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ASSESSING COMPARATIVE WATER RESOURCE CONDITION of NATIONAL CAPITAL REGION PARKS

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Atlantic City,

Identified 21 Vital Signs for Long-term Monitoring

Ozone
Wet deposition
Visibility and particulate matter
Mercury deposition
Weather
Shoreline features
Physical Habitat Index
Surface water dynamics
Water chemistry
Nutrient dynamics
Aquatic macroinvertebrates

Invasive / Exotic Plants
Forest insect pests
Forest vegetation
Fishes
Amphibians
Landbirds
White-tailed deer
T&E species and communities
Land Cover / Land Use
Landscape condition

How Display This as Information?

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21 Vital Signs

Information?

CATEGORY	VITAL SIGN NAME	VITAL SIGN MEASURES
AIR QUALITY AND CLIMATE	Ozone	Atmospheric ozone concentration
	Wet deposition	Wet deposition chemistry (pH, NO_3^-, SO_4^{-2})
	Visibility and particulate matter	Visibility (particulate matter 2.5 mass fraction)
	Mercury deposition	Mercury Deposition Network
	Weather	Ambient temperature, precipitation
WATER QUALITY AND HYDROLOGY	Surface water dynamics	Flow, discharge (cubic feet/second), gauge/stage height
	Water chemistry	Core parameters (pH, dissolved oxygen, specific conductance, temperature), acid neutralizing capacity
	Nutrient dynamics	Nitrate, ammonia, total phosphate
	Aquatic macroinvertebrates	Species composition and abundance
	Shoreline features	Rate of shoreline change
	Physical Habitat Index (PHI)	Stream habitat structure, river depth, vegetation composition on adjacent lands
BIODIVERSITY	Invasive/exotic plants	Detection of new species in sensitive areas
	Forest insect pests	Presence of new pest species
	Forest vegetation	Species diversity, age and size classes
	Fishes	Species composition
	Amphibians	Species composition and proportion of area occupied, malformations
	Landbirds	Species composition and abundance
	White-tailed deer	Deer density
	R/T/E species and communities	Presence and absence of, status of, threats to Rare, Threatened or Endangered (R/T/E) species/communities
ECOSYSTEM PATTERN AND PROCESSES	Land cover/ land use	Area of dominant land cover types, connectivity, core/ edge ratio of dominant forest communities, weighted average patch size, adjacency matrix
	Landscape condition	Land use intensity, disturbance status

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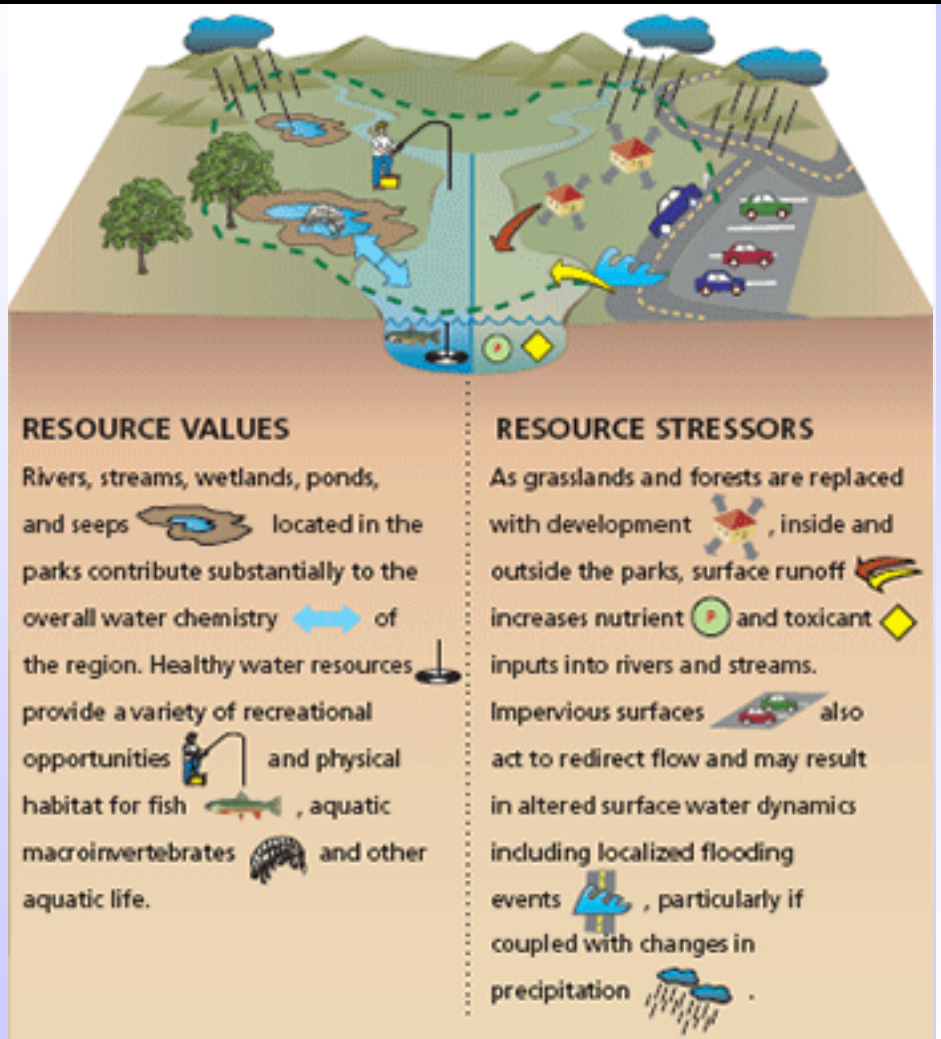
Conceptual

Models

By Resource



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http://www.ncrvitalsigns.net/

