their visits. This was largely due to the fact that, prior to the Encampment Store, there was little opportunity to spend money within the park. As of May 2005, the per-person transaction at the Encampment Store ranges from \$8-\$15 depending on the season.
- About half of all visitor spending is for lodging, with much smaller amounts spent on dining, admission fees, and transportation.
- The average age of visitors to the park is 45 – lower than at many other historic attractions. The reasonably low age is likely due mostly to recreational users and school groups.
- Most visitors come in small groups, with 62% of parties being one or two people. The overwhelming majority of visitors (98%) are traveling on their own, rather than as part of a group tour.
- No visitor survey accounts for the frequency of tour buses in the park or the number of visitors who arrive on them. During spring and fall in particular, bus groups arrive at the Welcome Center throughout the day, and there are frequently two or more groups present at the same time.
- Visitation to the park from outside the state is not heavily dependent on proximity. While 53% of visitors are from Pennsylvania, the only other state that accounts for more than 5% of visitation is neighboring New Jersey, which may account for some recreational users. Only 4% of visitors are international – the remainder come from around the country.

Table 3-4 summarizes this information.

**Table 3-4 Summary of 2001 Visitor Survey, Valley Forge NHP**

Group Type		Length of Stay		Spending by Category	
Family	46%	Daytrip	68%	Lodging	48%
Alone	23%	1 night	13%	Dining	23%
Friends	21%	2-3 nights	12%	Transportation	10%
Other	9%	4-5 nights	5%	Admission Fees	5%
		6+ nights	3%	Food/Other	14%
Frequency of Visit		Spending per Party in Area		Spending per Party in Park	
Every Day	3%	None	32%	None	44%
Several times a week	24%	Under \$100	48%	Under \$50	46%
Several times each month	31%	\$100 - \$300	10%	\$50 - \$100	9%
Once a month	7%	\$300-\$500	4%	\$100+	0%
Less than once a month	34%	\$500+	5%	Average	\$16
		Average	\$16	Per Capita	\$10
		Per Capita	\$10		
Season		Number of Visits/Year		Average Age	
Summer	99%	10+	22%	Group Size	
Spring	56%	5-9	6%		
Fall	55%	2-4	18%		
Winter	42%	1	55%		
				1	22%
				2	40%
				3-4	24%
				5+	15%
Sources of Visitor Information		Activities		Sites Visited	
Previous visit(s)	53%	Walking/Running	65%	Visitor Center	55%
Friends/relatives/ word of mouth	42%	Historic Structures	60%	National Memorial Arch	45%
Travel Guides	24%	Driving	40%	Washington's Headquarters	43%
Highway Signs	19%	Biking	29%	Muhlenberg Brigade	37%
Website	16%	Nature	25%	Wayne's Woods	33%
Newspaper/magazine	12%	Photography/Art	20%	Washington's Chapel	33%
State/local welcome center	9%	Picnic	18%	Schuylkill River Trail	31%
Travelers Info Radio Station	3%	Dog Walking	15%	Artillery Park	29%
Telephone call to park	2%	Ranger-led activities	10%	Varnum's Headquarters	26%
Written injury to park	1%	Tour Bus	9%	Multi-use Trail	24%
		Boating	7%	Pawlings Parking Area	20%
		Fishing	3%	Valley Creek Trail	17%
		Horseback Riding	3%	Varnum's Picnic Area	13%
				Walnut Hill	8%
Accommodations		Visitor Origin			
Hotel/Cabin	74%	Pennsylvania	53%		
Friends/Family	15%	New Jersey	6%		
Camping/RV	5%	New York	4%		
Other	11%	Ohio	4%		
		Virginia	3%		
		Illinois	3%		
		California	3%		
		Other U.S.	20%		
		International	4%		

Comparing the findings of this study with a previous survey from 1986 provides some insight into the park's evolving visitor experience and what needs to be done to enhance it. As with the 2001 study, the results of the 1986 study should not be

considered statistically valid but rather an indication of visitor characteristics and behavior. Indications about changes since 1986 are as follows

- The number of visitors only coming once a year went up from 46% in 1986 to 55% in 2001, suggesting that the park is seeing increased visitation from non-recreational visitors.
- The share of family groups declined from 55% in 1986 to 46% in 2001, but the share of people coming alone remained steady. This suggests that perhaps more adult couples are coming to the park.
- Children represented a smaller share of visitation in 2001 (21%) than in 1986 (26%), but the share of adults ages 21-45 remained about the same. This suggests that those adults coming without children may be older.
- The bulk of visitors continue to come from the Philadelphia area, and length of stay remains fairly short - people tend to stay in the park for fewer than three hours.

Visitation records maintained by the park rangers reinforce the 2001 survey findings, and provide a better picture of how visitors participate in history-related activities (Table 3-5). This information is collected by interpretive staff that counts visitors by hand at interpretive facilities and events. For interpretive purposes, visitors are most likely to visit the Welcome Center, followed by Washington's Headquarters and the Muhlenberg Brigade. However, these visitors represent only a small portion of all "recreational visits." In 2001, visitors to Washington's Headquarters comprised approximately 7% of all "recreational visits."

**Table 3-5 Visitation to Interpretive Sites and Programs at Valley Forge NHP**

	Welcome Center	George Washington's Headquarters	Muhlenberg Brigade	Other Interpretive Programs*
2004	98,246	68,601	21,689	20,183
2003	106,013	71,349	12,320	30,881
2002	112,229	83,816	20,213	26,783
2001	127,045	90,853	19,334	19,480
2000	126,881	93,296	44,778	19,704
1999	141,552	91,657	30,984	17,471
1998	187,481	114,095	32,092	27,159
1997	211,472	121,167	49,332	41,205
1996	190,439	108,661	64,778	17,129
1995	212,398	116,804	80,005	27,298
1994	205,595	108,534	52,663	18,448
1993	213,440	133,487	59,002	56,094
1992	225,297	148,159	64,110	32,394
1991	239,785	154,795	76,222	30,754
1990	219,691	160,541	75,023	41,868

\* Includes living history programs, educational programs for schools and Elderhostel groups, special topic ranger programs, walks, talks, etc. provided by Valley Forge interpretive staff. All numbers are measured according to the NPS fiscal year, October 1 through September 30.

Source: National Park Service



Additionally, park staff report that visitor use varies according to season: more historical visits take place in the summer, and more recreational visits occur in the spring, fall, and to some extent winter. Traditionally, school-group bus tours predominate in the spring and senior groups in the fall. As one would expect, there also is a distinct increase in recreation visits on weekends and on days with nice weather.

### **3.5.2 Visitor Contact, Orientation, and Information**

Following is a description of the visitor orientation and information services at Valley Forge NHP.

#### **Pre-visit Information and Orientation**

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Visitors planning a trip to Valley Forge NHP can turn to several sources of information. According to the 2001 Visitor Study, among visitors who received information the most popular source is friends, family, or word of mouth (42% of visitors). Other common sources include travel guides or tour books (24%), highway signs (19%), and the NPS website (16%). NPS staff report that hundreds of visitors call the park annually prior to their visit to request information on park regulations, maps, and other orientation materials. NPS staff also report a reduction in the number of requests for information by mail, suggesting that more visitors are using the park website. When visitors were asked what source of information they would turn to in the future, the website was the most popular source.

Rangers and park volunteers staffing the Welcome Center handle more calls relating to non-historical activities such as hiking, bicycling, picnicking, dog walking, and weddings, than they do requests for information on park history and historical programs. The Valley Forge Convention and Visitors' Bureau (VFCVB) also assists visitors in planning trips to the park and surrounding attractions through its website and via their volunteers, who staff a station in the Welcome Center. The VFCVB also employs a full-time staff person at the park. The VFCVB books reservations for visitors at their member lodging facilities in the area.

***Travelers' Information Station.*** The travelers' information station broadcasts an orientation and park guideline message over a low wattage AM radio system. The radio station message reaches travelers coming into the park from the major road approaches at a distance of approximately three miles. Signs alerting motorists to this message are posted on the PA Turnpike, the Schuylkill Expressway, US 202, and PA Route 23. The message is three minutes in duration.

***Website.*** The park website contains both orientation and historical information. In addition to a virtual tour, downloadable maps, a list of activities, and a large section on the history of the encampment, the site includes the muster roll database that is also available at the Welcome Center. The website offers information for potential park visitors, and also serves as a source of educational information for those who may never visit the Valley Forge encampment.

***Event Calendars.*** During the year, the park publishes two event calendars that list special programs and daily activities. One comes out in March (covering March through September) and the other is issued in September (covering September through March). A summer season supplement is also prepared to cover the additional programs and events available at that time. These event calendars are available at the Welcome Center and are also distributed to those on the park mailing list.

## On-site Information and Orientation

**Welcome Center:** The Welcome Center is the principal park information and orientation facility. Visitors to Valley Forge are encouraged to begin their experience at the Welcome Center, located near the park's main entrance at the intersection of PA Route 23 and North Gulph Road. At the Welcome Center, visitors see new museum exhibits, shop at a new museum store, and learn about activities such as ranger-led tours, guided bus tours, and self-guided auto tours. Components of the park Welcome Center experience include

- **The Park Film.** *Valley Forge: a Winter Encampment*, is an 18-minute film that provides an overview of the events that took place at Valley Forge during the American Revolution. The film is the third revision of a 1970s mood film directed by Caleb Deschanel. Plans are underway to develop an updated film that incorporates current scholarly research and expands on the stories of African-American, American Indian, and other groups' participation in the Valley Forge encampment.
- **The Park Brochure.** The park brochure outlines a 10-mile self-guided driving tour that highlights the park's most significant historical features. Tour signs are keyed to the map, and an audio CD also may be purchased to enhance the experience.
- **Interpretive Exhibits.** In October 2002, a new exhibit was installed in the Welcome Center. The exhibit, "Determined to Persevere," covers seven themes of encampment life, including health and medicine, diversity, and military training. The exhibit was the first investment in visitor exhibits since the park was designated as a national park. The exhibit and overall renovation of the Welcome Center was funded by donations raised by the America Revolution Center.
- **Encampment Store.** The Encampment Store is the bookstore located at the Welcome Center. The store offers a mix of books, souvenirs, prepackaged food, and beverages and is operated by The Encampment Store, Inc. through a Cooperating Associate agreement. Revenue and profitability have increased by more than 25% over the former cooperating association, operating in the same square footage in the Welcome Center. Gross revenue in 2004 was approximately \$800,000, of which 10% is donated to the park.

**Signage:** Visitors come to the park by car, bus, bicycle, and on foot; most arrive by car. There are 11 points of entry, and most visitors enter the park via PA Route 23. This route also serves as a commuter route, and during morning and afternoon travel times, traffic speeds and congestion can prove daunting to park visitors. There is inadequate way-finding signage from the PA Turnpike, the Schuylkill Expressway, and US 202, and it is difficult for visitors to find their way to the park. Once inside the park, way-finding signs keyed to a self-guided auto tour direct visitors to the key sites. A regional *Visitor Mobility Study* completed in 1997 recommended the creation of a regional directional signage initiative and the addition of signs to Valley Forge to route traffic from US 202 and US 422 West, in order to improve visitor orientation.

**Visitor Service Amenities:** Modest visitor service amenities are offered in the park. Six restroom facilities are scattered throughout the park, and there are three picnic areas; Betzwood, Varnum, and Wayne's Woods. Beverages and prepackaged food may be purchased at the Welcome Center, and a small café at the privately owned Washington Memorial Chapel offers a modest soup/sandwich lunch menu. The

Kennedy-Supplee Mansion, a privately operated restaurant in a historic house in the park, closed in 2004. There are no camping sites or lodging on site.

