

**POLICY AND GOVERNANCE OF WATER RESOURCES IN  
THE NATIONAL PARK SYSTEM: A CASE STUDY OF  
FIRST STATE NATIONAL HISTORICAL PARK ALONG  
THE BRANDYWINE RIVER**

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# RESEARCH QUESTIONS

**How are water resources science and policies managed in watersheds in the National Park System?**

**How does water resources policies and management vary among Valley Forge, Harpers Ferry, and Minute Man National Historical Parks as compared to First State National Historical Park?**



# OUTLINE

1. National Park Service Overview
  2. First State National Historical Park
  3. Water Quality of First State National Historical Park
  4. Water Management and Policies of the National Park Service
  5. Comparative Analysis of Water Resources in Nat'l. Historical Parks
  6. Summary/Conclusions/Recommendations
- 



# 1. NATIONAL PARK SERVICE OVERVIEW

## Mission:

To preserve “the natural and cultural resources and values of the National Park System for the enjoyment, education, and inspiration of this and future generations.”

## NPS System:

417 sites, covering over 84 million acres/131,250 mi<sup>2</sup>  
At least 19 different designations



# 1. NATIONAL PARK SERVICE OVERVIEW

<b>Date</b>	<b>Act/Event</b>	<b>Description</b>
1872	Yellowstone National Park Act	Established Yellowstone as the country's first national park
1906	Antiquities Act	Allowed for the protection of lands containing historic landmarks, structures, or objects as national monuments
1916	National Park Service Organic Act	The National Park Service was established
2013	First State National Historical Park	The First State became Delaware's first unit in the National Park System.
2016	Centennial	The National Park Service celebrated its 100 <sup>th</sup> anniversary on August 25, 2016

## Historic Timeline of NPS



# 1. NATIONAL PARK SERVICE OVERVIEW

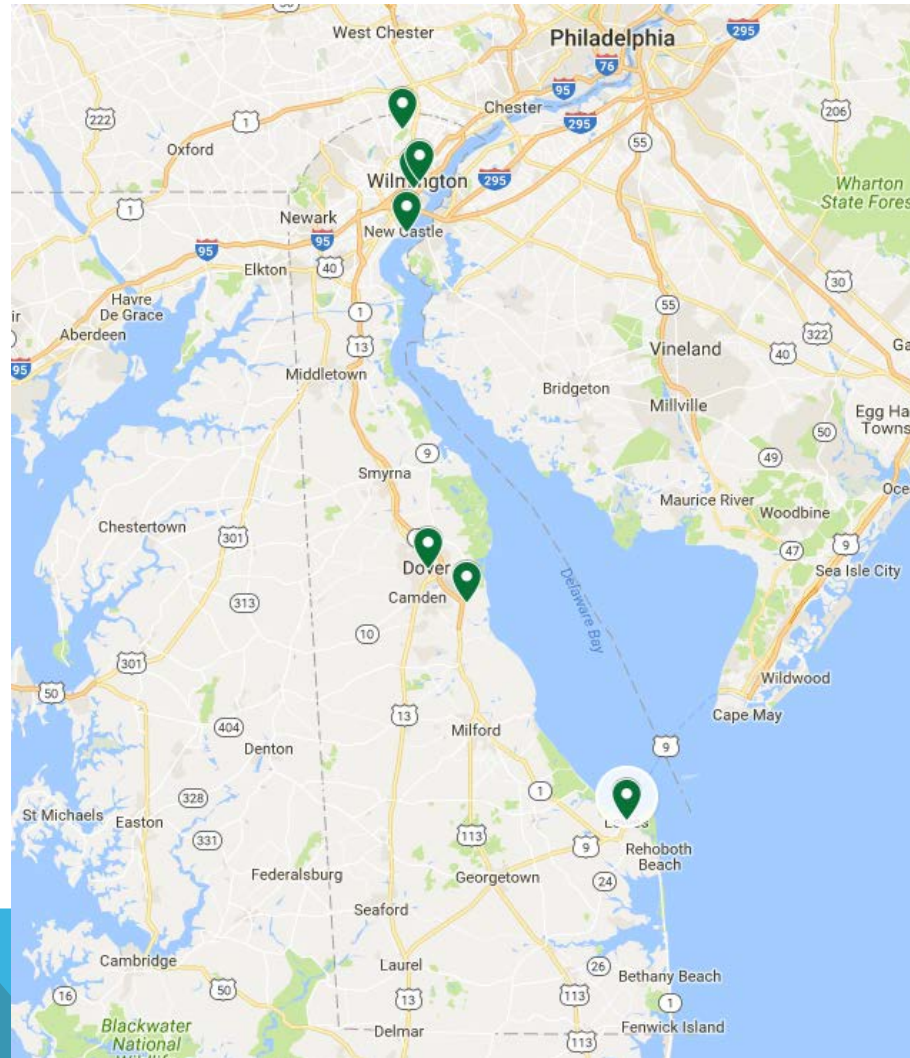
## Water Resources:

The Water Resources Division of the National Park Service's Natural Resource Stewardship and Science Directorate in Fort Collins, CO is authorized to manage 11,000 miles of coast, 2.5 million acres of ocean and Great Lakes waters, including coral reefs, kelp forests, glaciers, estuaries, beaches, wetlands, historic forts and shipwrecks, 100,000 miles of perennial rivers and streams, and over 2.3 million acres of lakes and reservoirs in the National Park System





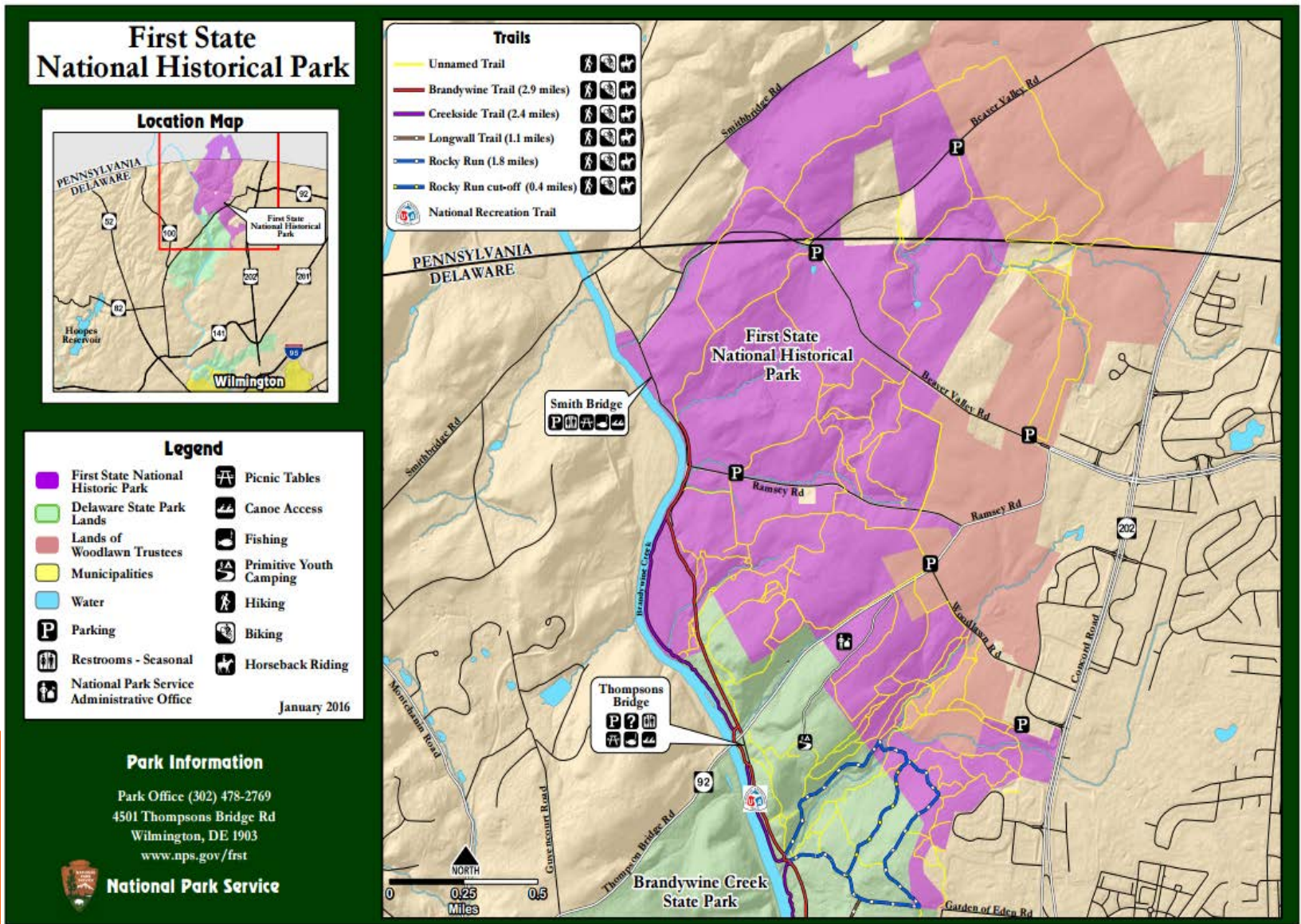
## 2. FIRST STATE NATIONAL HISTORICAL PARK



**7 units:** Beaver Valley (Wilmington), Fort Christina (Wilmington), Old Swedes Church (Wilmington), New Castle Court House, The Green (Dover), John Dickinson Plantation (Dover), and Ryves Holt House (Lewes)