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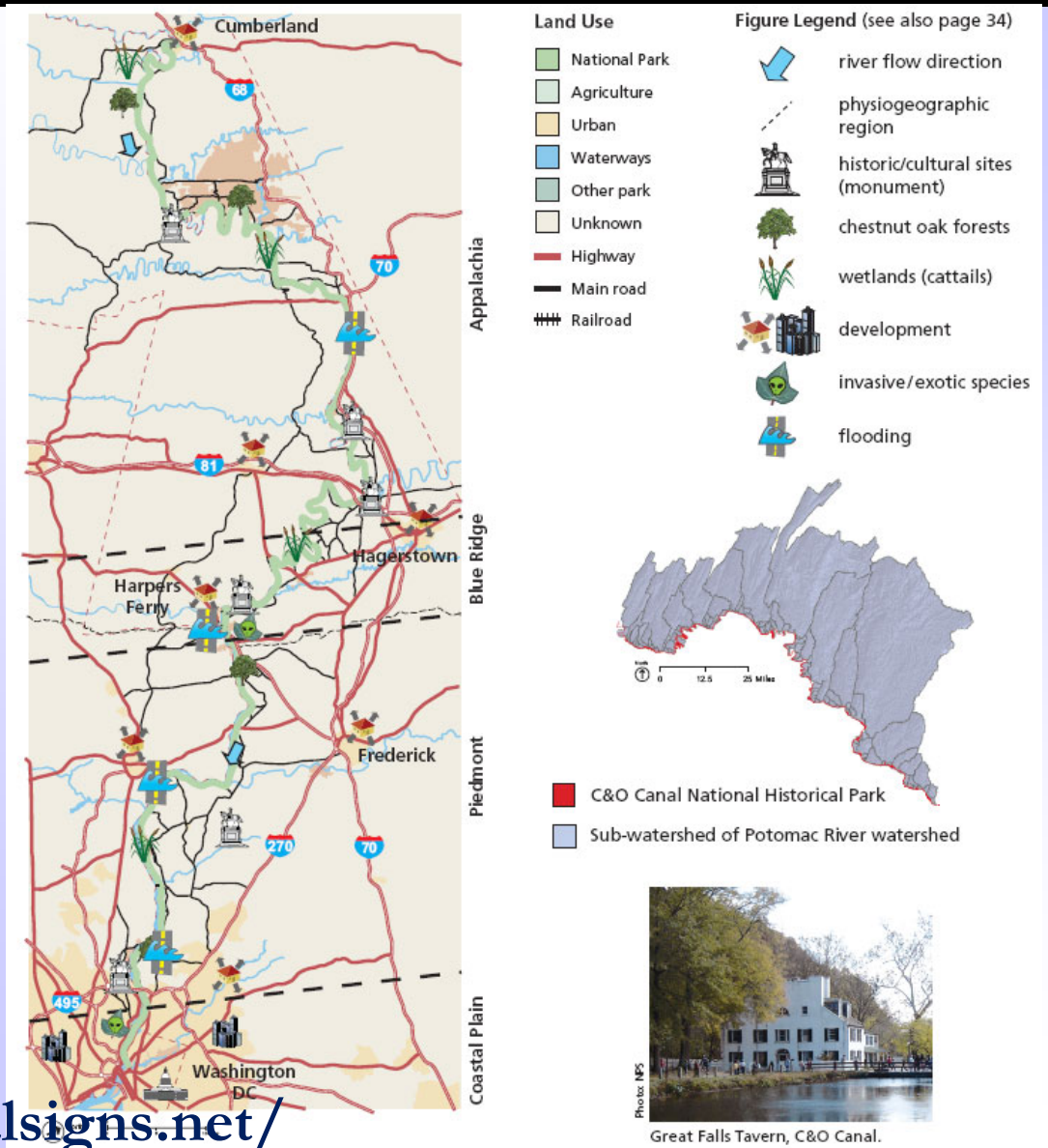
Conceptual Models

By Park



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NCRN Water Quality Monitoring

Perennial
Wade-able
Non-tidal

Streams

Per WRD guidance

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NCRN Water Quality Monitoring Vital Sign Measures

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Three Protocols:

- Flow
- Stage
- Discharge

Surface Water Dynamics

- pH
- Dissolved oxygen
- Temperature
- Specific conductance
- Acid neutralizing capacity
- Nutrients

Water Chemistry

- Physical Habitat
- Benthic Macroinvertebrate
- Fish

Biological Stream Survey

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1. Monthly Water Quantity & Quality Monitoring

- **Surface Water Dynamics & Water Chemistry**
- by NCRN staff
- monthly measurements at all sites

2. Continuous Water Quantity & Quality Monitoring

- **Surface Water Dynamics & Water Chemistry**
- by NCRN staff
- Waterlevel loggers and Hydrolabs
- Selected subset of sites, as needed

3. Yearly Biological Monitoring

- **Biological Stream Survey**
- contracted out
- Rotating panel of 6 sites per year, 6 years
- Insects spring, fish summer

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Spatial Sampling Design

44 streams
10 parks
8 counties
3 states, 1 district
4 Physiographic Provinces

No Streams from CHOH,

	1st order	2nd order	3rd order	4th order	5th order	6th Order	Total
CHOH	160	38	18	10	5	3	234