### **3.5.3 Interpretive Programs**

In addition to the Welcome Center museum, which offers an interpretive overview of Valley Forge, there are several sites in the park where limited interpretive programs take place.

#### **Washington's Headquarters**

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At Washington's Headquarters, visitors can tour the building and learn about how Washington and his staff lived and worked during their stay in the building. Rangers and volunteers in period costumes orient visitors and answer questions before visitors tour the house on their own. There is no formal interpretive program. A \$3.00 entrance fee is charged prior to entering Washington's Headquarters; the only location at Valley Forge NHP where a fee is charged.

#### **Muhlenberg's Brigade Programs**

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At the site of Muhlenberg's Brigade, formal and informal living history programs describe the life of the common soldier. These programs often include a musket firing. Cool weather talks are conducted by fireside inside the reconstructed log cabins.

As the first stop on the driving tour, and within walking distance of the Welcome Center, the site is very accessible and noticeable. In addition to the close location of the tour road and parking, the most heavily used section of the Joseph Plumb Martin Trail passes directly in front of the area. This provides a steady stream of visitors yet sometimes challenges the interpreters.

#### **Varnum's Quarters**

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Varnum's Quarters is a restored house that offers the opportunity to address several more park stories during the summer season. Among the stories that park staff and volunteers tell here are the life of a civilian farm family; the duties of the upper level officer, General Varnum, who occupied the house; the training of the army under General von Steuben on the adjacent Grand Parade; and the participation of the Rhode Island African-American troops who camped nearby. Staff and volunteers stationed at the site wear living history costume. The din of traffic noise from nearby PA Route 23 can cause a distraction, as it carries into the house.

#### **Natural Resources**

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Interpretive programming is offered as requested and when staffing permits. Groups requesting programs include home-schoolers; traditional grade, middle and high schools; local universities; scout troops; non-profits; and individuals. Programs address the natural and cultural histories of geology, Valley Creek, wildlife and their habitats, and white-tailed deer ecology. Local subject matter experts also provide tours and programs about the park's resources without support and with minimal training from the NPS.

### **3.5.4 Monuments and Markers**

The Valley Forge Park Commission placed nearly all of the park monuments such as the brigade markers and state monuments. These markers indicate where troops encamped and demonstrate that the soldiers came from 11 of the original 13 colonies. The remaining metal signs and markers installed by the state are mostly in poor shape. In



some cases, markers indicate soldiers' burial sites, although archeological investigations at these sites have shown no history of ground disturbance and have confirmed that these are not sites of burials.

### **3.5.5 Waysides**

The park wayside exhibits, installed in the 1980s, were professionally produced but in some cases they contain inaccuracies or were placed in locations nearly invisible to the average visitor. In addition, some are not placed within sight of the feature they describe or the feature described is no longer present. The waysides near the Schuylkill River and Valley Creek are subject to flood damage and have been destroyed in the past. At the statue of General von Steuben overlooking the Grand Parade, audio waysides were replaced by more dependable MP3 players in 2004.

### **3.5.6 Personal Services and Children's Programs**

#### **Boy Scout Trail**

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Numerous scout groups take the 10-mile compass-navigated historical trek developed by the Cradle of Liberty Council of the Boy Scouts of America. This booklet is sold for a nominal fee at the Encampment Store. An annual winter encampment of boy scouts is held on the park's north side over the Washington's Birthday weekend. The event has taken place each year for over 80 years.

#### **Junior Ranger Program**

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Two Junior Ranger programs are available. Children as passengers on the driving tour can complete either the Continental Soldier or Naturalist booklets and return to the Welcome Center to receive a Junior Ranger badge. The booklets are available in the Welcome Center for a nominal fee.

#### **Programs for Children**

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The educational programs conducted by the interpretive staff consist of four thematic lessons taught to students in grades 3-8. The staff presents these well-received programs three days a week during the school year, and approximately 2,000 regional students attend them annually. Staff presents these programs at the Education Center and at the Valley Forge Train Station located near Washington's Headquarters.

The park works with the Great Valley Nature Center to provide eight weekly sessions of summer camp in the park, focusing both on historical and natural themes. Staffed by Great Valley counselors, park-sponsored Student Conservation Association interns, and with presentations by park interpretive staff, the camp is very popular.

#### **Staffing**

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Nine interpretive rangers are augmented by seasonal rangers and Student Conservation Association interns (three and six respectively in 2005). In addition, dedicated volunteers are essential in keeping interpretive sites open to the public.

### **3.5.7 Living History Programs**

Living history programs offered by park staff and volunteers are supplemented by re-enactment groups, especially during the park's special events. The presence of these groups adds life to the encampment story by giving visitors the opportunity to observe a larger version of everyday encampment activities.

### **3.5.8 Tours**

After 25 years of operation, the park's bus-tour concessionaire ended operations in 2000. Since 2002, the park and the American Revolution Center have worked together to provide a guided bus tour. This fee-based tour is available five days a week in the summer and on weekends during the fall and holiday periods. The tour follows the 10-mile self-guided tour that is described in the park brochure. Visitors also may purchase an audio CD, available in the Encampment Store, to use on the 10-mile self-guided tour road.

Local tour companies also offer touring services. These services are not reviewed or managed by the park, and the level of quality and accuracy of interpretation is not known.

### **3.5.9 Special Events**

The park conducts four main commemorative events each year that coincide with important historical events of the encampment: March-In (December 19), Washington's Birthday Weekend (President's Day in mid-February), French Alliance (May 6), and the March-Out (June 19). Additional commemorative events include the von Steuben Society's annual program at the von Steuben monument, and the Patriotic Order of the Sons of America annual event.

#### **March-In**

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The March-In to Valley Forge is held on the evening of December 19. This very popular traditional program jibes with the ideal notion of Valley Forge as a place where the army endured a bitter winter. The program usually includes the participation of re-enactors, first-person portrayals of soldiers and camp followers, and tours of the campfire-lit camp. The March-In has been held in many locations in the park. Out-of-the-way locales offer more ambience, while more accessible areas provide an opportunity for more to attend.

#### **President's Day Weekend**

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The most well attended event of the year, and the longest running scouting event held in America, is the three-day program offered over President's Day weekend in February, serving approximately 3,000 Boy Scouts, as well as additional visitors. The scouts camp on the north side of the park. (This is the only group that is permitted to camp in the park, and for this event only.) On Saturday, the park and the Cradle of Liberty Council of the Boy Scouts of America jointly provide interpretive activities. On Sunday, re-enactors conduct tactical demonstrations, historic weapons firing, and soldier life demonstrations. Monday's activities include a children's program that often attracts as many as 500 participants, and a lecture on Washington's military career by park staff, both conducted from the Welcome Center. The popularity of this event is tied to the association between winter weather and the perception of Valley Forge as the place where soldiers suffered from and persevered against the cold.

#### **French Alliance Day**

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The French Alliance Day program is held on the weekend closest to the day that the army celebrated the announcement of the treaties of alliance with France on May 6, 1778. The French Alliance event has the distinction of being a recreation of the actual occurrence held in the actual location. The program takes place on the Grand Parade and includes a staging of the firing celebration, a "feu de joi," or fire of joy – a running sequence of musket and cannon fire that the Continental Army conducted on May 6.

## March-Out

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The March-Out program is conducted on the weekend closest to the army's departure from Valley Forge on June 19, 1778. The March-Out is generally held on the Grand Parade and involves a ceremony and a complement of re-enactors.

### 3.5.10 Amphitheater

The amphitheater is a large, open-air venue that offers hillside seating. It was built by the commonwealth in preparation for events associated with the bicentennial. Grading for the bowl undoubtedly destroyed the archeological resources of one or more brigade sites. The stage structure is in poor repair. The parking lot that served the venue is closed due to asbestos contamination. No events have been held here for over a decade.

### 3.5.11 Special Populations

Persons aged 55 and older comprise an estimated 15% of all visitors. For these older visitors, and others who may have physical limitations, wheelchair access is available at the Welcome Center, auditorium, and Muhlenberg's Brigade. However, only the kitchen at Washington's Headquarters and the first floor of Varnum's Quarters are accessible. There are picture albums available to provide visual access to the second floors of the buildings. All restrooms except those in the auditorium are accessible. A free wheelchair is available at the Welcome Center. A captioned version of the 18-minute park film is shown on request at the Welcome Center. A special audio transmitter is available for use by those who wear hearing aids. Assistance for the hearing impaired is available at the auditorium, and the main park information line has TDD capability. The Joseph Plumb Martin Trail is paved and universally accessible.

For the small share of international visitors, the park has produced three language brochures that match the English NPS version, which is produced at Harpers Ferry Center. Currently, the brochures are available in French, German, and Spanish. A black-and-white format brochure is also available in Japanese.

### 3.5.12 Regional Recreational Facilities and Use

#### Valley Forge Recreational Facilities and Use

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Valley Forge NHP includes numerous recreational facilities within its borders. Twenty-eight miles of trail, including 8.5 miles of paved multi-purpose trail, wind through the park and are popular for walking and bicycling (Figure 3-6). Other recreational activities include horseback riding, bird and nature watching, fishing, and boating. Camping is not permitted on park grounds.

#### **Hiking**

Valley Forge NHP has 19.5 miles of designated, marked hiking trails. On the south side of the park, the 6.5-mile paved, Joseph Plumb Martin Trail connects the key historic and interpretive sites. On the north side, two miles of the paved, multi-purpose Schuylkill River Trail run through the park. Hiking also is permitted in most open field areas in the park.

#### **Bicycling**

Both of the paved trails as well as another 12 miles of flat, unpaved trails are available for bicycling in the park. Many bicyclists also use the park's tour roads.



### ***Horseback Riding***

Horses or other saddle or pack animals may be ridden on road shoulders, cleared fields, mowed paths through meadows, or on trails designated for horse use. No new trails may be established nor may horses be ridden or led in places designated as being closed to horseback riding. Closed areas include

- Washington's Headquarters area
- Welcome Center area
- all trails on Mount Misery with the exception of the Horse Shoe Trail
- all designated picnic areas
- within 100 feet of the Memorial Arch, all other monuments, any building, and all fortifications, earthworks, and hut areas
- all exhibit areas
- areas of high visitor use

Horse-drawn vehicles may use historic trace roads except the one passing in front of Washington's Headquarters. They are prohibited from using trails but may drive through the fields in areas away from visitor concentrations. Horses or other saddle or pack animals cannot be ridden in agricultural fields that are in production. Horse trailers may be parked in one of the following locations

- lower Welcome Center lot
- upper parking lot at Washington's Headquarter off River Road
- Pawlings Road parking lot at the Walnut Hill access road
- road shoulder on south side of park

### ***Picnic Facilities***

Three picnic facilities exist within the park and are available on a first-come, first-serve basis (see Figure 1-2)

- Betzwood (north of the Schuylkill River, west of US 422)
- Varnum's (north of PA Route 23, west of the Star Fort)
- Wayne's Woods (Outer Line Drive, near National Memorial Arch)