# 2. FIRST STATE NATIONAL HISTORICAL PARK



Beaver Valley Unit: 1,100 acres (1.7 mi<sup>2</sup>)

Established: 2013 (National Monument), 2015 (Historical Park)



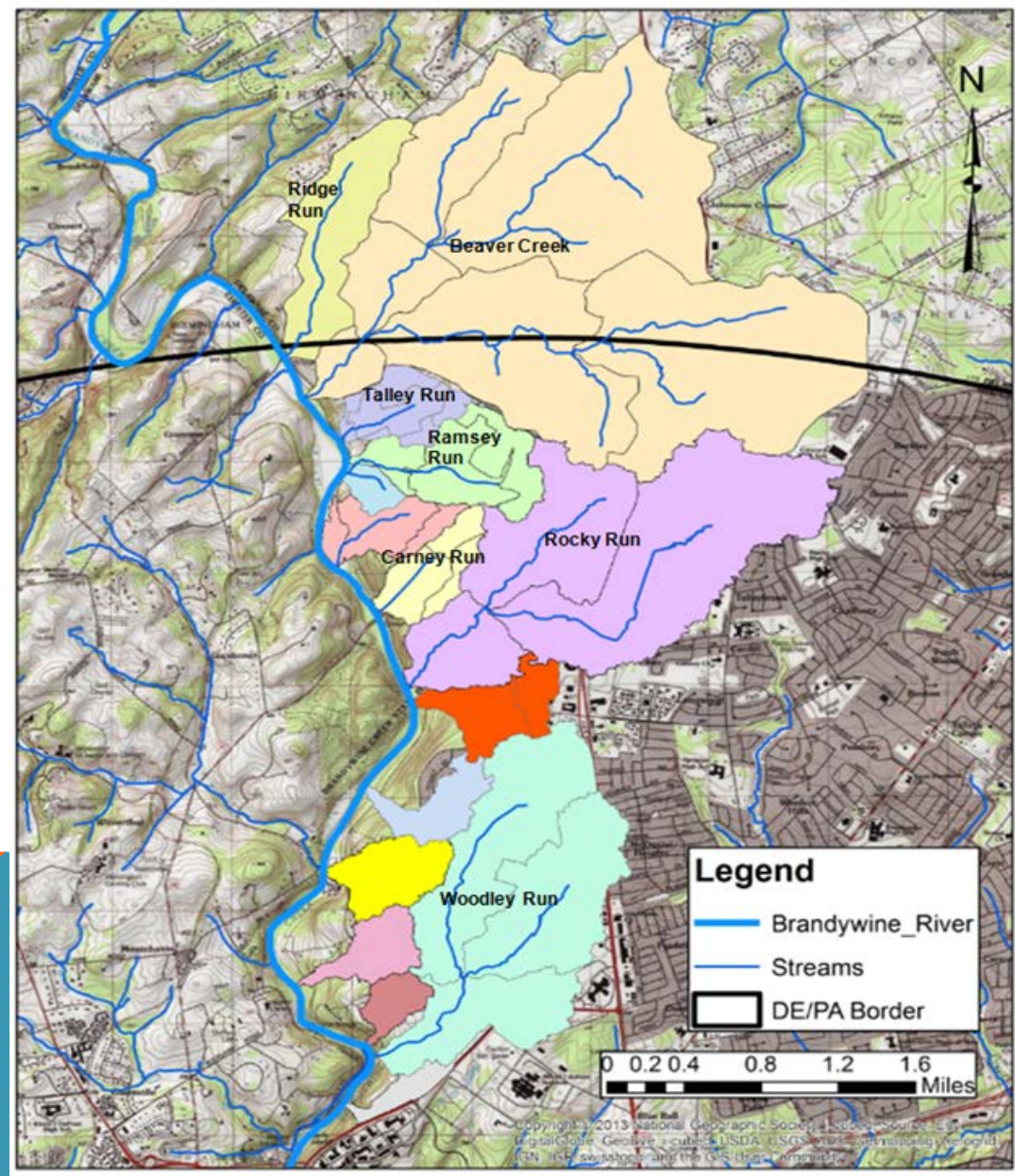


# 2. FIRST STATE NATIONAL HISTORICAL PARK

## HYDROLOGY

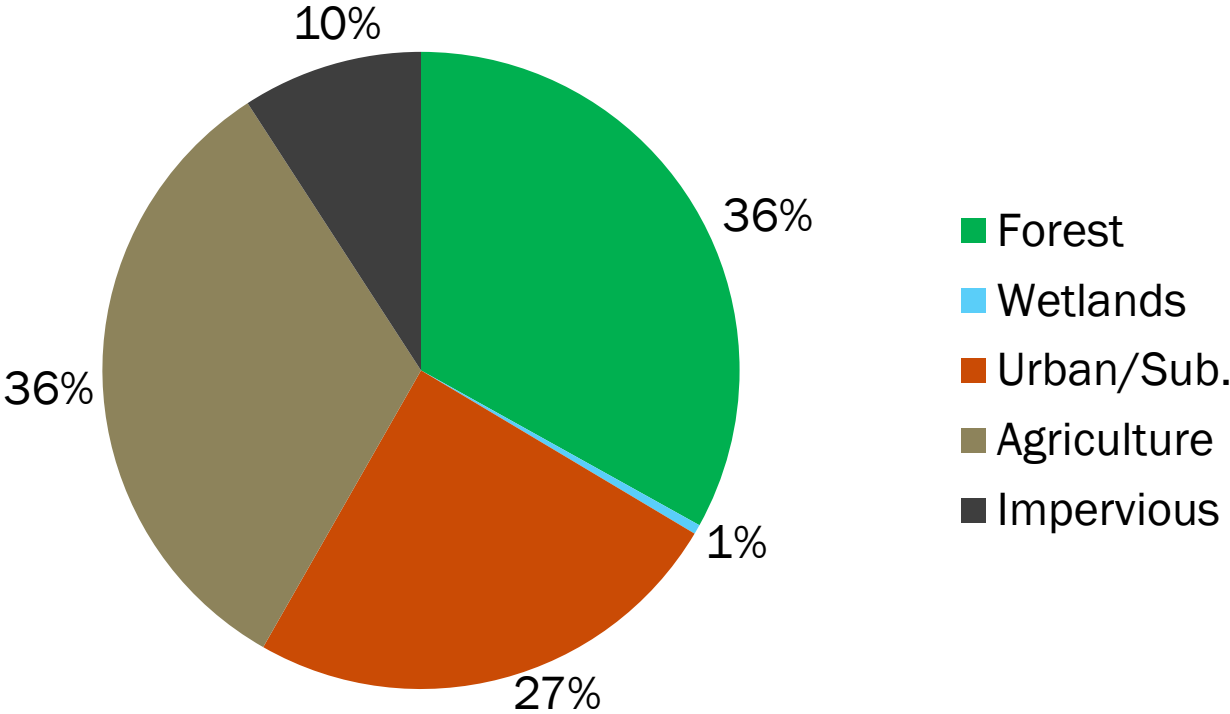
6 sub-watersheds of Brandywine Piedmont Watershed

Drainage Area: 4,485 acres/7 mi<sup>2</sup>



# 2. FIRST STATE NATIONAL HISTORICAL PARK

Total Land Use in the Brandywine Piedmont Watershed



36% forest, 1% wetlands, 27% urban/suburban, and 36% agriculture. Impervious cover 10%

**Most developed:** Rocky Run (19% imp. and 40% urban/sub.) and Beaver Creek (9% imp. and 28% urban/sub.).

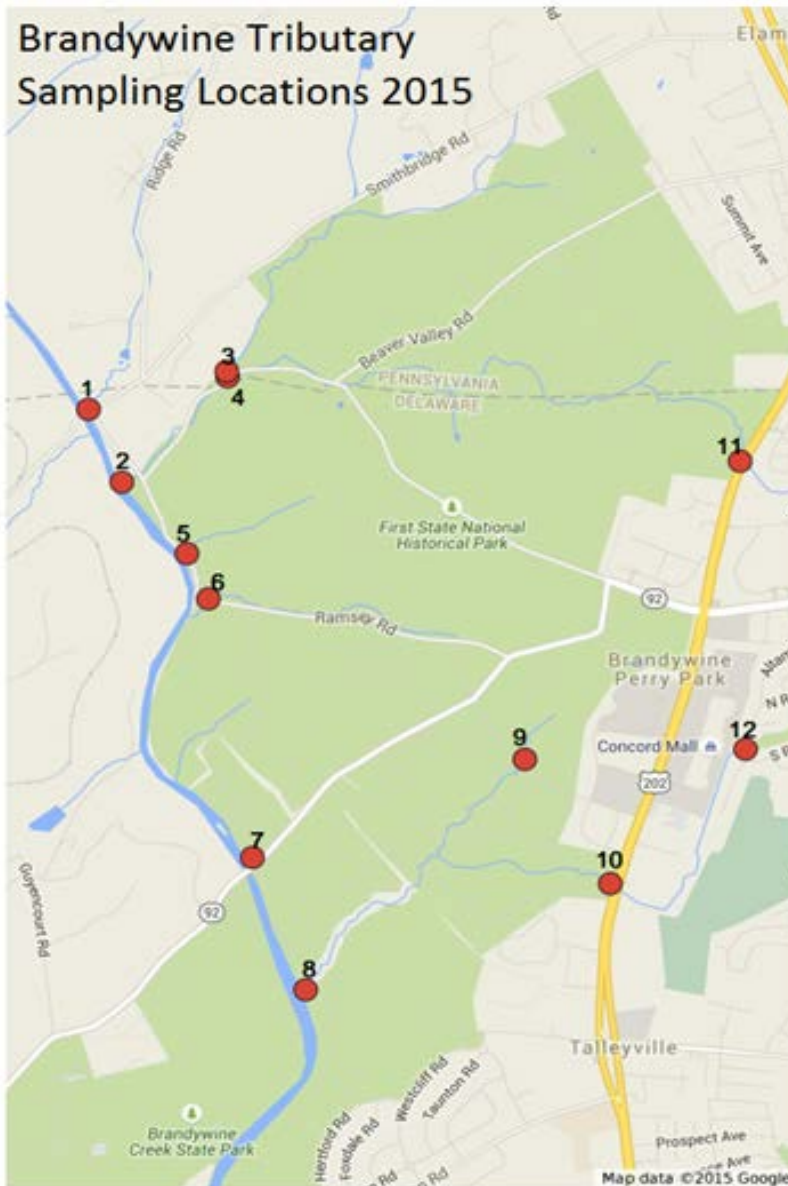
**Least Developed:** Ridge Run, Talley Run, Ramsey Run, and Carney Run