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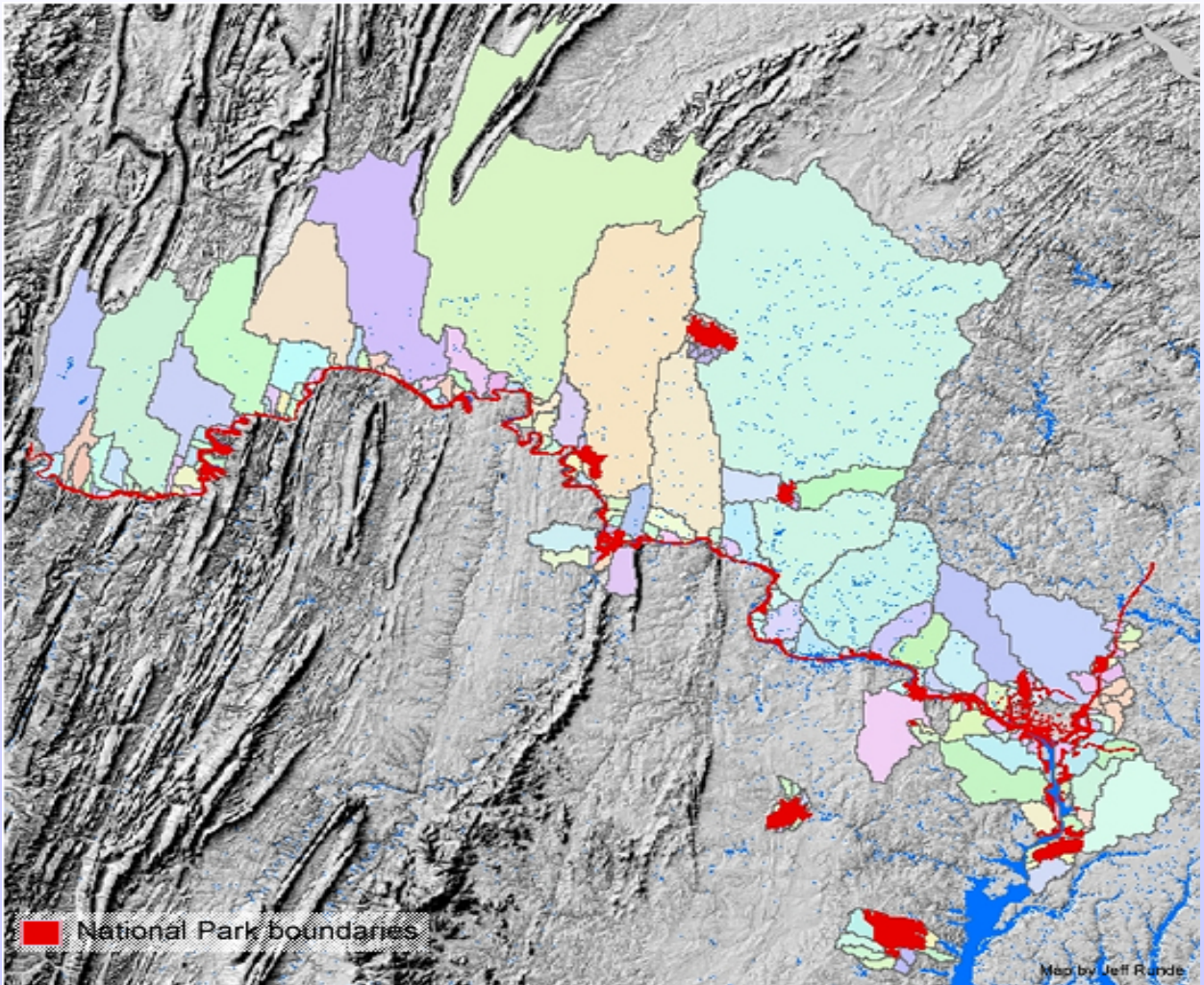
Spatial Sampling Design



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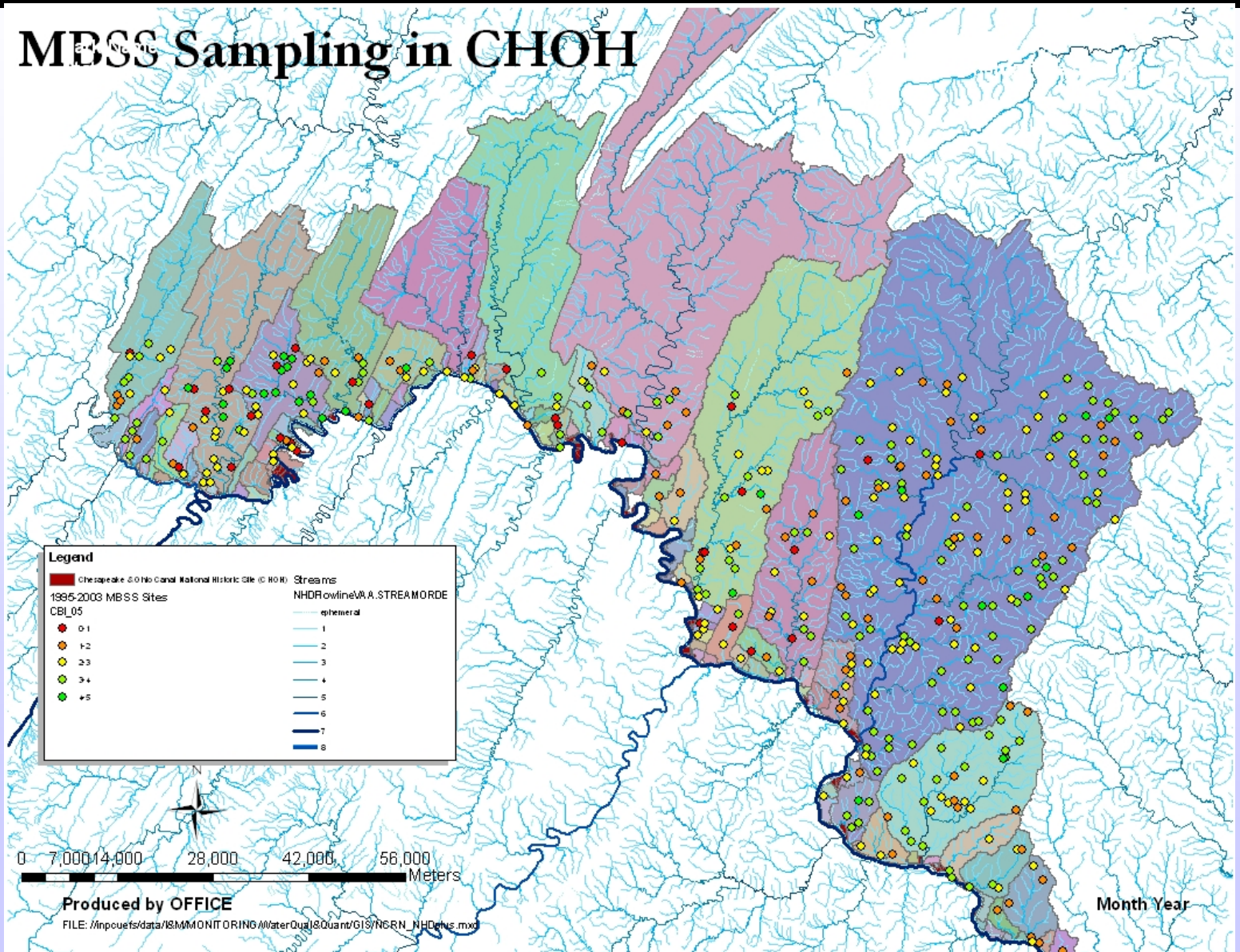