### ***Regional Recreational Facilities***

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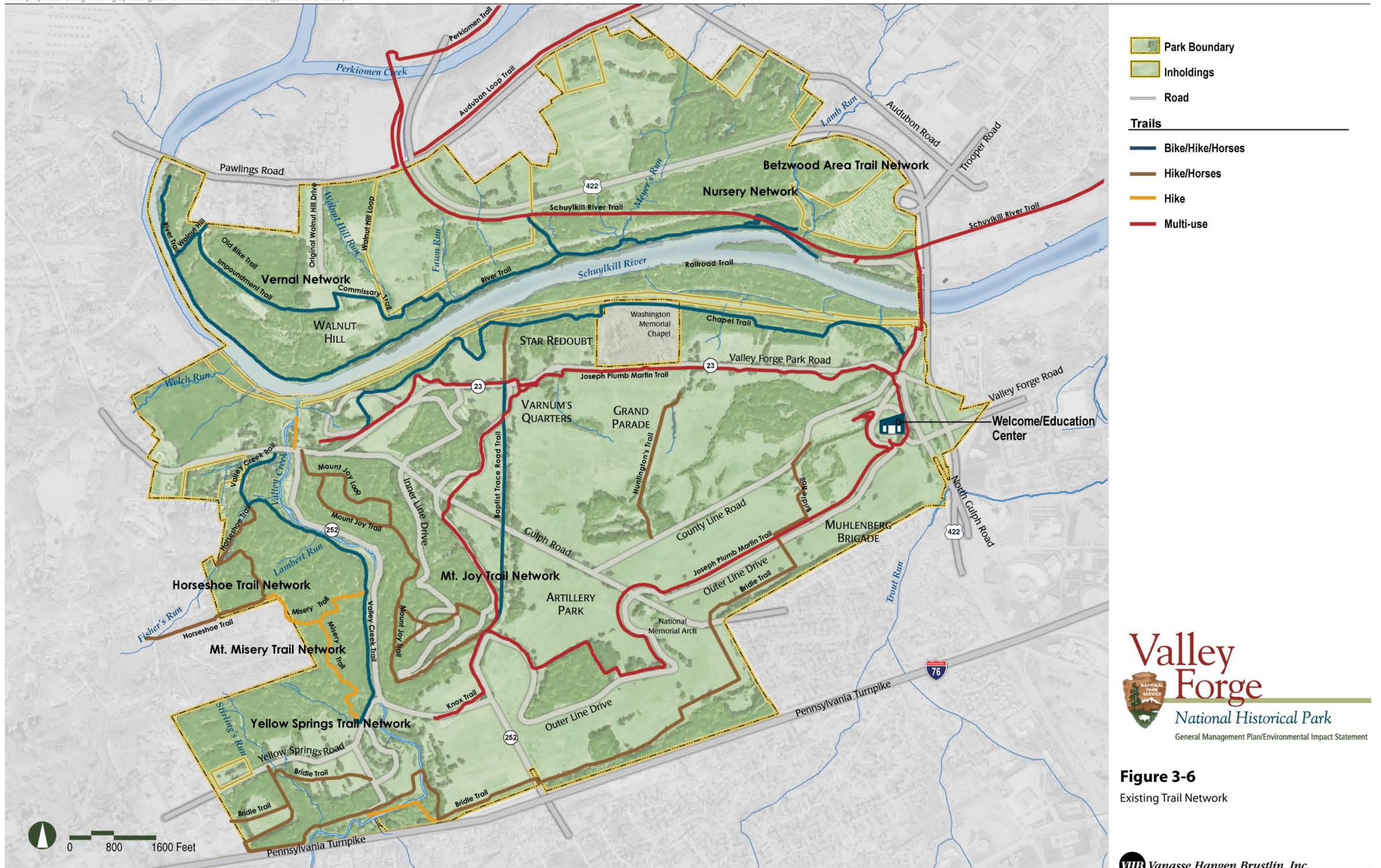
Regional recreational facilities and outdoor opportunities complement or directly relate to the recreational and visitor experience goals of Valley Forge NHP. Future planning can more effectively distribute Valley Forge NHP users to some of these similar facilities, such as nearby regional trails like the Schuylkill River Trail, or make stronger connections between Valley Forge NHP and those state parks that tell a piece of the American Revolution story.

### ***National, State, and Large Municipal Parks***

One national heritage area, five state parks, and one large municipal park are located within a 30-mile radius of Valley Forge NHP.

- ***Schuylkill River Valley State and National Heritage Area*** was designated a state heritage park in 1995 and a national heritage area in 2000. Recreational and interpretive opportunities are a major goal of the park, focusing on linkages of natural and recreational resources through corridor and greenway protection. It features the Schuylkill River Trail which, when completed, will follow length of the Schuylkill River.











- **Hopewell Furnace National Historic Site**, 848 acres adjacent to French Creek State Park, preserves the site and resources of an 18th-19th century iron plantation. The lands within adjacent French Creek State Park were part of the once vast iron plantation.
- **French Creek State Park** covers approximately 7,300 acres and is located in Chester County. It features fishing, swimming, boating, hiking, camping, and seasonal hunting.
- **Ridley Creek State Park**, approximately 3,600 acres, is located in Delaware County. In addition to its recreational opportunities, it is known for its Olmsted-designed gardens and for the Colonial Pennsylvania Plantation, which educates visitors about pre-Revolutionary life on a Pennsylvania farm.
- **Evansburg State Park** includes approximately 3,400 acres and is located in Montgomery County. It features many historic structures, a well-preserved 18th century settlement, golfing facilities, and an American Youth Hostel.
- **Fort Washington State Park**, 500 acres, is located in Montgomery County. It has a strong association with Valley Forge because it is the site of a redoubt fort built by Washington's troops in the fall of 1777, before they relocated to Valley Forge for the winter. This park is particularly sought out by birders because the seasonal migration of raptors is visible from the park's observation deck.
- **Marsh Creek State Park** covers 1,700 acres and is located in Chester County. The park features boating and permits seasonal hunting.
- **Brandywine Battlefield Park**, a small state historic site in Chester County, was the site of a major battle between the Continental and British armies in 1777, and includes Washington's and the Marquis de Lafayette's Headquarters. The park is oriented towards educational activities and features a small museum. Its recreational activities include birding and picnicking.
- **Fairmount Park** is an 8,700-acre municipal park located in the northwestern portion of Philadelphia, along the Schuylkill River and Wissahickon Creek. Biking, hiking, picnicking, and bird watching are primary uses.

With the exception of the Brandywine Battlefield Park, these parks offer similar recreational activities as Valley Forge NHP, including hiking, biking, horseback riding, cross-country skiing, picnicking, fishing, nature watching, and environmental education and interpretive programs.

### **County and Smaller Municipal Parks**

Chester County has over 3,600 acres of county park land and is planning to develop more parks in the central and eastern portions of the county. Montgomery County has 4,900 acres of park land and is focusing future activities on trails and greenways. Both Montgomery and Chester County continue to work together to enhance their open space and recreational resources.

Both of these counties' parks systems offer the traditional range of outdoor activities as well as historic, scenic, and educational resources. Numerous municipal parks, which are usually smaller in size, are also located in both counties. Municipalities are devoting greater fiscal resources to the creation and preservation of open space, especially parks, as development pressure generates stronger demand for community-based passive and active recreational areas.

The *Montgomery County Open Space Plan* (1996) is a comprehensive assessment of its open space resources, most of which allow for recreational activities. The plan clearly defines where and how future actions could expand the open space network. Chester County adopted *Landscapes: Managing Land in Chester County* as a policy in 1996, and the subsequent *Linking Landscapes: A Plan for the Protected Open Space Network in Chester County* in 2002. In addition to recommendations for rigorously protecting open space, with a goal of doubling the current amount by 2015, the plan recommends specific regional trail links.

### **Greenways**

“Greenways” refer to connected systems that incorporate parks, trails, and other resources aimed at enhancing the public’s recreational, aesthetic, and transportation opportunities while furthering environmental goals. Rivers, creeks, and rail and utility corridors can serve as spines that link greenway resources. Multiple greenways are present or under development near Valley Forge NHP, including the Schuylkill Greenway, French Creek Greenway, Pickering Creek Greenway, Great Valley Greenway, Perkiomen Creek Greenway, and Wissahickon Creek Greenway. Each features combinations of park lands, land and water trails, and utility corridors that are protected and managed to promote recreation as well as other conservation needs.

### **Trails**

Regional trails around and through Valley Forge NHP allow major pedestrian, running, hiking, biking, and in some cases, horseback riding activities. Trails include

- The ***Schuylkill River Trail***, originating in Philadelphia, extends through Valley Forge NHP north to Oaks. This trail is now 24 miles long. Ultimately, the trail will extend for approximately 100 miles, from Philadelphia north to Pottsville.
- The ***Perkiomen Trail***, a 19-mile-long bike-hike trail extending from the Schuylkill River Trail at Oaks to Green Lane Park in Upper Frederick Township.
- The ***Horse Shoe Trail*** is a traditional hiking and bridle route extending from Valley Forge NHP to the Appalachian Trail near Harrisburg. It largely crosses private land.
- The ***Chester Valley Trail***, which encompasses both finished and planned sections, will extend from Exton to Norristown, connecting to the Struble Trail at the west end, and the Schuylkill River Trail at the east end. It will connect with Valley Forge NHP at Wilson Road along the southern boundary of the park.

Additional proposed trails that are planned in the area of Valley Forge NHP include

- The ***Patriots’ Trail***, linking the Paoli Massacre site in Malvern with Valley Forge NHP via the Chester Valley Trail. A further connection to Ridley Creek State Park in Delaware County also is planned.
- A link from the Upper Merion Township trail system to Valley Forge NHP near the south end of the replacement Betzwood Bridge.
- Extensive countywide trail system in Montgomery County that, upon completion, will total 160 miles served by 13 greenway corridors. Some of the key trails proposed around Valley Forge NHP include the Evansburg Trail, beginning just north of Valley Forge NHP; the Schuylkill River Trail extensions; and the Liberty Bell Trail, which connects to the Schuylkill River Trail East.

## 3.6 Socioeconomic Environment

### 3.6.1 Park Setting and Adjacent Land Use

Valley Forge NHP's larger region is defined by both natural and man-made barriers occurring along the southern, southwestern, and eastern edges, specifically the Susquehanna and the Delaware Rivers. In particular, heavy population concentrations characterize the area extending from Wilmington, Delaware to Trenton, New Jersey, including greater Philadelphia.

Five townships surround Valley Forge NHP: Schuylkill and Tredyffrin Townships in Chester County; and Upper Merion, West Norriton, and Lower Providence Townships in Montgomery County (see Figure 1-1). Their form of governance is Township Manager with a Board of Supervisors or Councilors. Townships have zoning authority, approve development proposals, and determine their own land use ordinances, which vary depending on the municipality's policies toward land development.

The regional land use pattern of general bands of development running from northeast to southwest has resulted from influences of history, geography, geology, and economic resources. Population distribution and related development have historically followed transportation routes and networks. Villages grew along Pennsylvania's waterways at mills and inns, and the early road network connected these villages. Industrial growth was facilitated by the development of the Schuylkill Canal and the early Pennsylvania railroads. By the mid-19th century, advancing railroad lines and later trolley systems opened up previously inaccessible areas, leading to the development of suburbs. This trend was accentuated with the advent and domination of the automobile.

Today, the park is greatly affected by its location within a major eastern metropolitan area. Although agricultural production and its associated landscape dominated the region throughout most of the 20th century, southeastern Pennsylvania farms in the past two decades have yielded to tremendous suburban sprawl. Few farms and open spaces remain, having been replaced by residential, commercial, and office development serving local residents as well as greater Philadelphia commuters.

A densely developed industrial/commercial corridor interspersed with new and older residential development extends northwest from Philadelphia and engulphs the park. This area is the region's largest suburban office and retail complex and includes one of the nation's largest malls, King of Prussia. The area surrounding the park is built up, characterized by low- to mid-density residential and commercial land uses. Threading between the park and the commercial areas is the regional highway network, interconnecting several heavily traveled expressways. These include the north-south US 422, which passes through the park, and the east-west PA Turnpike, I-76/I-276, which passes along the park's southern boundary, connecting Philadelphia to the rest of the state.