# 3. WATER QUALITY OF FIRST STATE NATIONAL HISTORICAL PARK

## Sampling Locations

- #1 Ridge Run
- #2 Beaver Creek Mouth
- #3 North Fork Beaver Run
- #4 South Fork Beaver Creek
- #5 Talley Run
- #6 Ramsey Run
- #7 Carney Run
- #8 Rocky Run Mouth
- #9 Hurricane Run
- #10 Rocky Run @ Rt 202
- #11 Beaver Creek @ Rt 202
- #12 Rocky Run Residential



## WATER QUALITY ANALYSIS

**When:**

Jun, Jul, Oct, Nov, Dec 2015  
Mar-Oct 2016

**Parameters tested:**

2015: pH, conductivity, water temp., turbidity, DO  
2016: conductivity, turbidity

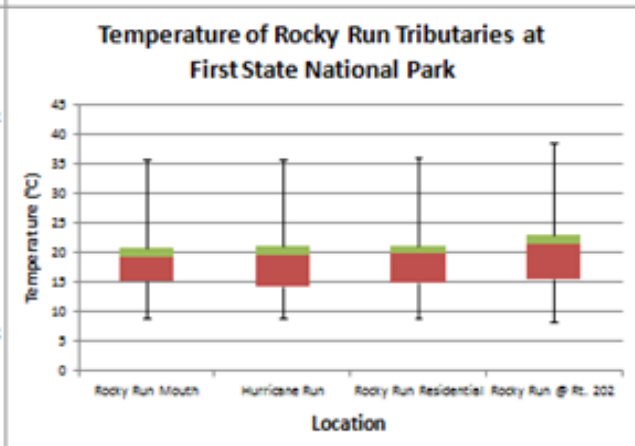
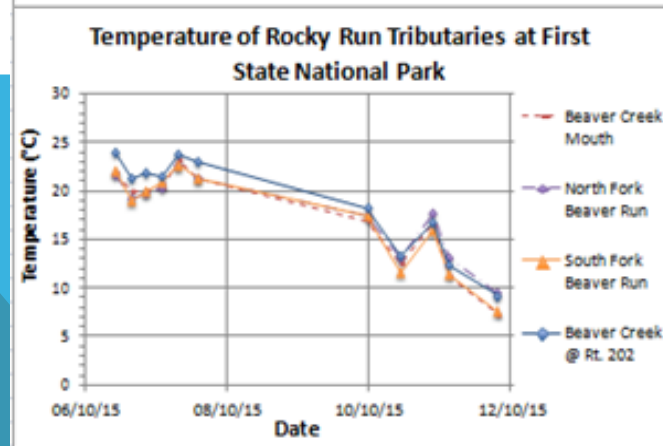
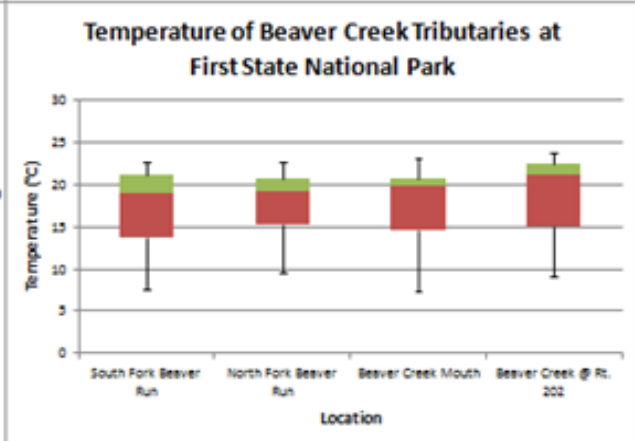
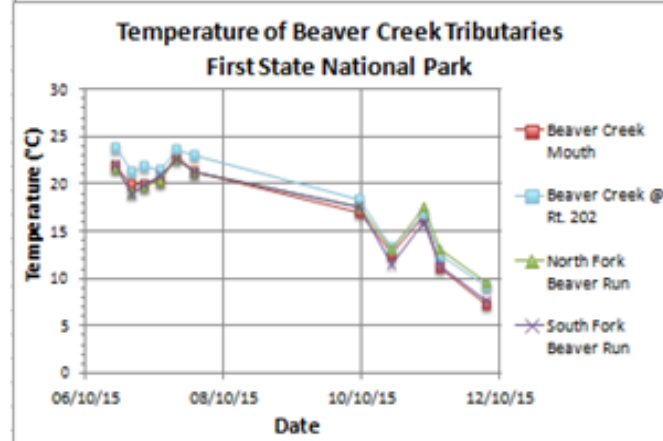
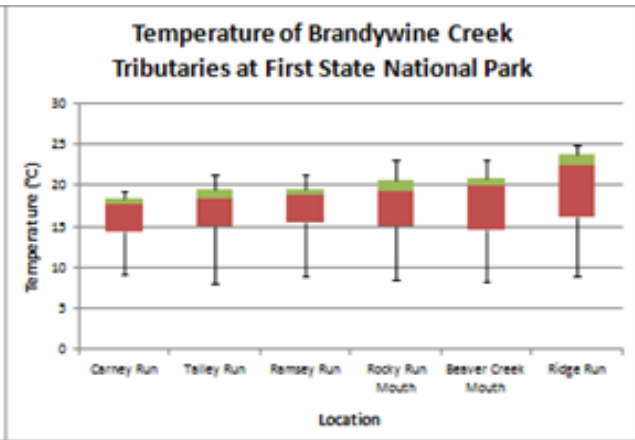
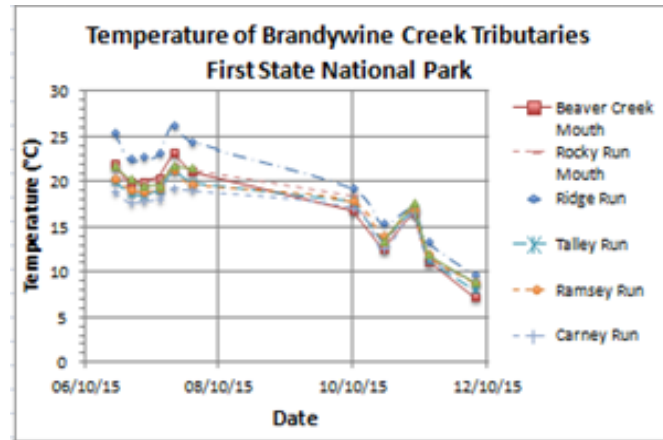


# 3. WATER QUALITY OF FIRST STATE NATIONAL HISTORICAL PARK

**Standard:**  
Max. daily temp.: 82°F  
(27°C)

All streams meet standard.