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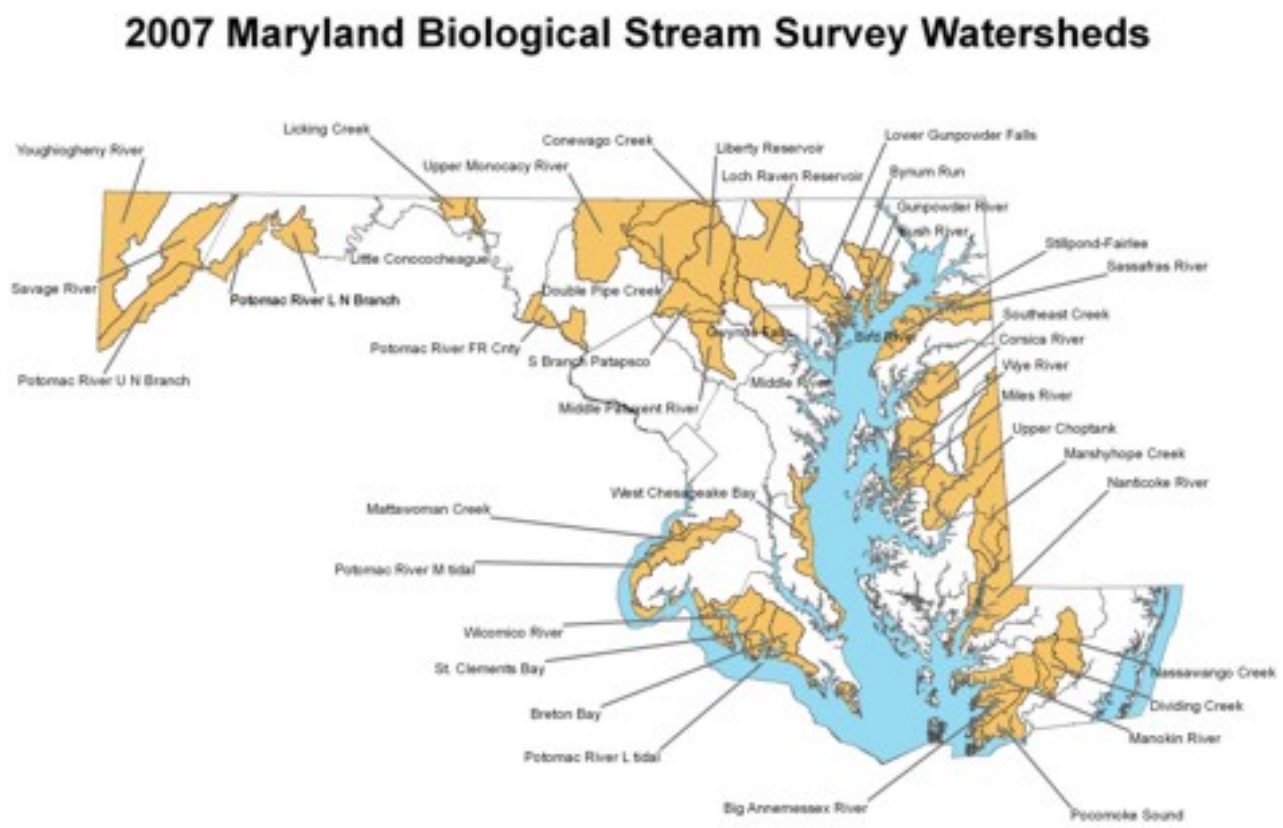
Additional Data Sources