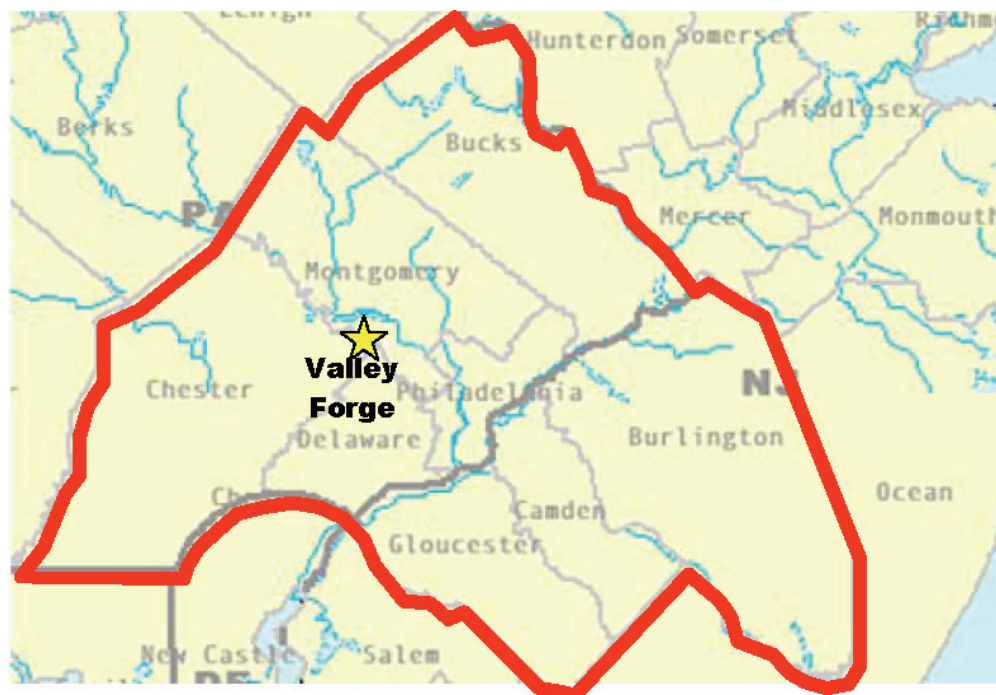
### 3.6.2 Socioeconomic Study Area Definition

The majority of Valley Forge NHP is located in Montgomery County, Pennsylvania, about 18 miles northwest of downtown Philadelphia. A smaller portion of the park is located in Chester County (see Figure 1-1). The park is situated in a very heavily developed, suburban area, and highway infrastructure and public transportation provide excellent regional access.



For this analysis, the study area is defined as the Greater Philadelphia Metropolitan Area, which includes the following counties: Philadelphia, Bucks, Chester, Delaware, and Montgomery in Pennsylvania; and Burlington, Camden, and Gloucester in New Jersey (Figure 3-7). It is recognized as an economic entity, and impacts related to plan implementation would be realized throughout.

**Figure 3-7 Socioeconomic Region**



The local impact area is defined as Montgomery County and specifically, the King of Prussia Mall area, which is the largest suburban commercial area in the eastern United States. It contains several million square feet of retail space, diverse dining and entertainment options, and thousands of hotel rooms in all price ranges. The park is also located near other population centers containing some visitor services, such as Norristown, Paoli, and Phoenixville.

### 3.6.3 Regional and Local Economy - Socioeconomic Trends

#### Population Trends

In 2000, the population of the eight-county region was 5.04 million, up about 4% from the 1990 total of 4.86 million. Among the eight counties, Bucks, Chester, Montgomery, and Gloucester all grew by more than 10% during the 1990s; Burlington County grew by 7%; and Delaware and Camden Counties grew slightly (less than 1% each). Philadelphia lost about 70,000 people - a rate of decline of about 4%.

In terms of age profile, closer-in counties to Philadelphia have higher percentages of senior citizens (65 or older) and lower percentages of adults of working age (25-64) than do outlying counties. Philadelphia differs from the rest of the region most in terms of the share of people ages 18-24, as 11% of its population falls in this range; the regional average is 8.8%.

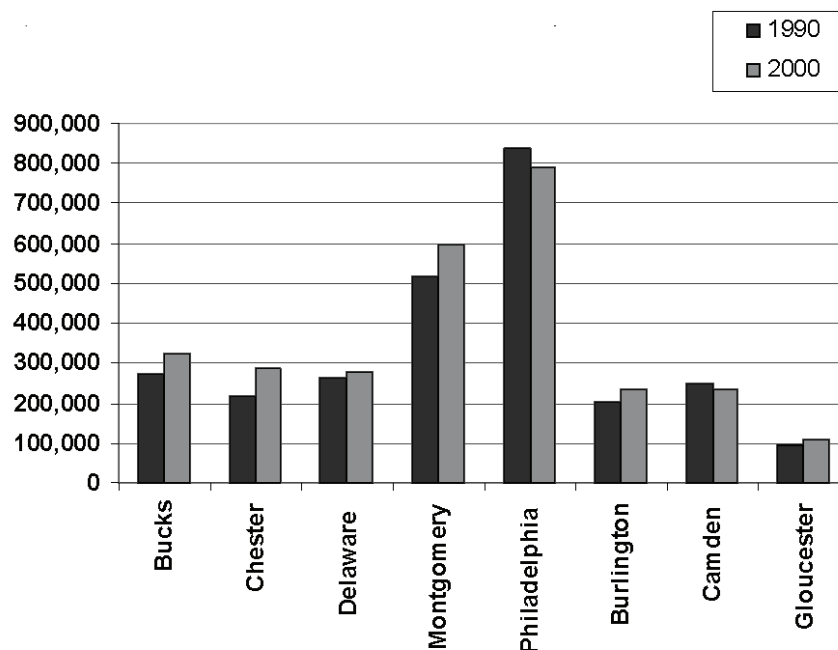
Looking at household income, Chester and Montgomery Counties, the two counties surrounding Valley Forge, have the highest income levels in the region. In each of these two counties, more than 38% of all households earn more than \$75,000 per year - the regional average is just 28%. In Philadelphia, Camden, and Delaware Counties, 50% or more of households earn less than \$50,000 per year, and in Philadelphia, more than 40% of households earn less than \$25,000 per year - by far the highest number of low-income households in the region.

## Employment Trends

The total employment base in the eight-county region grew by 205,000 jobs from 1990 to 2000, according to the U.S. Bureau of Economic Analysis (Regional Economic Accounts, on-line database). The end result in 2000 was a regional job base of 2.86 million - 7.7% higher than in 1990.

Counties growing the most during the 1990s were Montgomery and Chester, which collectively added over 150,000 jobs during the decade - 75% of the region's total job growth. Bucks County added over 50,000 jobs, and Burlington added about 18,000. These gains were offset somewhat by losses in Philadelphia (51,000 jobs) and Camden (16,000 jobs) (Table 3-6).

**Table 3-6 Employment Change, 2000**



Looking at how employment in the region has changed over time also offers some interesting insights. In 1970, 36% of jobs in the eight-county region were in the Manufacturing, Construction, and Transportation/Utilities sectors; by 2000, just 19% were in these categories. During the same period, the share of the Services and Finance, Insurance, and Real Estate (FIRE) sectors ballooned from just 28% in 1970 to over 48% in 2000. This mirrors the national trend of services employment replacing manufacturing employment.

Burlington County has seen the largest change in its economic structure. In 1970, 47% of this county's employees worked for the government, largely due to the presence of McGuire Air Force Base. As this base has been downsized and other sectors have grown, only 15% of Burlington County's employees work for the government, and services employment has grown from 16 to 42%. In other counties, the typical pattern has been a shift from manufacturing to services. In 1970, no county had more than 31% of its employment in the services/FIRE group; by 2000, all eight did, and only Gloucester County had less than 40% of its jobs in this group.

### **3.6.4 Demographic Profile - Resident and Tourist Visitor Markets**

Valley Forge NHP serves different purposes for different types of visitors. To local residents, who comprise the majority of park users, the park's primary value is as a recreational asset, as many nearby residents come to the park to walk, run, or bicycle. For residents of the Greater Philadelphia region, the park offers an attractive daytrip destination to learn about Revolutionary War history. For other tourists to the region, Valley Forge NHP is one of many historic destinations located in proximity to Philadelphia and serves as one part of a larger visitor experience.

In order to more clearly understand differences among these three visitor markets, their demographic and economic characteristics were examined according to visitor market. Analyzing these characteristics provides clearer insights into the nature of these visitor groups and provides guidance in planning for future visitor experiences.

#### **Local Residents (0-20 Minute Drive)**

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The local resident population is defined as people living within a 20-minute drive of Valley Forge NHP's Welcome Center. This population has easy and convenient access to the park via automobile, bus, bicycle, or foot, and forms the core visitor market, as it accounts for most of the park's recreational users. Table 3-7 provides a summary of the local market's demographics, along with a summary of the regional resident market.

The local market includes much of Montgomery County and portions of Philadelphia, Chester, and Delaware Counties as well. The following points summarize the local resident market

- In 2001, the population of the local resident market was 2.15 million, living in 822,200 households. This market is not expected to grow much in coming years, as it is projected to add just 9,400 residents from 2001 to 2006, a 0.4% growth rate.
- The local market is fairly ethnically diverse, as it is 60% Caucasian, 31% African-American, and 9% other races.
- The median household income level is \$48,700, and the average household income is \$62,600. Average per capita income is \$24,200.
- Nearly 30% of households are low income (under \$25,000), but 26% are high income (over \$75,000). This disparity accounts for the large difference between median and average income levels.
- The median age of the local market is 36.8. About 21% of residents are under the age of 15, and 14% are 65 or older.



**Table 3-7 Drive-Time Demographics**

	Distance from Valley Forge NHP Visitor Center		Total
	0-20 Minutes	20-90 Minutes	0-90 Minutes
<b>Population</b>			
2001	2,146,304	10,929,574	13,075,877
2006	2,155,708	11,385,435	13,541,143
Percent Change	0.4%	4.2%	3.6%
<b>Households</b>			
2001	822,178	4,067,751	4,889,929
2006	827,170	4,245,282	5,072,452
Percent Change	0.6%	4.4%	3.7%
Average Household Size, 2001	2.49	2.59	2.57
<b>Race</b>			
White	60.0%	81.1%	77.7%
Black or African-American	31.1%	10.1%	13.5%
Other Races	8.9%	8.8%	8.8%
<b>Income</b>			
Median Household Income	\$48,648	\$53,233	\$52,462
Average Household Income	\$62,618	\$66,257	\$65,645
Per Capita Income	\$24,186	\$24,832	\$24,724
<b>Population by Age</b>			
Under 15	20.9%	20.7%	20.7%
15-24	13.7%	12.3%	12.5%
25-44	29.2%	29.8%	29.7%
45-64	22.3%	23.5%	23.3%
65+	14.0%	13.8%	13.8%
Median Age	36.8	37.8	37.8
<b>Household Income</b>			
<\$25,000	29.6%	22.7%	23.8%
\$25,000 - \$49,499	26.3%	27.1%	26.9%
\$50,000 - \$74,999	17.7%	21.0%	20.4%
\$75,000 - \$99,999	10.7%	12.5%	12.2%
\$100,000+	15.6%	16.8%	16.6%

Source: ESRI Business Information Solutions, 2001 Estimates and Projections; ERA.