**Highest:**  
Ridge Run = 22.5°C  
(72.5°F)  
Rocky Run at Route 202 =  
21.5°C (70.7°F)



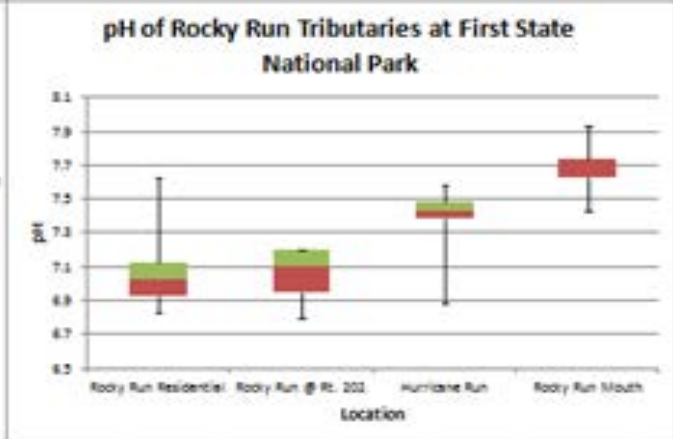
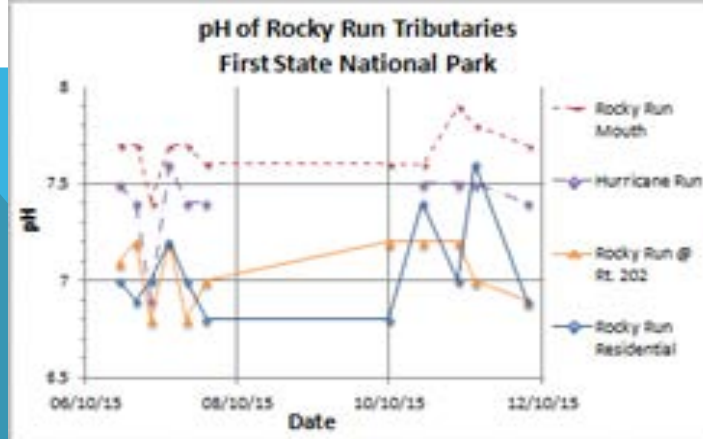
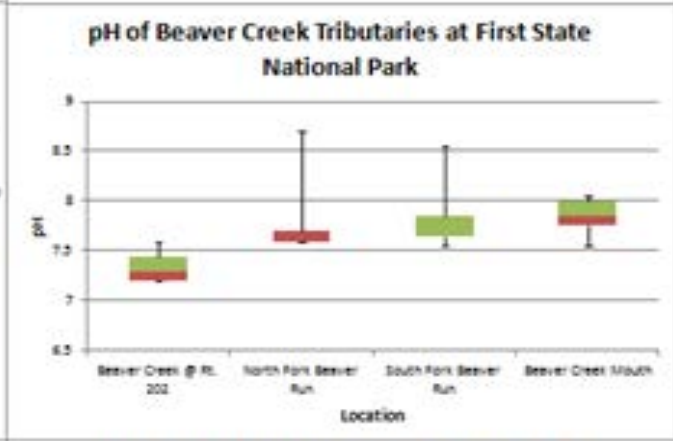
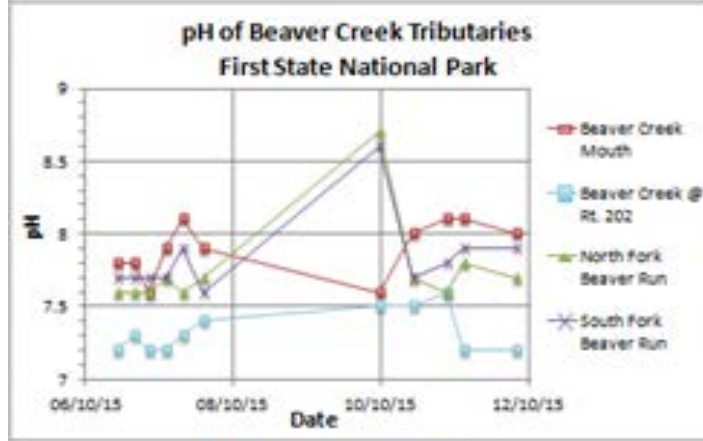
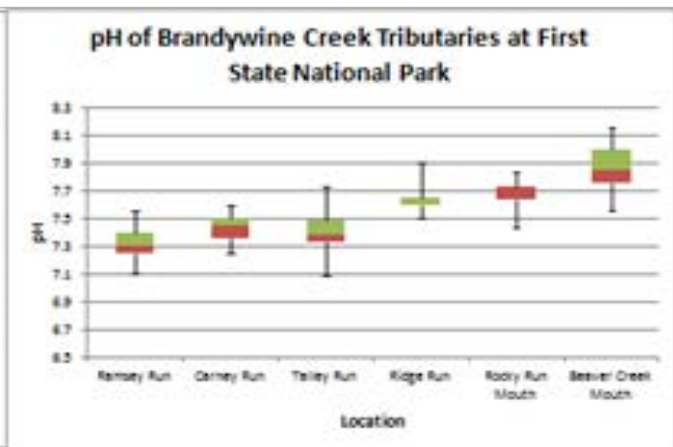
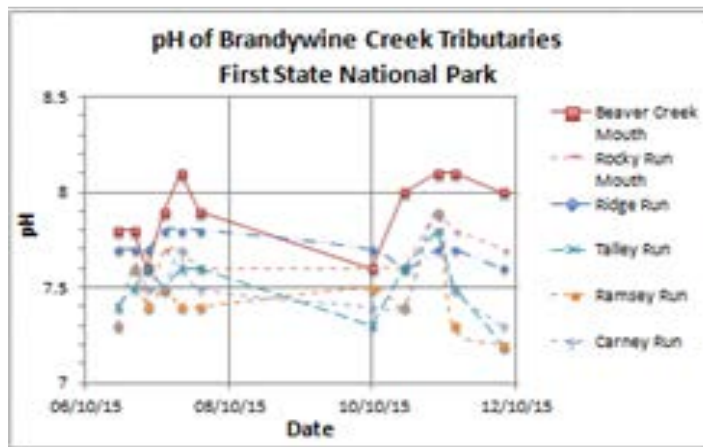
# 3. WATER QUALITY OF FIRST STATE NATIONAL HISTORICAL PARK

Standard: 6.5-8.5 pH

All streams meet standard.

Lowest: Rocky Run Residential (7.0 pH)

Highest: Beaver Creek Mouth (7.9 pH)





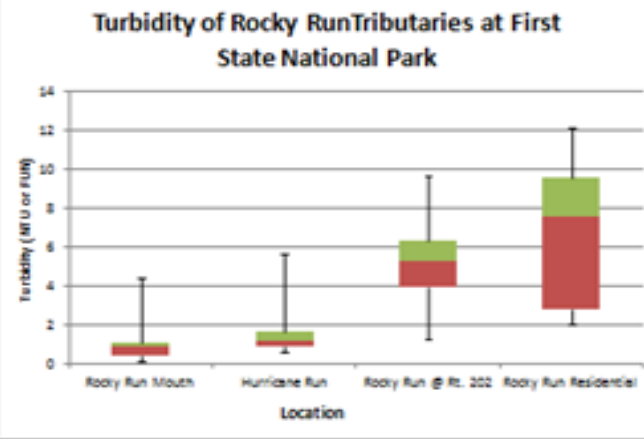
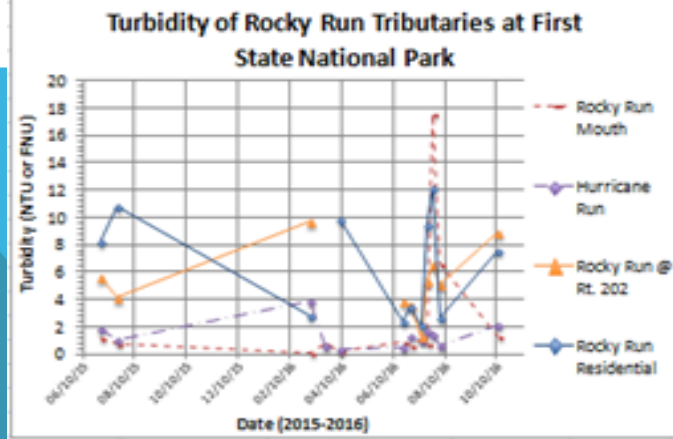
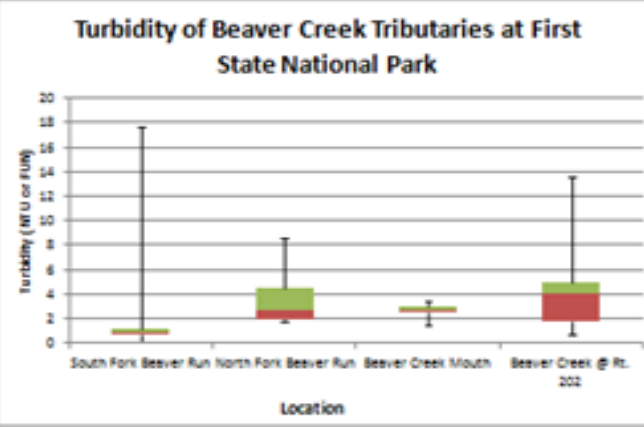
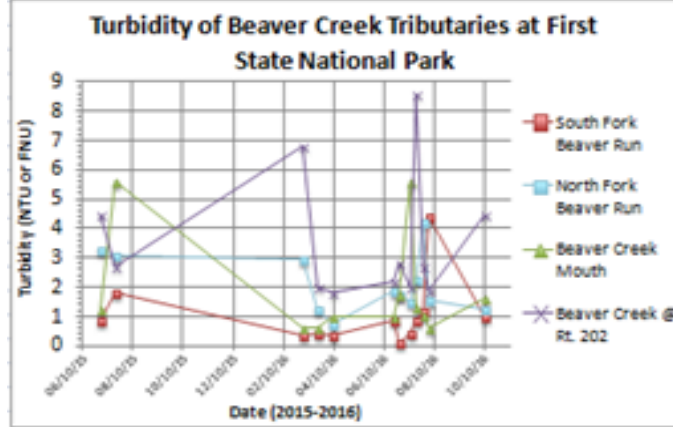
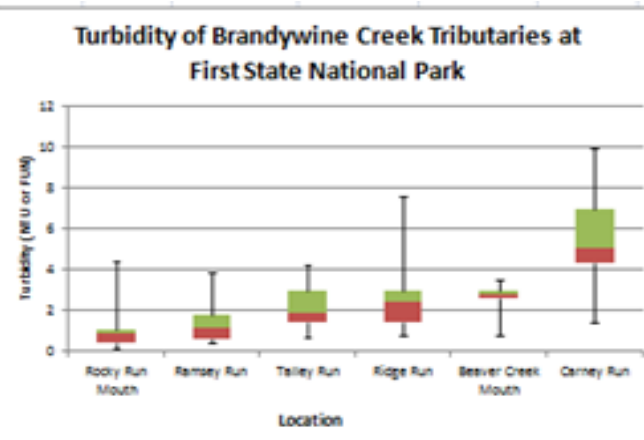
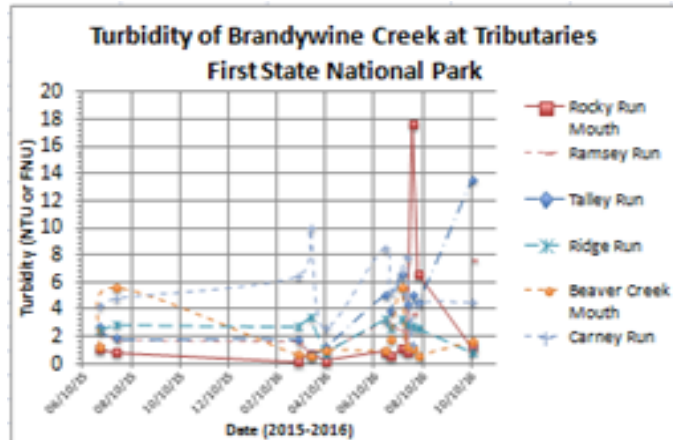
# 3. WATER QUALITY OF FIRST STATE NATIONAL HISTORICAL PARK