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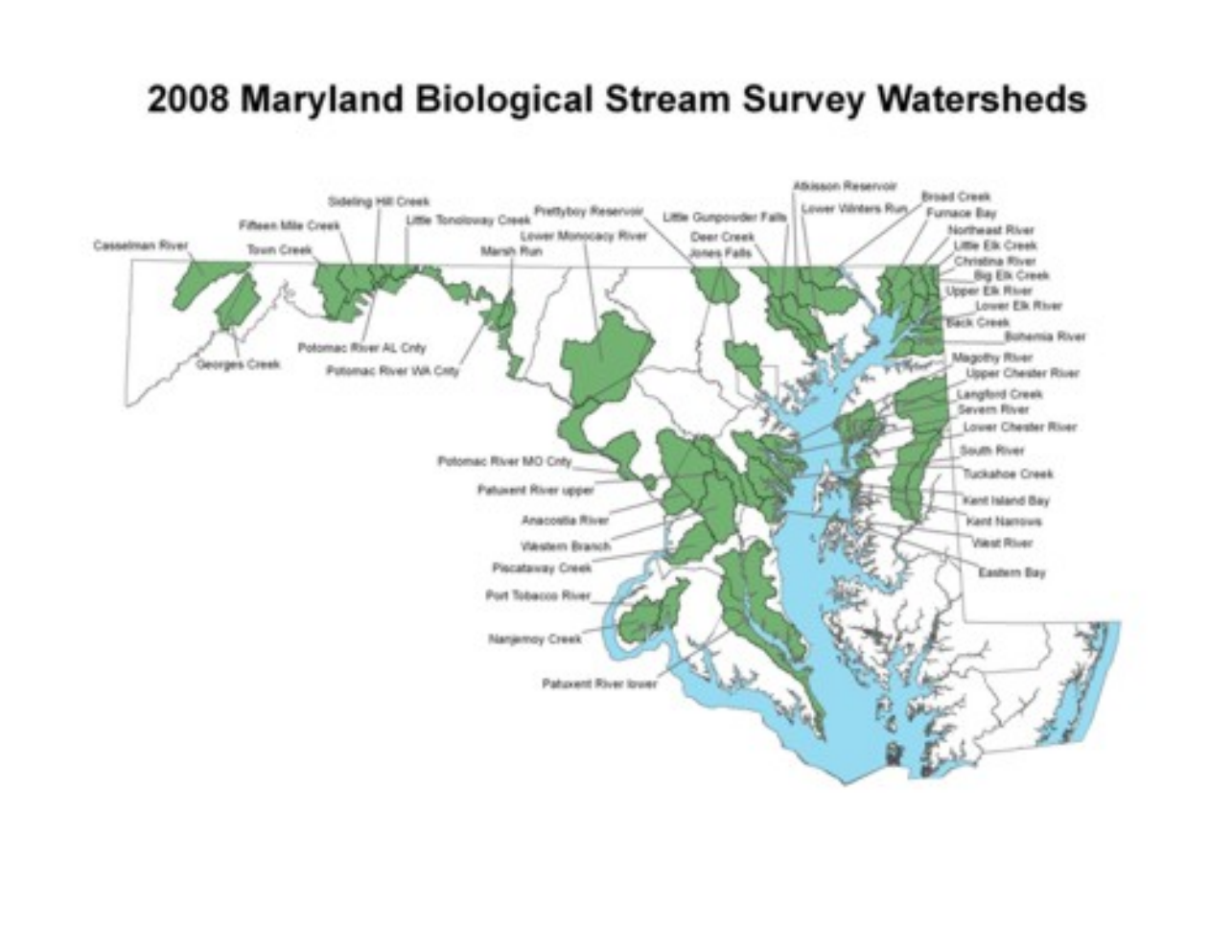

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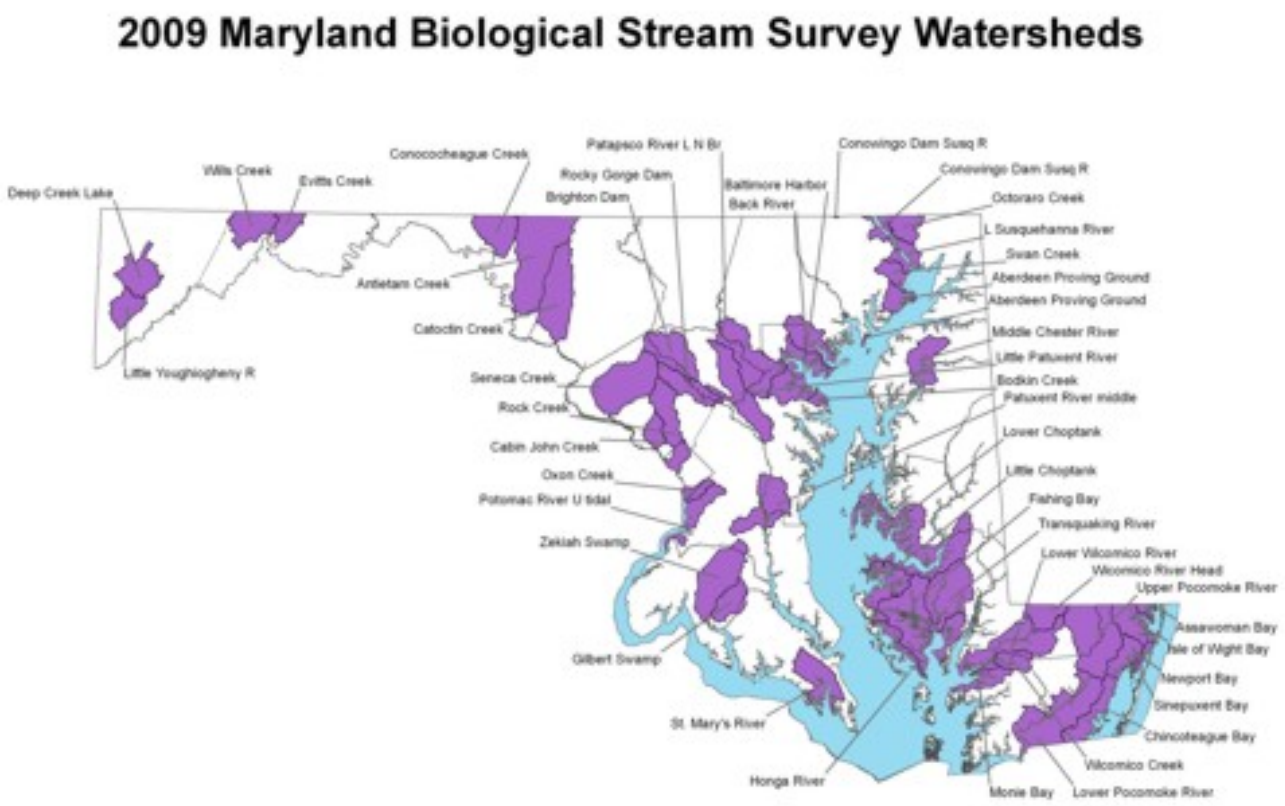