### Regional Residents (20-90 Minute Drive)

The regional resident market consists of all people living in the area located between a 20- and 90-minute drive from the Valley Forge NHP Welcome Center. Residents of this market are only occasional recreational users, but they do live close enough to be considered potential daytrip visitors. Regional residents visiting the park would be expected to come to the park primarily for a historic/interpretive experience.

The regional market's reach is the Jersey Shore to the east, Newark to the northeast, Wilkes-Barre to the north, Harrisburg to the west, the edge of Baltimore to the

southwest, and Dover to the south. The following points summarize the regional resident market

- The 2001 population of the regional resident market was 10.93 million, living in 4.24 million households. The regional market is projected to post more substantial population growth than the local market, with an expected net gain of more than 450,000 residents through 2006, a growth rate of 4.2%.
- The regional market is far less ethnically diverse than the local market, as it is 81% Caucasian. Just 10% of this market is African-American, but its percentage of residents of other races is 9% - equal to the share in the local market.
- The median household income level in the regional market is \$53,200, and its average household income is \$66,300. Though these household figures are a good deal higher than the local market, the average per capita income of \$24,800 is only very slightly higher. This suggests that more people work per household in the regional market than in the local market.
- Although the regional market has a lower share of low-income households (under \$25,000) than does the local market, 23% of its households are still in this category. On the other end of the scale, more than 29% of its households are high income (over \$75,000).
- The median age of the regional market is 37.8, one year older than the local market. Like the local market, about 21% of residents are under the age of 15, and 14% are 65 or older. However, the regional market has a slightly lower percentage of young adults (ages 15-24) and a slightly higher percentage of working adults (ages 25-64).

### **Non-resident Tourist Markets**

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Valley Forge NHP is just one of several significant early American historic attractions located in the Greater Philadelphia area. The region also is home to Independence NHP, which contains Independence Hall and the Liberty Bell in Philadelphia, Washington Crossing, and the Chadds Ford/Longwood Gardens area. This concentration of visitor attractions, along with other visitor activities, and proximity to other major visitor locations such as Pennsylvania Dutch Country, Atlantic City, New York, and Baltimore, has established the Philadelphia region as one of the premiere tourist destinations in the country.

The non-resident tourist market is examined in two segments. The first segment consists of residents of the larger region, including Pennsylvania, New Jersey, Delaware, Maryland, the District of Columbia, and the portions of New York, Connecticut, and Virginia that are located in the New York and Washington metro areas. Excluding the 13.1 million people living within 90 minutes of Valley Forge NHP, this larger region is home to 18.0 million people - about 6.5% of the United States' total population. This market is already a source of visitation to the Philadelphia area, and given the distance and travel times involved, is too far away for daytrips but prime for short overnight trips to the area.

The second tourist market segment is the existing pool of visitors already coming to the Philadelphia region. This category includes visitors coming from the regional market described above, as well as visitors from all over the country and the world. According to the Greater Philadelphia Tourism Marketing Corporation (GPTMC), a total of 11.3 million people visited the five-county region in 2000. Based on GPTMC research, the characteristics and habits of visitors to the region are summarized below.

- ***Numbers of Visitors and Visitor Mix*** – In 2000, business and leisure visitors made approximately 11.3 million trips to the Philadelphia region, up slightly from the 1999 total visitation of 10.7 million and the 1998 total of 10.3 million. In 2000, 25% of all visits to the area were discretionary leisure visits; 45% were by those visiting friends and relatives (known as VFRs); and 30% were business visits. This visitation profile has remained relatively steady over the past few years.
- ***Visitor Activities*** – Among leisure visitors, the most popular activities in the Philadelphia area are visiting historic areas and historical attractions, with over 30% of all travelers visiting such places. Other popular sightseeing destinations are small towns/villages (29%), rural farming areas (25%), historic houses (24%), architecture (19%), and national/state parks (16%). Shopping is by far the most popular entertainment activity, as 55% of visitors come to the area to shop. In fact, the most popular destination of any type in the four surrounding counties is the King of Prussia Mall, with Valley Forge NHP a distant second.
- ***Trip Characteristics*** – Of all visitors to the region, 37% named Philadelphia as their primary destination, with 33% visiting the other four counties, 15% going elsewhere in Pennsylvania, and 15% going to another state. The vast majority (78%) travel in their own vehicles, with 19% coming by airplane and 5% by bus or train. The average length of trips for all visitors to the region is 4.1 nights.
- ***Overnight Accommodations*** – Visitors to Philadelphia are much more likely to stay in hotels than are typical U.S. travelers, as 47% stay in hotels. They are also more apt to stay with friends or family than other U.S. travelers - 21% compared to 11%.
- ***Seasonality*** – Compared with all travel in the United States, visitation to Philadelphia does not differ seasonally. Nationally, 33% of travel occurs in the summer, 28% in the spring, 20% in the fall, and just 19% in the winter. In the Philadelphia region, the breakdown is 28% in the summer, 29% in the spring, 23% in the fall, and 20% in the winter.
- ***Visitor Origin*** – Pennsylvania was the most popular state of origin for those visiting the area, with 19% of visitors coming from in-state. New York was a close second at 17%, followed by Virginia (9%), New Jersey (7%), and Maryland (7%). Among metropolitan markets, the New York metro area accounted for 19% of visitors to the region, with the Washington/Baltimore area representing 12% of visitors, and no other region accounting for more than 3%.

The points below summarize other demographic characteristics of visitors to the Philadelphia area.

- ***Age*** – Philadelphia attracts a higher percentage of younger visitors than the U.S. as a whole, as 30% of visitors to Philadelphia are between 25 and 34, compared with 24% nationally. By contrast, Philadelphia does not do well at attracting older visitors, with just 17% of its visitors being over the age of 55, compared to 25% of all travelers nationally. The average age of visitors to Philadelphia is 41.0, far lower than the national average of 43.6.
- ***Race*** – Philadelphia is a popular destination for minority travelers, with 25% of visitation to the region coming from African-American travelers. While visitation from Hispanics is not as strong (4%), it still represents nearly half a million visits per year.
- ***Marital Status*** – The region gets a lot of visitation from singles, with 40% of visits from those who have never been married, compared with just 22% of all U.S. visitors.



- ***Size of Traveling Party*** – Traveling parties to Philadelphia are typically not very large, with 32% consisting of one person and another 29% being two people. However, 11% of visitors come in parties of five or more, a figure slightly greater than the national average of 10%.
- ***Children in Household*** – Just 29% of visitors to the region have children in their households, with 35% of kids in these households between 13 and 17, another 35% between 6 and 12, and 30% under the age of 6.
- ***Household Income*** – The majority of visitors to the region come from households earning more than \$50,000 per year, with 35% earning more than \$75,000 and another 19% in the \$50,000-\$74,999 range. Just 17% come from households that earn less than \$25,000.
- ***Education*** – Visitors to the region are generally fairly well educated, as 20% have graduate degrees, 32% are college graduates, 29% started but did not finish college, and just 19% did not attend college.

Other research by the GPTMC has documented spending by visitors to the region. In 1999, visitors to the region spent \$2.6 billion, of which half was spent by business visitors and one-quarter each was spent by leisure visitors and VFRs. Business visitors spent a great deal more than the other two groups: an average of \$371 per trip compared with \$207 for leisure visitors and \$140 for VFRs. Other studies conducted on “heritage” tourists to Pennsylvania reveal that this type of visitor spends more than the average leisure visitor.

### 3.6.5 Tourist Facilities in the Region

Valley Forge NHP is located within the Greater Philadelphia tourism region, which, in addition to Philadelphia, includes the four surrounding counties of Bucks, Chester, Delaware, and Montgomery. Boasting more than 4,000 area attractions, the region offers a wealth of historic attractions in proximity to Valley Forge NHP. These attractions are considered complementary in that collectively, they add to the drawing power of the region, and thus benefit Valley Forge NHP. The levels of visitation also offer a comparative context for considering the potential for visitation to Valley Forge under various development alternatives considered.

#### Downtown Philadelphia

Philadelphia is the focal point for tourist activities in the region with many major attractions located in the downtown area.

- ***Independence NHP*** is often referred to as the birthplace of our nation and includes the Liberty Bell and Independence Hall, a World Heritage Site where both the Declaration of Independence and the U.S. Constitution were created. In addition, the park interprets events and the lives of the diverse population during the years when Philadelphia was the capital of the United States, from 1790 to 1800. A section of the park where Benjamin Franklin’s home once stood is dedicated to teaching about Franklin’s life and accomplishments. Spanning approximately 45 acres, the park has about 20 buildings open to the public.
- The ***Independence Visitor Center*** is the primary point of orientation for Independence NHP, the City of Philadelphia, the southern New Jersey and Delaware River waterfront, as well as Bucks, Chester, Delaware and Montgomery Counties in Pennsylvania.
- The ***National Constitution Center*** is an independent, non-profit organization dedicated to increasing public understanding of, and appreciation for, the Constitution. The center opened on July 4, 2003 on Independence Mall and

tells the story of the U.S. Constitution through more than 100 interactive and multimedia exhibits, photographs, sculpture, text, film, and artifacts.

- The *Franklin Institute Science Museum* offers a hands-on approach to science and technology. The museum includes the Fels Planetarium, the Mandell Center, the Tuttleman IMAX Theater, and the Musser Theater.
- The *Philadelphia Museum of Art* houses over 300,000 works of art encompassing some of the greatest achievements of human creativity, and offers a wealth of exhibitions and education programs for a public of all ages.
- The *U.S. Mint* offers visitors the opportunity to observe the engraving of U.S. coins and medals and the production of medal and coin dies for all denominations of coins in general circulation as well as the production of regular uncirculated coin sets and commemorative coins.
- The *Academy of Natural Sciences* offers four floors of exhibitions and activities centering on the environment and its diverse species. The academy houses 17 million specimens of plants, animals, and other organisms, including rare library holdings that document scientific discovery from the 1500s to today.

Table 3-8 below illustrates visitor attendance for selected major downtown Philadelphia attractions.

**Table 3-8 Major Attractions, Downtown Philadelphia**

Attraction	Location	Attendance
Independence National Historical Park	Philadelphia	2,300,000
Independence Visitor Center <sup>1</sup>	Philadelphia	2,000,000
National Constitution Center	Philadelphia	1,100,000
Franklin Institute	Philadelphia	850,000
Philadelphia Museum of Art	Philadelphia	528,342
U.S. Mint	Philadelphia	342,346
Academy of Natural Sciences	Philadelphia	256,000
U. Penn Museum of Archaeology & Anthropology	Philadelphia	180,000
Please Touch Museum	Philadelphia	178,839
Independence Seaport Museum	Philadelphia	106,000
Esther Klein Art Gallery at University City Science Center	Philadelphia	100,000
Morris Arboretum & Gardens (Penn)	Philadelphia	85,000
Pennsylvania Academy of Fine Arts	Philadelphia	83,577
Schuylkill Center for Environmental Education	Philadelphia	72,829
African-American Museum	Philadelphia	60,000
Rodin Museum	Philadelphia	52,480
Masonic Temple	Philadelphia	25,500
Eastern State Penitentiary Historic Site	Philadelphia	20,000

<sup>1</sup> Source is Independence Visitor Center Annual Report, 2002-2003.

## Greater Philadelphia

Outside downtown Philadelphia are several other major attractions including the Philadelphia Zoo, located two miles from downtown, Longwood Gardens in Kennett Square, and the James A. Michener Art Museum in Doylestown.