Standard: Max. 10 NTUs.

Highest:  
Rocky Run Residential= 7.53  
Route 202= 5.25

Lowest:  
Rocky Run Mouth= 0.847

Therefore, there is little concern for turbid water entering the Brandywine Creek





# 3. WATER QUALITY OF FIRST STATE NATIONAL HISTORICAL PARK

**Standard:** Min. 5.5 mg/L

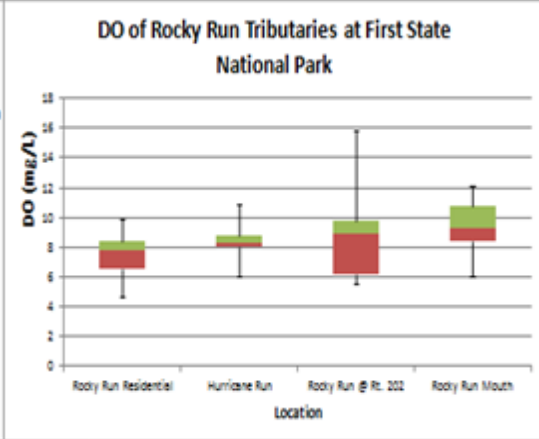
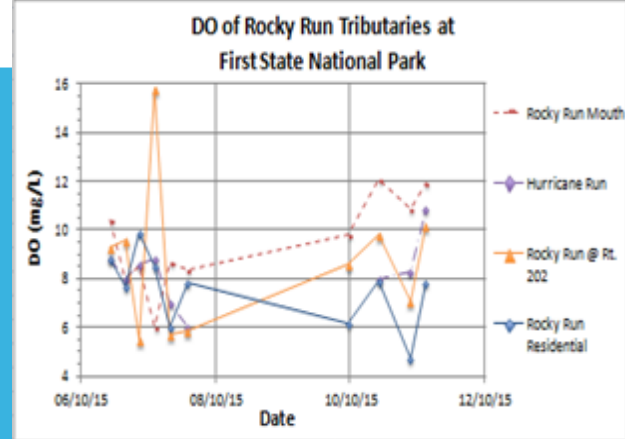
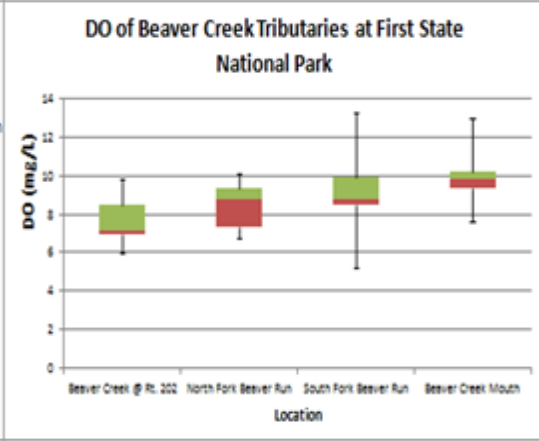
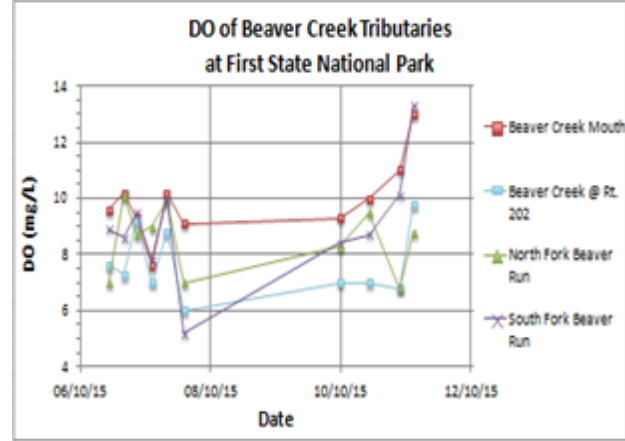
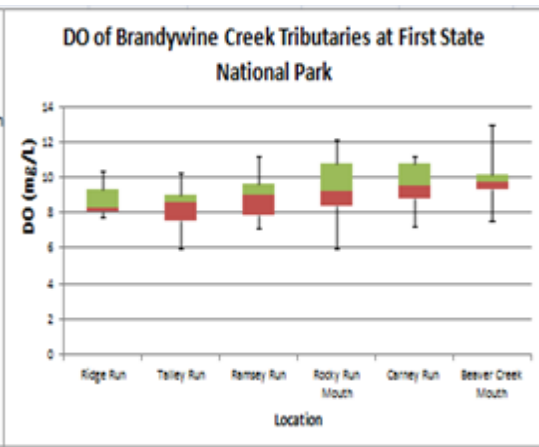
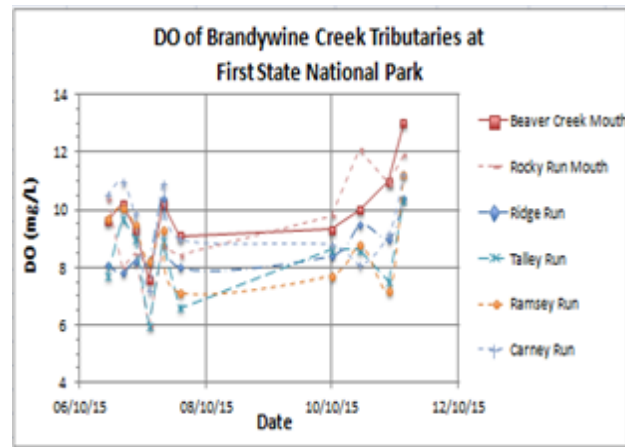
All streams meet this standard.

**Lowest:** Beaver Creek at Route 202=7.15 mg/L

**Highest:** Beaver Creek Mouth=9.8 mg/L

**Range:** 4.7-15.8

Rocky Run at Route 202 had three instances of coming within 0.2 mg/L of the standard in the month of July 2015, which may indicate an area of concern for the urban tributary but not for the Brandywine.





# 3. WATER QUALITY OF FIRST STATE NATIONAL HISTORICAL PARK

## Standard:

150 $\mu$ S-500 $\mu$ S (ideal)

50 $\mu$ S- 1500 $\mu$ S (normal range)