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	Visits	ANC	DO	NO_3	NH_3	pH	PO_4	SC
Broad Branch	10	0	0	33	10	33	100	100
Rock Creek @ Edgewater	9	0	0	38	0	11	100	56
Fenwick Branch	9	0	33	38	22	0	100	89
Hazen Creek	10	0	0	56	0	0	100	100
Luzon Branch	9	0	0	88	0	0	100	100
Palisades Creek	4	0	0	100	0	25	100	100
Pinehurst Branch	10	0	30	11	10	0	100	60
Piney Branch	10	0	0	56	0	33	90	100
Rock Creek	10	0	30	20	0	0	100	40
Soapstone Stream	10	0	0	44	0	11	100	100

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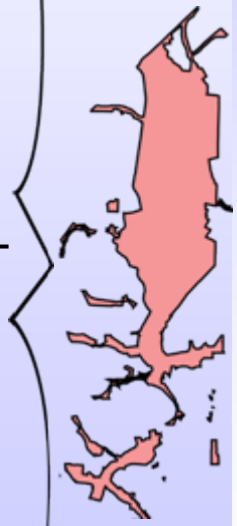
Park	Category	Vital Sign	Threshold (eg EPA)	Attainment (% of time)	Category Score	Park Score
ROCR	Air quality and climate		8 ppm/8 hr	0.28		ROCR
			Need data	---		
			15 ug/m^{-3}	0.33		
			Need data	---		
			Need data	---		
	Water quality and hydrology		Need data	---		
			6.0 ≥ X ≤ 8.5	0.92		
			36.56 ug/L	0.04		
			IBI>3	0.52		
			Need data	---		
			Need data	---		
	Biodiversity		Need data	---		
			Need data	---		
			Need data	---		
			IBI>3	0.62		
			Need data	---		
			Need data	---		
			<10 deer/sq km	0		
			Need data	---		
	Ecosystem pattern and process		>10% impervious	0		
			Need data	---		



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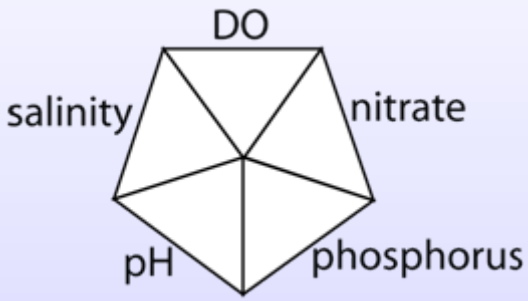
Resource Report Card



Vital sign metric	Threshold	Source
Dissolved Oxygen	> 5mgL^{-1} Mar-Jun > 4mgL^{-1} Jul-Feb	EPA
Nitrate	< 0.69 mgL^{-1}	EPA
Total Phosphorus	< 0.037 mgL-^{1}	EPA
pH	6.0-8.5	EPA
Salinity	< 0.25	EPA

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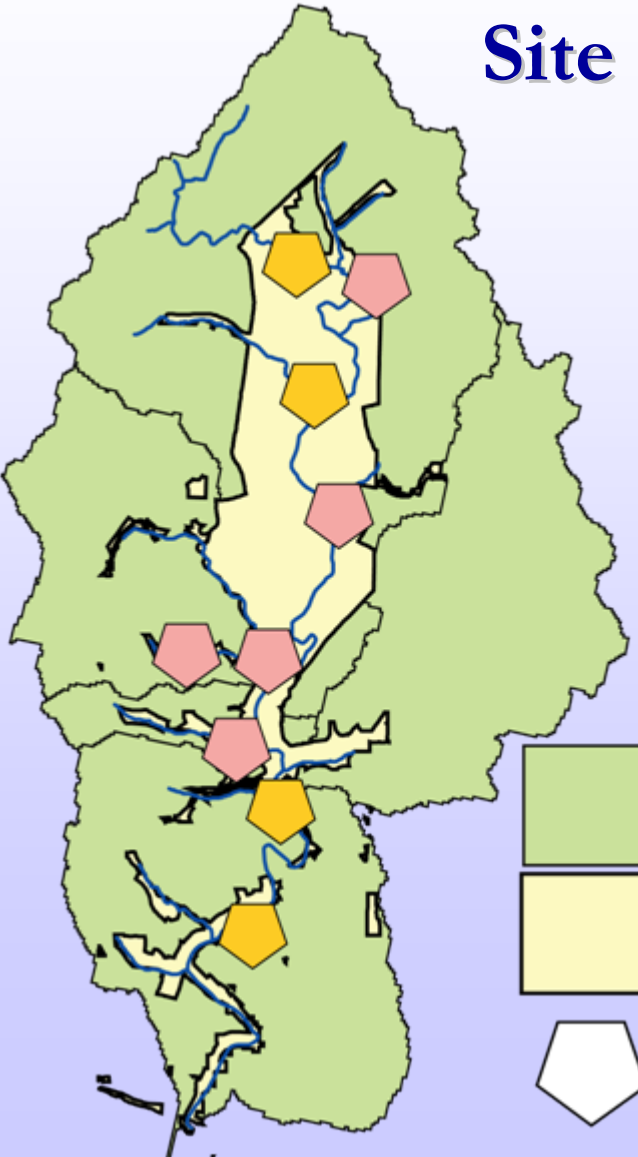
Site condition by catchment



Excellent	≤ 1.0
Good	≤ 0.8
Poor	≤ 0.6
Degraded	≤ 0.4
Very Degraded	≤ 0.2

Subwatershed boundaries

ROCR Park boundary

Sample site condition

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Site condition by catchment

Excellent	≤ 1.0
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ROCR Park boundary