- The **Philadelphia Zoo** includes more than 1,600 rare and exotic animals from around the world, 42 acres of gardens, and art and historical architecture. Specific components of the zoo include a Primate Reserve, the Rare Animal Conservation Center, and the world's first Children's Zoo, featuring a petting yard and daily live animal shows.
- **Longwood Gardens** is located in Kennett Square, approximately 30 miles from downtown Philadelphia. Originally established by industrialist Pierre S. du Pont, the site offers 1,050 acres of gardens, woodlands, and meadows; 20 outdoor gardens; 20 indoor gardens within 4 acres of heated greenhouses; 11,000 different types of plants; spectacular fountains; extensive educational programs; and 800 horticultural and performing arts events each year. Events include flower shows, gardening demonstrations, children's programs, and concerts.
- The **Adventure Aquarium** is located across the Delaware River in Camden, New Jersey on the waterfront, approximately one mile from center city, Philadelphia. The aquarium was completely rebuilt, doubled in size, and re-opened in May 2005 with many more exhibits and activities than previously offered.
- The **James A. Michener Art Museum** is an independent, nonprofit cultural institution located in Doylestown, Pennsylvania, dedicated to preserving, interpreting, and exhibiting the art and cultural heritage of the Bucks County region. Named for the Pulitzer Prize-winning writer and Doylestown native, the museum includes an extensive permanent collection of regional art and hosts nationally touring art exhibits. The site was once the Bucks County prison.

Table 3-9 illustrates visitor attendance for these major regional attractions outside downtown Philadelphia.

**Table 3-9 Major Regional Attractions, Greater Philadelphia**

Attraction	Location	Attendance
Philadelphia Zoo	Philadelphia, PA	1,086,238
Longwood Gardens	Kennet Square, PA	769,000
James A. Michener Art Museum	Doylestown, PA	100,000
Adventure Aquarium <sup>1</sup>	Camden, NJ	N.A.

<sup>1</sup> The aquarium reopened in May 2005 after a complete reconstruction and enlargement. New attendance figures are not available.

Source: *The Official Museum Directory, 2004.*



## Early American and Revolutionary War Sites

In addition to the geographic concentration of attractions found in downtown Philadelphia and the vicinity, there also is a concentration of Early American and Revolutionary War historic sites within the region. This thematic concentration of sites complements Valley Forge NHP's appeal and provides visitors with a range of historic destinations to visit in addition to the park itself.

- ***Brandywine Battlefield Park*** is a state historic site that preserves part of the battlefield of the 1777 Battle of Brandywine. The park features a museum exhibit, video, and tours of Washington's and Lafayette's Headquarters.
- ***Cliveden*** is a historic house museum on six acres of landscaped grounds in the Germantown neighborhood of Philadelphia's Historic Northwest. The property was the scene of the Battle of Germantown in October 1777. During the battle, Continental Army soldiers shelled the British, who occupied Cliveden. Today the house museum is open to visitors and contains several example of period furniture craftsmanship.
- ***Fort Mifflin*** is an 18th century fort on the Delaware River. In 1777, it was the scene of the greatest bombardment of the Revolutionary War. Today, visitors can tour the fort and observe musket and cannon demonstrations.
- ***Hopewell Furnace National Historic Site*** is an example of an early American iron plantation. Founded in 1771 by Ironmaster Mark Bird, the furnace operated until 1883. The buildings include a blast furnace, the ironmaster's mansion, and auxiliary structures.
- ***Washington Crossing Historic Park***, a state historic site, is the place from which General Washington and his army crossed the Delaware River on Christmas night, 1776, to surprise and defeat Hessian troops in Trenton. The 500-acre park and recreational area includes 13 historic buildings, the noted 100-acre Bowman's Hill Wildflower Preserve and observation tower, and many picnic areas.
- The ***Old Barracks Museum*** in Trenton was built in 1758 to house troops during the French and Indian War but is best remembered for its role in the 1776 and 1777 Battles of Trenton during the Revolutionary War. First opened as a museum in 1902, the museum is now an educational institution dedicated to interpreting American culture and the history of colonial and revolutionary New Jersey.
- The ***Betsy Ross House and Flag Museum***, built in 1740, was occupied by Betsy Ross and her family from 1773 to 1786. At the turn of the last century, two million Americans donated dimes to help restore the house. Today the house holds exhibits on the maker of the first American Flag.
- ***Elfreth's Alley***, a district within the city of Philadelphia, is considered America's oldest continuously occupied residential street. Dating between 1702 and 1704, the street is lined with 32 colonial and federal period homes, each no more than 16 feet wide.

- **Haddonfield's Indian King Tavern** is one of New Jersey's most historic buildings. Named for the local Lenape Indians, it is a premiere example of 18th century colonial tavern architecture, as well as the site where New Jersey was legally created. In 1777, as clashing armies devastated Trenton, the assembly reconvened in the Indian King to pass legislation officially creating an independent state. In 1903, the facility became New Jersey's first state historic site.

Table 3-10 illustrates visitor attendance for these Revolutionary War sites in the Philadelphia area.

**Table 3-10 Revolutionary War Sites and Attractions, Greater Philadelphia**

Attraction	Location	Attendance
Betsy Ross House	Philadelphia	300,258
Washington Crossing Historic Park	Washington Crossing, PA	95,000
Hopewell Furnace National Historic Site	Elverson, PA	65,498
Brandywine Battlefield Park	Chadds Ford, PA	50,000
Elfreth's Alley	Philadelphia, PA	35,000
Fort Mifflin	Philadelphia, PA	35,000
Trenton, New Jersey Barracks	Trenton, NJ	28,500
Cliveden	Philadelphia, PA	15,000
Indian King Tavern Museum	Haddonfield, NJ	4,277

Source: *The Official Museum Directory*, 2004.

### 3.6.6 Economic Value of Regional Recreation

Visitor surveys and anecdotal information provided by park staff indicate that recreational use of Valley Forge NHP constitutes the majority of overall visitor activity. Survey responses dealing with visitor activity preference, visitor origin, frequency of use, and level of expenditure data all point to a high level of recreational use: approximately 80%.

While many benefits can be attributed to outdoor recreation, this category of activity, at least as practiced in the park, does not typically result in significant economic impacts on the local or regional economies. Recreational users participating in walking, hiking, biking, picnicking, and other activities that are popular at the park do not, as a rule, spend substantial amounts of money as part of their recreational experience. Moreover, regardless of expenditure levels, the majority of recreational users are thought to be from the area around the park. This local residency means that any dollars spent as part of recreational visits to Valley Forge NHP are dollars that already exist in the local economy. They do not represent "net new" dollars for the economy, so they do not have the effect of adding to the economic growth of the area.

## 3.7 Transportation and Site Access

Transportation and site access have been identified as an important issue in the public and agency coordination process for the GMP/EIS. Representatives of Valley Forge NHP have worked with PennDOT, FHWA, DVRPC, SEPTA, the Greater Valley Forge Transportation Management Association, Montgomery and Chester Counties, and the five townships to develop a transportation plan that will meet the needs of the park and the traveling public. Balancing the regional commuter traffic needs with the needs of the park visitors is a delicate matter. The above mentioned agencies continue to work to implement transportation projects that will be beneficial to all parties.

### 3.7.1 Transportation Network

The study area for the traffic and transportation network is larger than the park because the operations of the transportation infrastructure depend on traffic congestion on roadways outside the GMP/EIS study area in addition to operations of PA Route 23 within the park. The area of focus for this discussion is centered on the state highways and local roads in the vicinity of the park, however. The travel demand analysis showed little change in traffic volume in the outer reaches of the transportation study area based on the transportation elements selected for each alternative. The transportation network includes highway facilities, commuter transit and freight facilities, parking facilities, and multi-use trails. (See Section 3.4.12: Regional Recreational Facilities and Use and Figure 3-6 for a detailed description and depiction of existing trails within the park.)

The state highways are maintained by PennDOT. Regional access to the park is provided by major roadways such as I-76 (Schuylkill Expressway) from Philadelphia, US 202 from Chester and Montgomery Counties, and US 422 from western Montgomery County. The PA Turnpike also provides access to the park for tourists from outside the region (Figure 3-8). I-76, US 422 and the PA Turnpike are currently four-lane highways, but plans are underway to widen portions of the turnpike and US 422 to six lanes. Much of US 202 was recently improved to six lanes through the Valley Forge area.

Other state highways provide access to the park as the visitor approaches Valley Forge. PA Route 23 is the primary east/west highway within the park. It carries the highest commuter traffic volume through the park and has the greatest impact on the visitor experience. North Gulph Road (State Route [SR] 3039) intersects with PA Route 23 at the main entrance to the park approaching the Welcome Center. Entry to the park is also available in 10 other locations, most prominently along PA Route 23 near the Village of Valley Forge, PA Route 252 at the PA Turnpike overpass, and along Pawlings Road between PA Route 23 and US 422.

Pawlings Road (SR 4004), US 422, and US 202 are the primary roads adjacent to the park that provide alternate routes for PA Route 23. Another east/west alternate route north of Valley Forge NHP is Egypt Road (SR 4002). Valley Creek Road (SR 0252) is a north/south roadway that passes through the western part of the park. Gulph Road and County Line Road are also state highways within the park boundary. These two-lane roads function as minor arterials or collectors. In general, these facilities are narrow and were originally intended to carry local trips. Most are heavily used on a 24-hour basis, serving both commuter and commercial traffic.



The park self-guided tour route utilizes a one-way road system comprised of two loop roads that parallel the inner and outer line defense system of the encampment. Inner Line and Outer Line Drives were designed *circa* 1900 as carriage roads, for slow speeds. At the higher speeds of automobiles, some sight distance problems occur, and roadway widths at visitor stopping places are narrow. The tour route overlaps with and shares portions of the commuter routes discussed above, mixing slow-moving visitor traffic with fast-moving commuter and commercial traffic. The objective of both user groups is divergent and at times has resulted in accidents and near accidents.

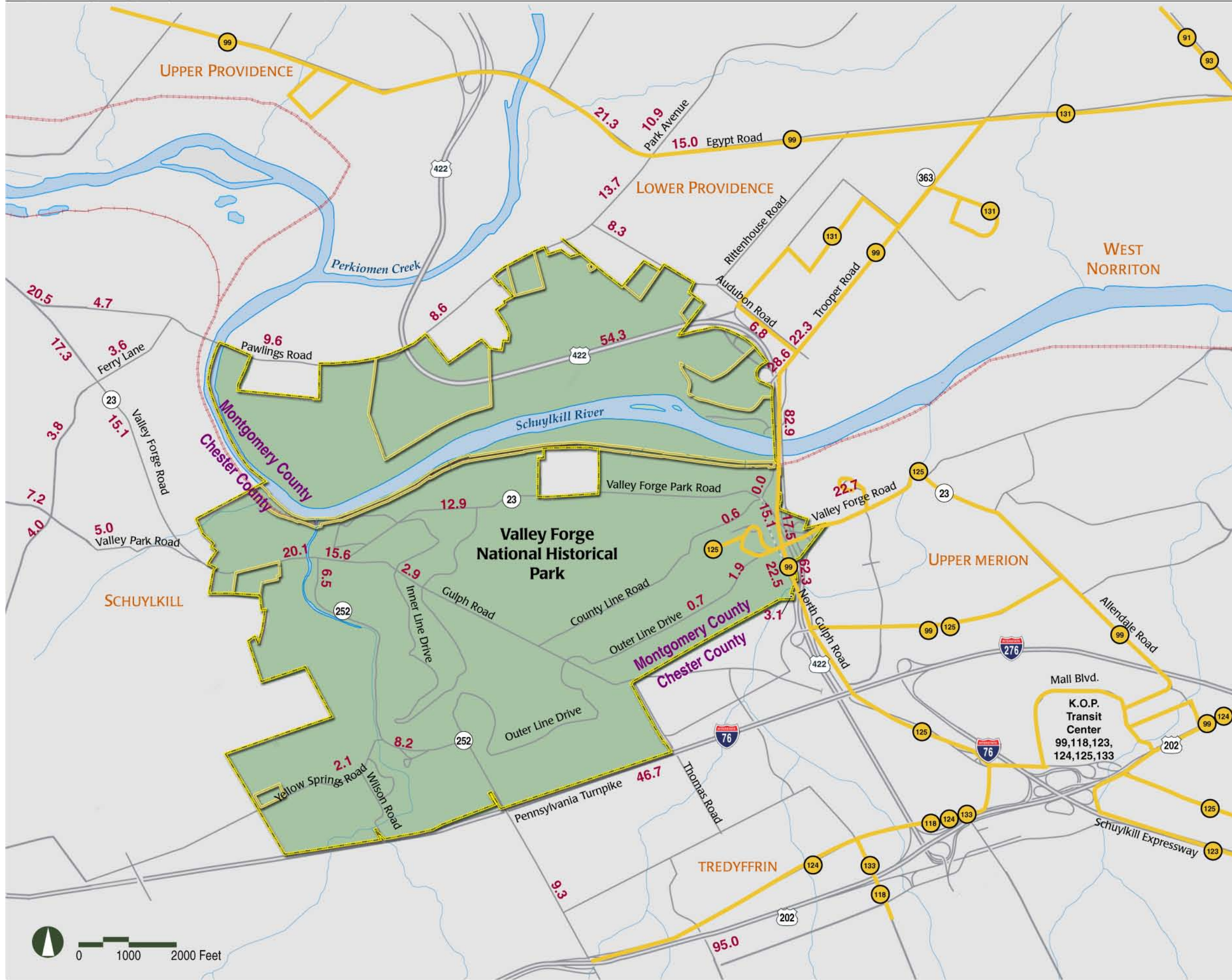
### 3.7.2 Existing Average Annual Daily Traffic Volumes