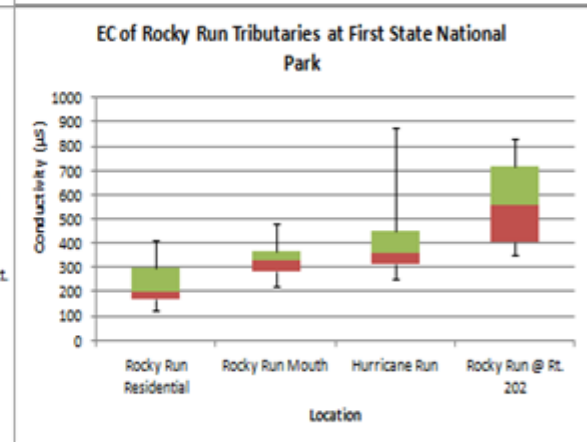
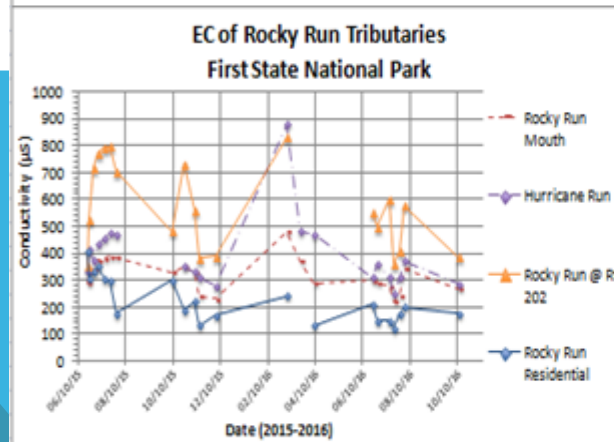
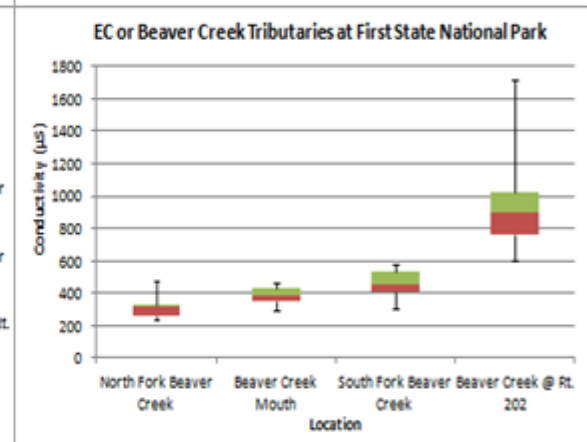
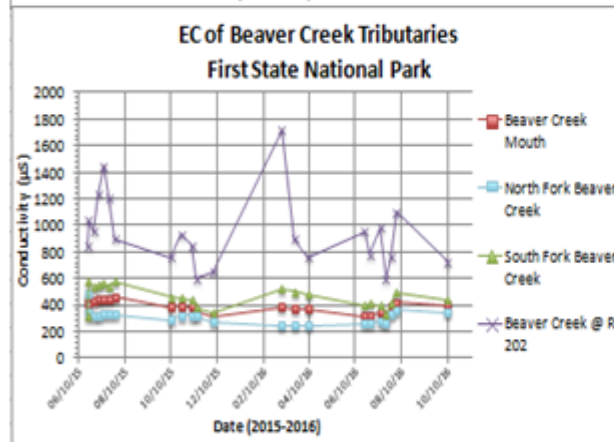
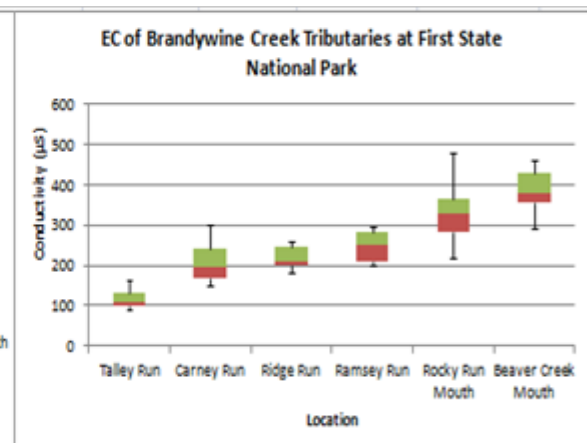
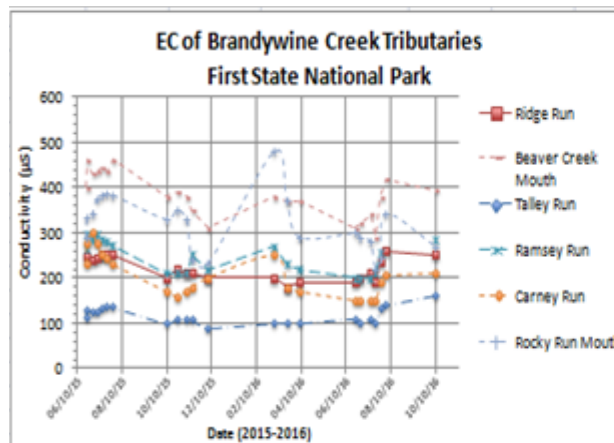
## Highest:

Beaver Creek at Route 202= 899 $\mu$ S.

Lowest: Talley Run= 110 $\mu$ S

Conductivity to chloride:  $Cl = (sc - 310) * 0.28$

Beaver Creek: 164.9







# 4. WATER MANAGEMENT AND POLICIES OF THE NATIONAL PARK SERVICE

## I&M NETWORKS

### Mid-Atlantic Network:

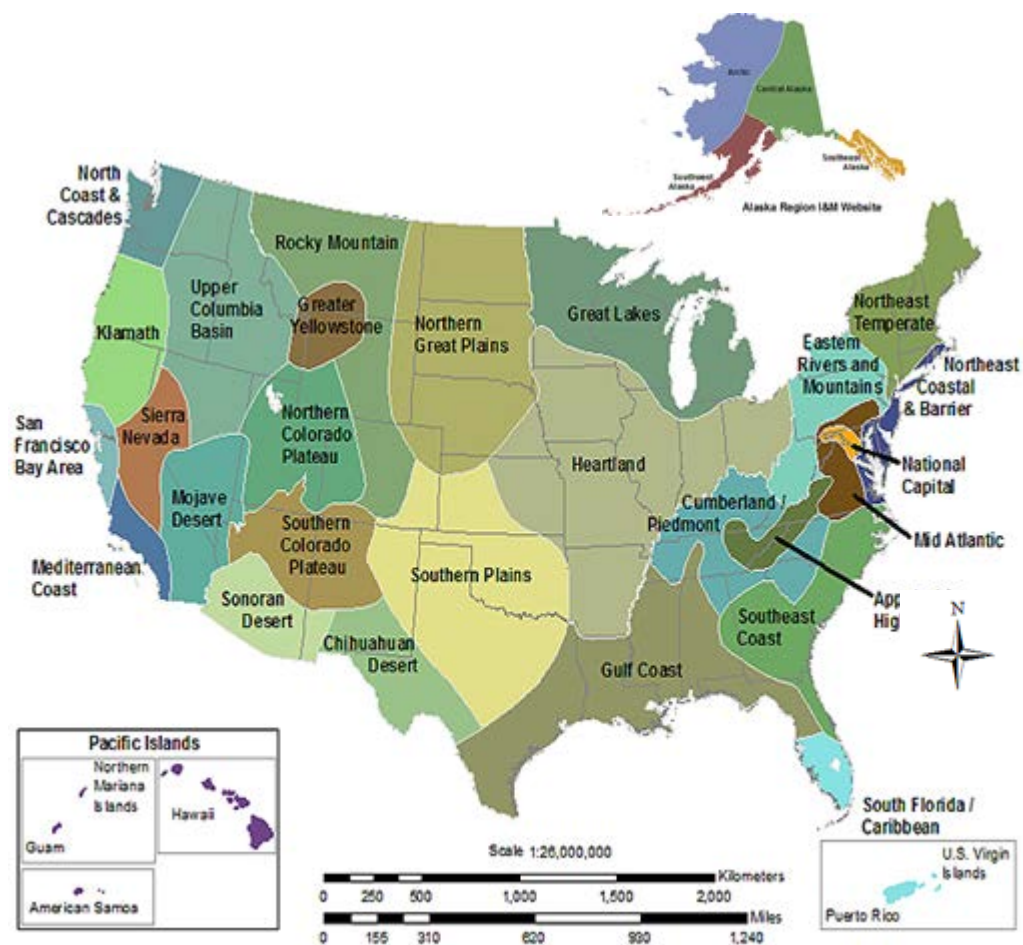
Valley Forge is one of 10 park units in this network. The First State will eventually be added to this network.

### National Capital Region Network:

Harpers Ferry is one of 11 park units in this network.

### Northeast Temperate Network:

Minute Man is one of 13 park units in this network



National Park Service Inventory and Monitoring Program Networks

# 4. WATER MANAGEMENT AND POLICIES OF THE NATIONAL PARK SERVICE

National Park Service  
U.S. Department of the Interior



Natural Resource Stewardship and Science



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**Harpers Ferry National Historical Park**  
**Natural Resource Condition Assessment**  
*National Capital Region*

Natural Resource Report NPS/HAF/NRR—2013/746



National Park Service  
U.S. Department of the Interior



**STATE OF THE PARK REPORT**  
Valley Forge National Historical Park  
Pennsylvania  
2015

# 4. WATER MANAGEMENT AND POLICIES OF THE NATIONAL PARK SERVICE



## VALLEY FORGE

Size: 3465.6 acres/5.415 mi<sup>2</sup>

Location: 20 miles northwest of Philadelphia, Pennsylvania

Purpose: Educate others about the people, events, and legacy of the American Revolution, as well as preserving the cultural and natural resources within the park














# 4. WATER MANAGEMENT AND POLICIES OF THE NATIONAL PARK SERVICE

Water Quality Parameter	Reference Condition	Source
pH	6.0-9	PA Code, 1993
DO (mg/L)	7-day avg. 6.0 mg/l; min. 5.0 mg/l	PA Code, 1993
Water Temperature (°F)	Range: 38°F-66°F	PA Code, 1993
Alkalinity (mg/L)	Min. 20 mg/l as CaCO <sub>3</sub>	PA Code, 1993 and Botts, W., 2005
Specific conductivity (µS/cm)	Range of 15-500 µS/cm	United States Environmental Protection Agency (EPA), 2009a
Nitrate (mg/L)	Max. 10 mg/l as nitrogen	PA Code, 1993
Total phosphorus (mg/L)	< 0.1 mg/L = Good Condition >0.1 mg/L = Significant Concern	Correll, D.L., 1998
Total Dissolved Solids	500 mg/l max. as a monthly avg. value; and max. 750 mg/l	PA Code, 1993
Ammonia (mg/L)	≤ 0.02 mg/L	Murphy, K. J., 2002
Chloride (mg/L)	< 250 mg/L	Pennsylvania Code, 2001

# 4. WATER MANAGEMENT AND POLICIES OF THE NATIONAL PARK SERVICE

## Valley Forge National Historical Park State of the Park Report

Condition Status		Trend in Condition		Confidence in Assessment	
	Warrants Significant Concern		Condition is Improving		High
	Warrants Moderate Concern		Condition is Unchanging		Medium
	Resource is in Good Condition		Condition is Deteriorating		Low

Name of Creek/River	Indicators of Condition	Condition Status/Trend
Valley Creek	Water Quality	
Schuylkill River	Water Quality	

0-33 Red (Significant Concern) 34-66 Yellow (Moderate Concern) 67-100 Green (Good)  
 3 or greater (Trend improving), -3 or lower (Trend Deteriorating), -2 – 2 (trend unchanging)



# 4. WATER MANAGEMENT AND POLICIES OF THE NATIONAL PARK SERVICE



- 1. Lower Town
- 2. Virginius Island
- 3. Camp Hill
- 4. Murphy Farm
- 5. Bolivar Heights
- 6. Schoolhouse Ridge North
- 7. Schoolhouse Ridge South
- 8. Maryland Heights
- 9. Loudoun Heights

## HARPERS FERRY

**Size:** 3660.8 acres/5.72 mi<sup>2</sup>

**Location:** At the confluence of the Potomac and Shenandoah Rivers in the state of West Virginia, Virginia, and Maryland.