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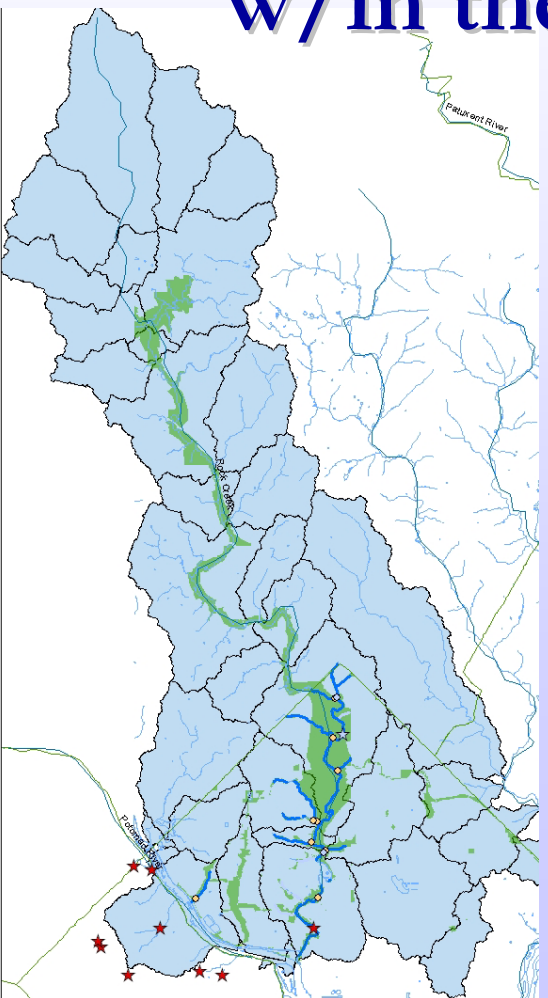
Data collected by other agencies w/in the Rock Creek watershed.



- MBSS North Branch Rock Creek 2003
- DC DOH Yearly
- Montogomery County for TMDLs
- Volunteer and Education groups
- Researchers

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National Capital Region Network (National Parks Service) Vital Signs - Microsoft Internet Explorer provided by NCR

http://www.npsvitalsigns.net/#step2:vitalsign_step2:step3:vitalsign_water_step

Vital Sign | National Park | Ecological System

Step 2 - Choose Vital Sign Category

Choose one of the four vitals sign categories - Air Quality and Climate, Water Quality and Hydrology, Biodiversity or Ecosystem Pattern and Processes

Step 3 - Choose Vital Sign

Choose a vital sign from the Water Quality and Hydrology table

CATEGORY	VITAL SIGN NAME	VITAL SIGN MEASURES
WATER QUALITY AND HYDROLOGY	Surface water dynamics	Flow, discharge (cubic feet/second), gauge/stage height
	Water chemistry	Core parameters (pH, dissolved oxygen, specific conductance, temperature), acid neutralizing capacity
	Nutrient dynamics	Nitrate, ammonia, total phosphate
	Aquatic macroinvertebrates	Species composition and abundance
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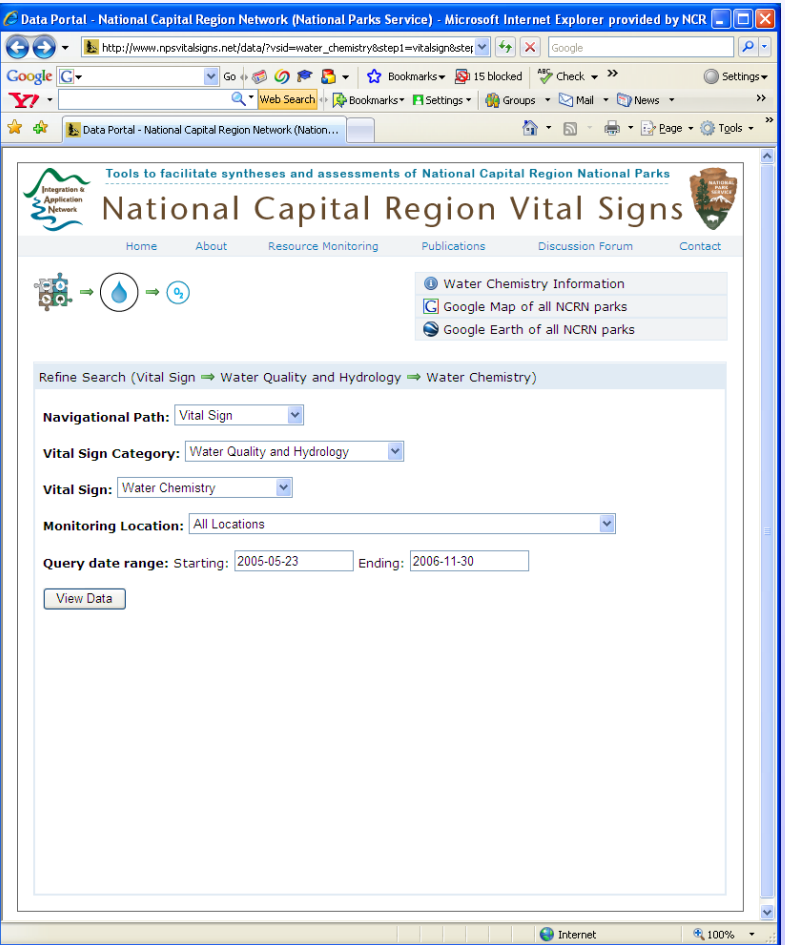
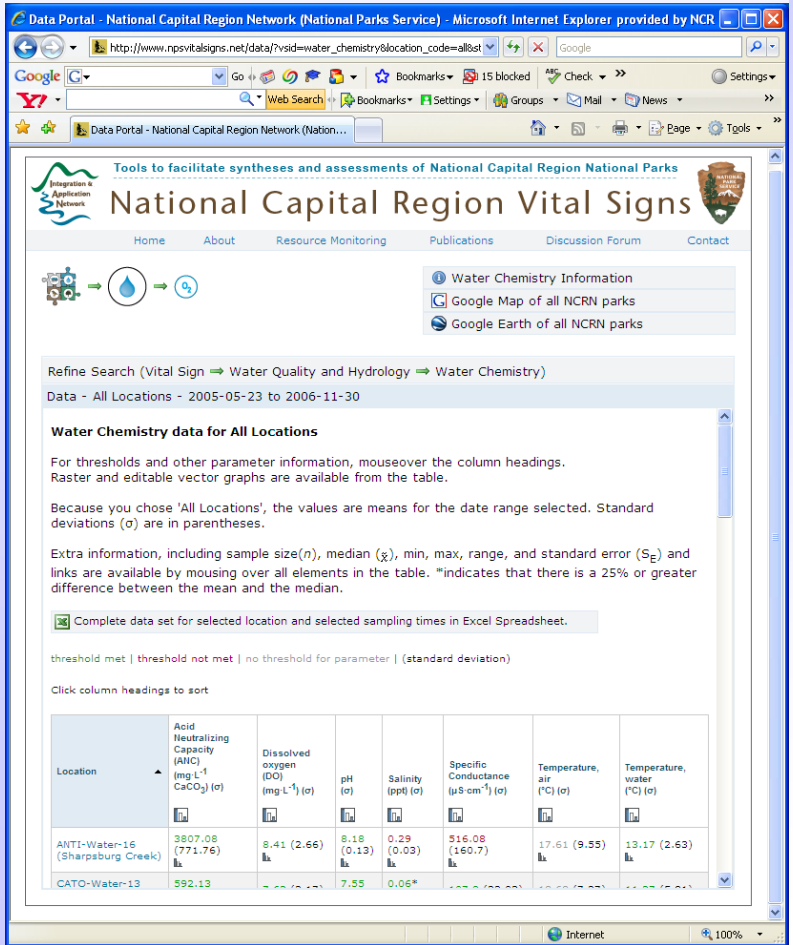
Topic Query – by Vital Sign