Existing daily traffic volumes, obtained from the DVRPC, were collected from traffic counts taken on the surrounding highway network between 2001 and 2004. DVRPC is the Metropolitan Planning Organization responsible for traffic analysis and projections for major transportation planning in this region. Figure 3-8 identifies volumes expressed as AADT. Over 75 locations were counted. Additional peak period intersection turning movement traffic counts were taken to supplement the Automatic Traffic Recorder (ATR) counters. Table 3-11 also shows the current AADT volumes for the roadways within the sphere of influence of this study.

**Table 3-11 Current Average Annual Daily Traffic Volumes**

Road	From	To	Current Traffic Counts (2002)
PA Route 23	Pawlings Road	Ferry Lane	17,300
PA Route 23	Ferry Lane	Valley Park Road	15,100
PA Route 23	Valley Park Road	PA Route 252	20,100
PA Route 23	PA Route 252	Gulph Road	15,600
PA Route 23	Gulph Road	Old Betzwood Bridge	12,900
PA Route 23	Old Betzwood Bridge	Outer Line Drive	15,100
PA Route 23	N. Gulph Road	West of US 422	17,500
PA Route 23	East of US 422	Moore Road	22,700
PA Route 252	PA Route 23	Yellow Springs Road	6,500
PA Route 252	Yellow Springs Road	PA Turnpike (I-76)	8,200
PA Route 252	PA Turnpike (I-76)	Walker Road	9,300
Pawlings Road	PA Route 23	Ferry Lane	4,700
Pawlings Road	Ferry Lane	US 422	9,600
Pawlings Road	US 422	Audubon Road	8,600
Pawlings Road	Audubon Road	Egypt Rd	13,700
Gulph Road	PA Route 23	County Line Road	2,900
Outer Line Drive	Welcome Center	Gulph Road	700
Outer Line Drive	Welcome Center	PA Route 23	1,900

Source: DVRPC 2005



- Park Boundary
- Inholdings
- 00.0 Current AADT (2002) (In Thousands)
- SEPTA Bus Route
- K.O.P. (King of Prussia) Transit Center



**Figure 3-8**  
Existing Transportation Network and  
Average Annual Daily Traffic (AADT) Volumes





### 3.7.3 Existing Intersection Levels of Service

Table 3-12 highlights the current Levels of Service (LOS) for the relevant signalized intersections in the traffic and transportation study area. These levels of service were developed using the procedures outlined by FHWA in the Highway Capacity Manual 2000 (HCM 2000).

**Table 3-12 Signalized Intersection Level of Service at Key Locations**

Intersection	AM Peak LOS	PM Peak LOS
<b>Valley Forge Road (SR 0023) at:</b>		
Valley Creek Road (SR 0252)	E	E
North Gulph Road (SR 3039)	E	E
US 422 Eastbound off/on-ramps	E	D
Moore Road	C	D
<b>Egypt Road (SR 4002) at:</b>		
Pawlings/Park Road (SR 4004)	E	F
Trooper Road (PA Route 363)	D	C
<b>Trooper Road (SR 0363) at:</b>		
Audubon Road	F	F

An LOS of D or better is desirable in traditional transportation planning initiatives. The LOS at many locations on state highways in and around the park is worse than LOS D. The AM and PM peak period LOS at every signalized intersection on PA Route 23 within the park is E or F. DVRPC projects that the traffic volumes will continue to increase over time with changes in employment, population, and development projections through the transportation Design Year 2030.

### 3.7.4 Transit and Freight Facilities

Figure 3-8 also shows the mass transit network that serves the study area. While not currently served by rail transit, the park and the surrounding study area are served by a variety of transit routes, which lead both to central Philadelphia and across the region. The SEPTA bus routes operating within the study area include: Routes 99, 118, 123, 124, 125, 131, and 133. All of these routes stop at the King of Prussia Transportation Center except Route 131. Route 125 stops at the park Welcome Center and is the only transit service that currently provides direct access to the park.

The Residential Rambler, operated by the Upper Merion Transportation Authority, also provides bus service near the park. The Suburban Link provides small bus service between Upper Merion, Collegeville, and Phoenixville and uses PA Route 23 as it passes through the park.

The Norfolk & Southern Railroad is a freight line through the park on the south side of the Schuylkill River. This corridor is being considered for a new 62-mile transit system between Reading and Philadelphia called the SVM. The proposal, currently being evaluated in a separate environmental impact statement, may also reduce Design Year 2030 No-Action traffic volumes by 1% to 2% in the Valley Forge area. This long-term transit improvement program has an added potential benefit in that there may be an opportunity for off peak period stops at the park to provide additional service beyond the current Route 125 bus line.



### **3.7.5 Trails**

In addition to transit, a network of bicycle and pedestrian trails pass through the park and the study area (see Section 3.5.12: Regional Recreational Facilities and Use and Figure 3-6 for details). Fostered primarily by county planning initiatives, the trails now make up a comprehensive network used by a substantial number of local residents and regional visitors.

### **3.7.6 Parking Facilities**

An assessment of the existing parking facilities in the park was completed in June/July 2002 to determine the existing capacity and current utilization of each lot. Figure 3-9 shows the approximate location of each lot in the vicinity of the park and number of available parking spaces in each facility. The parking lot designation numbers are for ease of reference only.

There are almost 2,560 parking spaces available in the park. The utilization of all parking lots range from 225 (9%) to 483 (19%). The largest parking lot (#1) holds 488 vehicles and had an average of 111 vehicles on Saturday, June 8, 2002. The maximum number of cars identified in Lot #1 was 125 for 26% utilization.

Lot #2, an 80-space parking area, has a much higher utilization. On average, approximately 50 vehicles were consistently parked at this location. Utilization of this lot is approximately 62%.

Other notable lots include locations #23, #24, and #25 in the Betzwood picnic area. Lots #23 and #24 were both over capacity on June 8, 2002, and vehicles were parked on the grass areas in the vicinity of the lots.

In addition to the lots identified in Figure 3-9, there are several remote parking areas outside of the park that could be used to shuttle visitors to the site from outside. These include the South Gulph Road Park & Ride and the Matsonford Road Park & Ride. Others could include King of Prussia Mall and SEPTA regional rail stations.

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## **3.8 Park Operations and Facilities**

Most of the land that is now Valley Forge NHP was formerly part of the first state park in Pennsylvania. The national historical park was designated in 1976, with a larger Congressionally authorized boundary. Newer acquisitions were primarily farm land with residential structures and barns. In almost every case, the facilities, roads, buildings, and utilities currently used for park operations and by the visiting public were in use while the area was a state park. Few additions or changes have been made during the ensuing 29 years of NPS operation.

### **3.8.1 Operational and Support Facilities**

The park infrastructure includes facilities necessary for the daily support of park operations. Operational activities are conducted from seven locations.

The administration and management team is located in one building in the Welcome Center complex. The building lacks sufficient space to accommodate current office needs. Its original heating, ventilation, and air conditioning (HVAC) systems are highly inefficient and no longer can be properly maintained.





**Figure 3-9**  
Existing Parking and Capacity







The maintenance complex comprises a main building and five out buildings. With the exception of a frame addition added to the main building to provide office space and a woodshop, all were in use by the state park for many years, with most dating to the early 1900s. The complex is located within a former quarry that was used as a disposal site for asbestos-containing materials in the late 1800s, and is within the park Asbestos Release Site. Staff have been and could continue to be exposed to asbestos.

There are a number of challenges to continued use of the collection of buildings as the primary location for maintenance operations. The complex is too small for current maintenance needs, and there is no room for expansion. The HVAC systems are old and inefficient. Some workspaces are in old frame buildings that cannot be winterized. Restrooms for employees are inadequate. Any ground-disturbing activity either for infrastructure repairs or for expansion would disturb buried asbestos, greatly increasing the risks and costs.

In addition to the two complexes, five other buildings are used to provide office space to various functions. All are located within historic structures that were built as residences. These structures require continued system upgrades to meet electrical capacity needs, telephone and computer service, and building code issues.

The Ranger Station, located in the encampment-period Mordecai Moore House, provides office space for visitor protection functions, including a 24-hour dispatch center/visitor contact station. Approximately 20 personnel work out of the building, taxing restroom facilities, parking, and overall building condition. The garage is used for vehicle parking, other storage, and the physical fitness facility.

The 18th/19th century Philander C. Knox mansion is used as office space for some staff and for the Friends of Valley Forge NHP. The park's Horace Willcox library also is located there. The 18th century Maurice Stephens House also is used for offices. All historic houses are deteriorated and inefficient to heat and cool.

The interpretive function maintains office space at both the park Welcome Center and the Interpretative Field Office (IFO). The IFO is located in the Dewees Barn near Washington's Headquarters. The historic structure is too small for this function, has outdated and inadequate HVAC, and an electrical system that does not meet current safety codes. Expansion to the structure is not possible due to its historical status and location within the cultural landscape of the headquarters.

The Welcome Center was under construction when the state park was transferred to NPS management in 1977. Most utilities and services are adequate, although the systems are at the end of their functional lives, and require constant maintenance and parts replacement to function well. The elevator, which is necessary for people with physical handicaps to reach the auditorium, no longer meets code. In addition to housing the museum and park bookstore (the Encampment Store), the structure provides office space for park personnel and the staff of the store. The building also provides curatorial storage for some of the park's artifact collection (see Section 3.3.4: Archives and Collections).

The park maintains approximately 28 historic structures as quarters for park staff. All of these structures were originally built to be homes and serve well as housing; however, all are in need of routine maintenance and in some cases major repair if continued use is desired.

### **3.8.2 Public Use Facilities**

The park provides a variety of facilities to support public use and enjoyment. With the exception of the Welcome Center and the Schuylkill River National Recreation Trail, all of the public use facilities existed and were in use when the area was a state park. The Welcome Center's interior was rehabilitated in 2002, but the majority of public use facilities are dated and in need of some improvement.