**Purpose:** Established in 1944 to be a public national memorial commemorating a diverse number of historic people and events that influenced the course of our nation's history at or near Harpers Ferry.

# 4. WATER MANAGEMENT AND POLICIES OF THE NATIONAL PARK SERVICE

## Natural Resource Condition Assessment

**Table 4.12a.** Categorical ranking of reference condition attainment categories for pH, dissolved oxygen, temperature, acid neutralizing capacity, specific conductance, nitrate, and total phosphorus.

Attainment of reference condition	Natural resource condition
80–100%	Very good
60–<80%	Good
40–<60%	Moderate
20–<40%	Degraded
0–<20%	Very degraded

**Table 4.12b.** Categorical ranking of the reference condition attainment categories for the Benthic Index of Biotic Integrity and the Physical Habitat Index.

Reference conditions	Attainment of reference condition	Natural resource condition	Reference conditions	Attainment of reference condition	Natural resource condition
<b>Benthic Index of Biotic Integrity (BIBI)</b>			<b>Physical Habitat Index (PHI)</b>		
4.0–5.0	100%	Good	81–100	75–100% (scaled)	Minimally degraded
3.0–3.9	↕ scaled linearly	Fair	66–80	50–75% (scaled)	Partially degraded
2.0–2.9		Poor	51–65	25–50% (scaled)	Degraded
1.0–1.9	0%	Very poor	0–50	0–25% (scaled)	Severely degraded

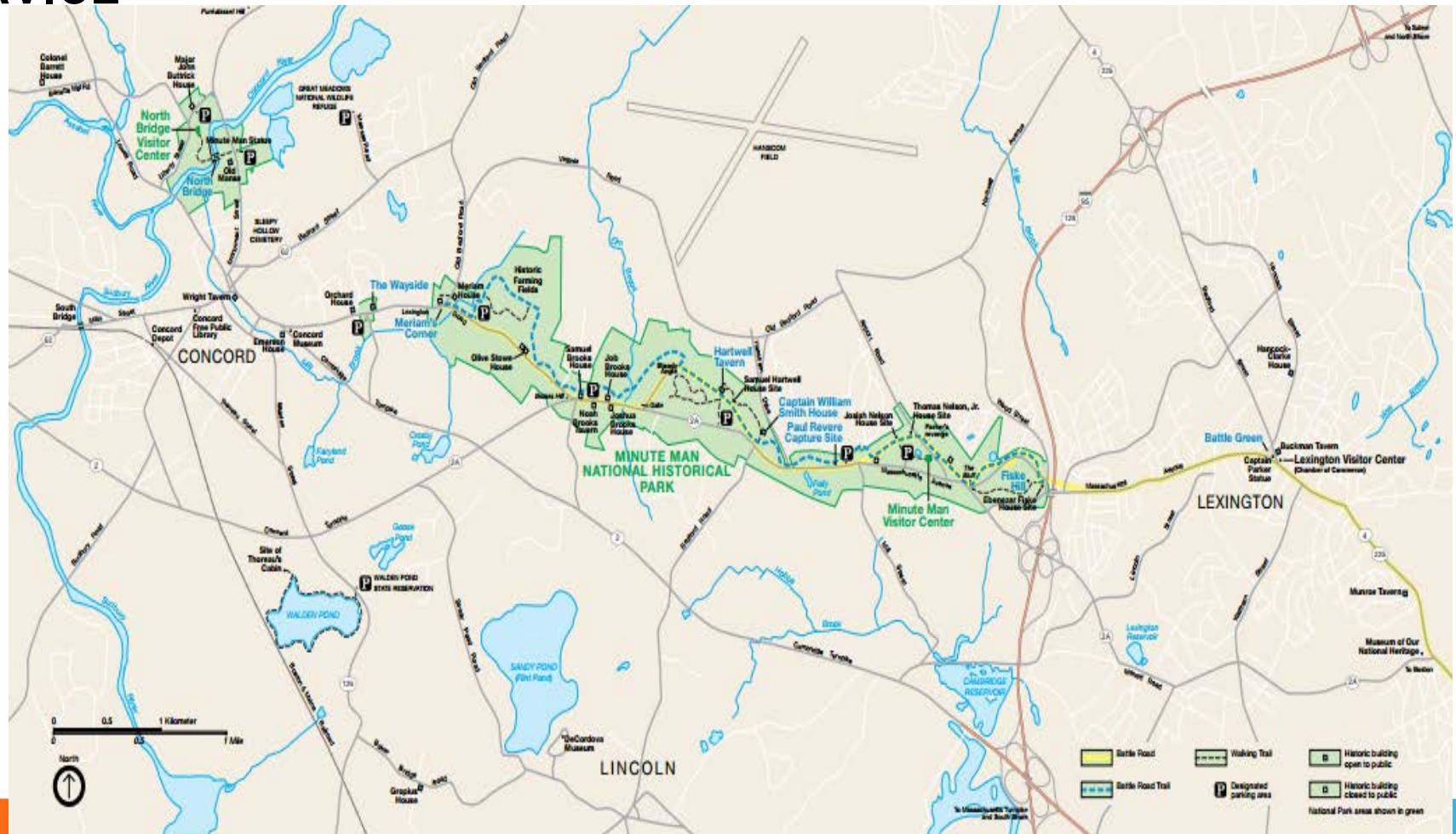


# 4. WATER MANAGEMENT AND POLICIES OF THE NATIONAL PARK SERVICE

Water Quality Parameter	Reference Condition	Source	Observed Median	% Attainment	Condition
pH	6.0 ≤ pH ≤ 9	State of West Virginia, 2008	8.2	100	Very Good
DO (mg/L)	≥ 5.0	State of West Virginia, 2008	8.4	96	Very Good
Water Temperature (°C)	≤ 30.56 May-Nov; ≤ 22.78 Dec-Apr	State of West Virginia, 2008	19.1 May-Nov; 7.4 Dec-Apr	100	Very Good
Acid Neutralizing Capacity (µeq/L)	≥ 200	MBSS	4,820	100	Very Good
Specific conductance (µS/cm)	≤ 500	Buchanan et al., 2011	660	2.9	Very Degraded
Nitrate (mg/L)	≤ 2	MBSS	4.1	7.2	Very Degraded
Total phosphorus (mg/L)	≤ 0.01	U.S. EPA Ecoregional Nutrient Criteria (2000)	0.14	0	Very Degraded
Benthic Index of Biotic Integrity (BIBI)	1.0-1.9; 2.0-2.9; 3.0-3.9; 4.0-5.0	MBSS interpretation of the BIBI	2.8	45	Poor
Physical Habitat Index	0-50; 51-65; 66-80; 81-100	MBSS	75	67	Partially Degraded



# 4. WATER MANAGEMENT AND POLICIES OF THE NATIONAL PARK SERVICE



## MINUTE MAN

Size: 967.04 acre/1.511 mi<sup>2</sup>

Location: 22 miles outside of Boston within the towns of Lexington, Lincoln, and Concord, Massachusetts

Purpose: Celebrates the opening battles of the American Revolution by preserving the historic sites, structures, landscapes, and ideas embodied by these events



# 4. WATER MANAGEMENT AND POLICIES OF THE NATIONAL PARK SERVICE

Table 1. Rating categories and numerical scores used in the assessment of condition, trend, and data reliability.

Condition	Icon	Numerical Score
Condition midpoint score (range)		
Good		0.84 (0.68 to 1.0)
Caution		0.50 (0.34 to 0.67)
Significant concern		0.16 (0 to 0.33)
Unknown condition		No value given
Trend midpoint score (range)		
Improving trend		0.84 (0.68 to 1.0)
Stable trend		0.50 (0.34 to 0.67)
Declining trend		0.16 (0 to 0.33)
Unknown trend		No value given
Data reliability midpoint score (range)		
Good data		0.84 (0.68 to 1.0)
Satisfactory data		0.50 (0.34 to 0.67)
Limited data		0.16 (0 to 0.33)

## Natural Resource Condition Assessment

**Current Condition:**

Water quality – Concord River, Elm Brook, Mill Brook	Significant concern	0.16
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**Trend:**

Water quality	Declining trend	0.16
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**Reliability:**

US EPA water quality assessment data	Good	0.84
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# 4. WATER MANAGEMENT AND POLICIES OF THE NATIONAL PARK SERVICE

Water Quality Parameter	Reference Condition	Source	Results
pH	6.5-8.3	MA state standard	All values were between the upper and lower Massachusetts water quality standards
DO	Min. 6 mg/L	MA state standard	Most measurements were above the standard except the June and July measurements from Mill Brook and July measurement from Concord River
Water Temperature	Max. temp 28.3°C- warm water; 20°C- cold water	MA state standards	Most measurements were within the standards except in July at Mill Brook and Elm Brook
Acid Neutralizing Capacity	>100 µeq/L= well-buffered < 0 µeq/L= acidic waters	(Stoddard et al. 2003)	All values exceeded the standard
Turbidity	0-10 NTU	U.S. EPA (1999)	All values fall within this range
Nitrogen	0.71 mg/L	EPA Region criterion (non-regulatory)	All but 1 value were above the criterion of 0.71 mg/L
Total phosphorus	31.25 µg/L	EPA Region criterion (non-regulatory)	All values were above the criterion of 31.25µg/L

# **5. COMPARATIVE ANALYSIS OF WATER RESOURCES IN NAT'L. HISTORICAL PARKS**



# 5. COMPARATIVE ANALYSIS OF WATER RESOURCES IN NAT'L. HISTORICAL PARKS

Parameter	Unit	Water Quality Standard	Attainment (%)	Condition
Temperature	°C	Max. 27.7°C	100%	Very Good
pH	standard pH unit	6.5-8.5	98%	Very Good
Turbidity	NTU	Max. 10 NTUs	97%	Very Good
Dissolved Oxygen	mg/L	Min. average 5.5	98%	Very Good
Electrical Conductivity	µS	150-500µS	84.1%	Very Good
Enterococci Bacteria	#/100mL	925/100mL	71%	Good

**First State National Historical Park**












# 5. Comparative Analysis of Water Resources in Nat'l. Historical Parks

	Minute Man National Historical Park	Harpers Ferry National Historical Park	Valley Forge National Historical Park	First State National Historical Park
Water Quality Parameter	Criteria	Criteria	Criteria	Criteria
pH	6.5-8.3 <sup>1</sup>	$6.0 \leq \text{pH} \leq 9^3$	6.0-9.0 <sup>7</sup>	6.5-8.5 <sup>10</sup>
DO (mg/L)	$\geq 6$ mg/L cold water; $\geq 5$ mg/L warm water <sup>1</sup>	$\geq 5.0$ mg/L <sup>3</sup>	Min. daily avg. 5.0 mg/L; min. 4.0 mg/L (Warm Water). Min. daily avg. 6.0 mg/l; min. 5.0 mg/l (Cold Water) <sup>7</sup>	Avg. $\geq 5.5$ mg/L <sup>10</sup>
Water Temperature (°C)	Max: 28.3°C- warm water; 20°C- cold water <sup>1</sup>	No standard	Max.: 38°F- 66°F	Max. daily mean temp.: 82°F (27°C) Daily max. temp.: 86°F (30°C). Max. increase above natural conditions shall be 5°F (-15°C). <sup>10</sup>
Total Nitrogen	$\leq 0.71$ mg/L <sup>2</sup>	$\leq 0.31$ mg/L <sup>4</sup> $\leq 10$ mg/L <sup>5</sup>	$\leq 0.69$ mg/L <sup>8</sup> $\leq 10$ mg/L <sup>5</sup>	$\leq 0.69$ mg/L <sup>11</sup> $\leq 10$ mg/L <sup>5</sup>
Total phosphorus	$\leq 31.25$ µg/L <sup>2</sup>	$\leq 10$ µg/L <sup>4</sup>	$\leq 36.56$ µg/L <sup>8</sup>	$\leq 36.56$ µg/L <sup>11</sup>
Bacteria	No standard	Max.: 200/100 mL Max: 400 /100 mL	Max. Fecal coliforms/ 100 ml: 200/100 mL Max. 400/100 mL. Max. 2,000/100 mL	Max.: 2,400 organisms/100 mL o Max. 1,000 organisms/100 mL
Turbidity	$\leq 3.04$ FTU <sup>2</sup>	$\leq 1.7$ FTU <sup>4</sup> Max. :10 NTU	$\leq 5.7$ FTU <sup>8</sup> Max.:100 NTU (Potable water supply, warm water fishes, migratory fish). <sup>9</sup>	$\leq 5.7$ FTU <sup>11</sup> Max.: 10 NTU or 10 FTU <sup>10</sup>

# 5. Comparative Analysis of Water Resources in Nat'l. Historical Parks

Historical Park	State of the Park Report	Natural Resource Condition Assessment	Water Quality Parameters	Condition/Trend
First State			Water temp., pH, turbidity, DO, conductivity, enterococci	
Valley Forge	✓	✓	Water temp., specific conductance, alkalinity, turbidity/total dissolved solids, ammonia, chloride, nitrite/nitrate, phosphorus, pH, DO, boron, and macroinvertebrate and fish sampling	Traffic-like symbols
Minute Man		✓	Specific conductance, DOC, bacteria, turbidity, total nitrogen, total phosphorus, water temp., DO, pH, and ANC, chloride, and sulfate	Traffic Like Symbols
Harpers Ferry		✓	pH, DO, water temp., ANC, salinity/specific conductance, nitrate, total phosphorus, BIBI, and PHI	Percent Attainment

# 5. COMPARATIVE ANALYSIS OF WATER RESOURCES IN NAT'L. HISTORICAL PARKS

Condition Status		Trend in Condition		Confidence in Assessment	
	Warrants Significant Concern		Condition is Improving		High
	Warrants Moderate Concern		Condition is Unchanging		Medium
	Source is in Good Condition		Condition is Deteriorating		Low

**Table 4.12a.** Categorical ranking of reference condition attainment categories for pH, dissolved oxygen, temperature, acid neutralizing capacity, specific conductance, nitrate, and total phosphorus.

Attainment of reference condition	Natural resource condition
80–100%	Very good
60–<80%	Good
40–<60%	Moderate
20–<40%	Degraded
0–<20%	Very degraded

Icon numerical scores used in the assessment of condition, trend, and

Valley Forge












**Table 4.12b.** Categorical ranking of the reference condition attainment categories for the Benthic Index of Biotic Integrity and the Physical Habitat Index.

Reference conditions	Attainment of reference condition	Natural resource condition	Reference conditions	Attainment of reference condition	Natural resource condition	
<b>Benthic Index of Biotic Integrity (BIB)</b>						
4.0–5.0	100%	Good	81–100	75–100% (scaled)	Minimally degraded	
3.0–3.9	↑ scaled linearly ↓	Fair	66–80	50–75% (scaled)	Partially degraded	
2.0–2.9		Poor	51–65	25–50% (scaled)	Degraded	
1.0–1.9		0%	Very poor	0–50	0–25% (scaled)	Severely degraded
<b>Physical Habitat Index (PHI)</b>						

Unknown condition

Improving trend  
Stable trend  
Declining trend  
Unknown trend

Good data  
Satisfactory data  
Limited data

Icon	Numerical Score
<b>Condition midpoint score (range)</b>	
	0.84 (0.68 to 1.0)
	0.50 (0.34 to 0.67)
	0.16 (0 to 0.33)
	No value given
<b>Trend midpoint score (range)</b>	
	0.84 (0.68 to 1.0)
	0.50 (0.34 to 0.67)
	0.16 (0 to 0.33)
	No value given
<b>Data reliability midpoint score (range)</b>	
	0.84 (0.68 to 1.0)
	0.50 (0.34 to 0.67)
	0.16 (0 to 0.33)

Harpers Ferry

Minute Man



# 6. CONCLUSIONS AND RECOMMENDATIONS

## Conclusions

1. NPS Units: The National Park Service is authorized to manage 417 units that contain 100,000 miles of perennial rivers and streams, and over 2.3 million acres of lakes and reservoirs in the National Park System.
2. The 400<sup>th</sup> unit of the National Park System, First State National Historical Park contains 6 sub-watersheds of the Brandywine Piedmont Watershed that capture a drainage area of 4,485 acres/7 mi<sup>2</sup>.
3. Water quality testing in FSNHP indicates that standards are met for pH, temperature, and DO, but there are concerns for high turbidity and conductivity levels in headwater streams.
- 4 & 5. The reporting and water quality standards for each of the historical parks vary. Some historical parks use traffic symbols, while others use percent attainment to display the status and condition of the parks water resources.

# 6. CONCLUSIONS AND RECOMMENDATIONS

## Recommendations

- 1. Water Quality Criteria:** First State National Historical Park should manage its water resources as Valley Forge, Minute Man and Harpers Ferry National Historical Parks.
- 2. Condition Assessments:** The First State National Historical Park should prepare natural resource condition assessments and state of the park reports and communicate water resources condition and status using traffic symbols and percent attainment of Harpers Ferry, Valley Forge, and Minute Man National Historical Parks.
- 3. Water Quality Monitoring:** It is recommended that First State National Historical Park continue monthly monitoring of the existing parameters of the 12 sampling sites in the park to assess spatial and temporal trends of existing parameters.
- 4. Expanded WQ Monitoring network:** It is suggested to expand the water quality network to include other parameters such as nutrients, such as nitrogen, and phosphorus, and metals, such as zinc copper, and lead, and pathogens such as E .Coli and Enterococci bacteria.
- 5. BMP Implementation:** Provide recommendations for BMP in the First State National Historical Park, including reforestation in the upper parts of the watershed, and establishing stream buffers in residential and urban areas outside the park boundaries.

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