As noted above, the Welcome Center was still under construction when the state park was transferred to NPS management in 1977. Renovations in 2002 comprised a complete replacement of the interpretive displays, the information areas, and the bookstore. A major cosmetic upgrade included new carpet, paint, refinished floors, "wrapping" the exterior mirror glass with historical images, and plantings. While most utilities and services are adequate, they require constant maintenance and parts replacement to function.

Other public use facilities include three picnic areas at Betzwood, Wayne's Woods, and Varnum's. The Betzwood area includes boat launch access to the Schuylkill River, access to an unpaved three-mile trail that runs along the river to the Pawlings Area, and access to the Schuylkill River National Recreation Trail, which runs from Philadelphia to Collegeville. The park also provides an extensive network of trails south of the river including a paved 6.5-mile loop trail designed to encourage visitation to the major historic sites by foot and bicycle. In all, there are 27 miles of designated trails (see Figure 3-6 and Section 3.5.12: Regional Recreational Facilities and Use). The park maintains a tour road system composed of two one-way road loops and a series of parking lots (see Section 3.7: Transportation and Site Access and Figure 3-9).

A theater is located in a separate building, erected by the commonwealth in the 1960s. A research library is located at the Philander C. Knox mansion, open to the public by appointment.

### **3.8.3 Operational Funding and Staffing**

All functions have been operating with declining numbers of staff as well as inadequate funding for non-personnel costs. After adjusting for inflation, the park's base budget has declined 11.5% since 1985. In 2005, the park staff included 69 FTE with an operational budget of \$5,829,965.

In the summer of 2005, the park participated in the NPS Business Plan Initiative, a joint effort between the NPS and the NPCA to enable parks to assess and more clearly communicate their financial status to principal stakeholders. It was projected that an additional 9.3 FTE would be required in order to optimally run all operations. This relatively low number is feasible only because of an increasing reliance on partnerships.

### **3.8.4 Partnerships**

The park depends on many able partners to share in carrying out the mission of education and preservation.

#### **The Encampment Store**

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The Encampment Store operates as the park's retail and programmatic partner under a Cooperating Association agreement with the park. Cooperating associations are

private, nonprofit corporations established under state law. They support educational, scientific, historical, and interpretive services of the parks.

The Encampment Store operates as an extension of the park's efforts primarily in the areas of enhanced programming and visitor services, ranging from assisting with the operation of guided trolley tours to developing special educational products to complement the interpretation in the park. In addition, the store donates 10% of gross revenue back to the park to use as appropriate.

### **The Friends of Valley Forge NHP**

This group provides support, services, and donations of artifacts, educational materials, and funds to support many park projects, and they take part in their planning and implementation. The group funds re-enactment groups for events, and members come out and provide ambience and refreshments for major events.

### **The Valley Forge Park Interpretive Association**

This group formed as a cooperating association at the time the national historical park was established in order to promote and provide funds for educational and interpretive programming. In the past the association has supported the Muster Roll project, the Student Conservation Association program, and the Living History program among many other park projects. As of this writing, the association is considering its future partnership role.

### **Valley Forge Partners' Council**

In 2006, four current park partners have come together to plan how they might cooperate on a formal basis to help the park meet its mission. The goals of the coalition to date are to

- create an informed, engaged community actively involved in supporting the park
- build the financial base of non-federal funds to deliver direct support to park programs and projects
- advocate in support of the mission of Valley Forge NHP

The partners – the Valley Forge Historical Society (American Revolution Center), the Valley Forge Park Interpretive Association, the Friends of Valley Forge, and the Encampment Store – continue to explore alternatives for future organization structures to enable them to jointly meet these goals.

### **Site Volunteers**

Site volunteers perform many functions at Valley Forge NHP.

- Volunteers assist at the park Welcome Center to provide visitors with orientation to the park and current programs. They aid out-of-town visitors with local directions and recommendations. They assist in setting up and taking down large events, and in distributing literature.
- Volunteers assist interpretive staff at the park's living history sites. They study history and dress in accurate period costume to enhance the historical scene and provide one-on-one and group interpretation. They help to staff Washington's Headquarters and Varnum's Quarters, participate in soldier



Interpretive volunteers, such as these who portray the roles of women and children during encampment, enliven the park.





Citizens view themselves as stewards of Valley Forge NHP. Hundreds of dedicated volunteers provide service to the park, even working in the rain.

life demonstrations, run the bake oven at Muhlenberg's Brigade, fill out artillery crews, and participate in all major events.

- Curatorial volunteers assist with cataloguing, photography, and yearly inventories, as well as moving, cleaning, and properly storing the artifacts in the park's collection.
- Library volunteers repair and catalog books, make database entries, and assist researchers to locate materials.
- Archeology volunteers provide the muscle when a dig is taking place.
- Administrative volunteers assist with paper work and keeping systems up to date. They also assist at the reception desk and answer phones during lunch breaks.
- Natural resource volunteers assist with projects such as monitoring the white-tailed deer exclosures; performing mammal, bird, amphibian, and other inventories; trails work; exotic invasive vine eradication; and the installation of the riparian buffer along Valley Creek.
- Many Eagle Scouts perform their service projects at the park, donating more than 150 hours of volunteer time for each project. Projects have included maintenance and repainting of outdoor cannon, trail work, landscaping, and removal of exotic invasive plants.

### Service Organizations

There are many service organizations that also support park operations.

- The *Telecom Pioneers, Chapter 6* (formerly the Bell Telephone Pioneers of America) is a volunteer group that has participated in many projects for over 25 years. Volunteers have donated, planted, and cared for trees in the park; performed general grounds maintenance; funded the lighting of the National Memorial Arch; installed TDD in the Welcome Center and a hearing aid loop in the Theater; and provided numerous other services.
- Volunteers from the *Lockheed Martin Corporation's NOVA program* take on such projects as repairs to the park's huts, mulching trees, trimming shrubs, and planting wild flowers. NOVA was also instrumental in developing and maintaining the Muster Roll of soldiers present at the encampment by developing software and providing data input for the system now available at the Welcome Center and on the Internet.
- The *Delta Sigma Theta Sorority* is an organization of professional educators, one of whose missions is to ensure greater understanding of the valuable participation of patriots of African descent in winning the country's independence. The organization was the driving force in placing the Patriots of African Descent monument in the park. They fund its maintenance and hold a remembrance ceremony at the monument every June.
- The *Rotary Club of Wayne, Pennsylvania*, facilitated by Earnest Eadeh and additional community volunteers, including the local chapter of the Penn State University Alumni Association, Wayne Rotary, and Prudential Fox & Roach Realtors, have undertaken rehabilitation projects on numerous historic buildings in the park. Most recently, they have taken on a multi-year maintenance project for historic buildings, donating labor and materials for the rehabilitation of eight buildings to date.

- The ***Rotary Club of King of Prussia, Pennsylvania*** conducts an annual project to replace roof shakes on huts.
- The ***Grand Lodge of Free and Accepted Masons of Pennsylvania*** funded the stabilization and preservation of the National Memorial Arch and photogrammetric recording of the arch for the Historic American Buildings Survey, and play an ongoing role in the arch's maintenance.
- The ***Boy Scouts of America, Cradle of Liberty Chapter*** sponsors the "oldest continuous scout event in the United States:" the annual scout encampment during Presidents' Weekend. The park and the scouts work together on programs for the approximately 2,000 scouts who participate.

### Natural Resources Organizations

- The park works with the ***PA Fish & Boat Commission*** as co-trustees in administering a grant program for restoration of the Valley Creek watershed. Funds for grants are provided from the judgments against former polluters of the creek. The Valley Creek Restoration Partnership, comprising watershed municipalities and conservation organizations, implements restoration projects using this money as seed for outside grants.
- The ***Valley Forge Chapter of Trout Unlimited*** formed to protect and improve the waters of Valley Creek. The organization provides manpower, expertise, and information for issues and projects on the creek and in the watershed, and acts as a respected advocate for protection.
- The ***Valley Creek Restoration Partnership*** formed to implement the recommendations of the Valley Creek Restoration Plan. The partnership comprises regional environmental groups, with advisory participation from the park; federal, state, and local governments; and universities.



Volunteers devoted many weekends to establishing a riparian buffer along the banks of Valley Creek, a project that would not have been accomplished without this service.

### Historical Interest Groups

- The ***Patriotic Order of Sons of America*** (P.O.S. of A) promotes patriotism and remembrance of our founding fathers. They lease the P.O.S. of A. building on Horseshoe Trail from the park, and maintain it under a special-use permit. Each year at their annual picnic, they present the park superintendent with a year's supply of flags for each of our flagpoles. The order recently funded major repairs on the park's Rogers building.
- The ***Pennsylvania Society, Sons of the Revolution*** promotes patriotism and remembrance of our founding fathers. They own the park's orientation film and have funded each edit and improvement. They also lend furnishings for Varnum's Quarters, and until the remodeling of the Welcome Center, the Rembrandt Peale portrait of George Washington.
- The ***Pastorius Unit #38 of Philadelphia, Steuben Society of America*** donated the funds to repair the plaza at the von Steuben monument as well as construction of a universally-accessible ramp. The society also has contributed funds to replacement of the audio unit at the plaza.
- The ***Women's Auxiliary of the German Society of Pennsylvania*** made a matching donation toward replacement of the audio unit at the von Steuben monument plaza.
- The ***National Society of the Children of the American Revolution*** contributes to the development of educational materials for children.

- The *Council of American Revolution Sites* promotes better understanding and appreciation for the American Revolution and fosters cooperation among Philadelphia area Revolutionary War sites via meetings, exhibits, programs, research, and publications.

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### **Washington Memorial Chapel**

This historic church is adjacent to the park and preserves artifacts and stained-glass windows commemorating General Washington and the encampment. The church cooperates with the park and the American Revolution Center on the regularly scheduled interpretive bus tour.

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### **Military Re-enactment Units**

Of the many units that participate in the park's special events to tell the story of the Revolution through living history, the 1st Continental Regiment, the 2nd Pennsylvania Regiment, and the 6th Pennsylvania Regiment are longstanding regulars.

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### **The Schuylkill Valley National Heritage Corridor**

This group manages the corridor and promotes cultural and natural preservation, recreation, interpretation, and heritage-related economic development. The corridor and the park cooperate on interpretive, signage, and natural restoration initiatives.

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### **Valley Forge Convention and Visitors Bureau**

The bureau promotes the region and the park as a visitor destination and assists the park with promoting park-sponsored events. The bureau staffs a desk at the park Welcome Center to help visitors with local hotel reservations. This convenience provides a welcome sense of security for out-of-town visitors.

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### **National Preservation Organizations**

The NPCA, the National Trust for Historic Preservation, the Save America's Treasures Program, and many others provide assistance, guidance, and expertise to the park. Their experience and assistance are important to the park's ability to ensure that its actions are appropriate and in the best interests of long-term preservation of its resources.

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### **Local Government**

The park cooperates with the five townships for important services such as fire protection, ambulance service, water and sewer, and law enforcement. Chester and Montgomery Counties are partners with the park in trail and greenway projects. All are partners in a project to identify means to resolve area-wide traffic problems.

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### **State and Federal Government Partners**

The PA Historical and Museum Commission, the DEP, the PA Department of Conservation of Natural Resources, the PA Department of Transportation, U.S. Fish and Wildlife Service, EPA, U.S. Department of Public Health Federal Occupational Health Service, FHWA, and many others provide advice and consultation and cooperate with the park on special projects to conserve natural and cultural resources.