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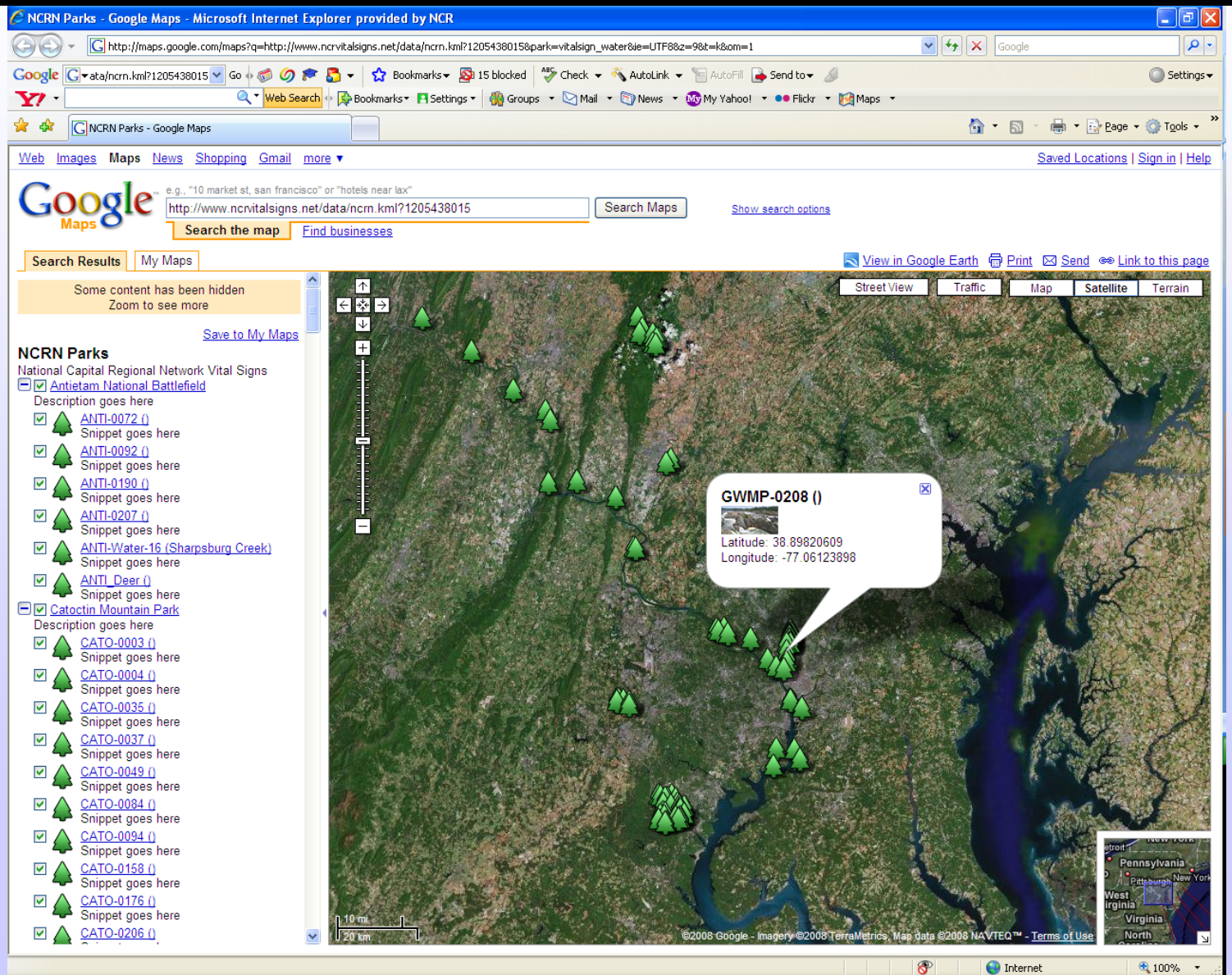

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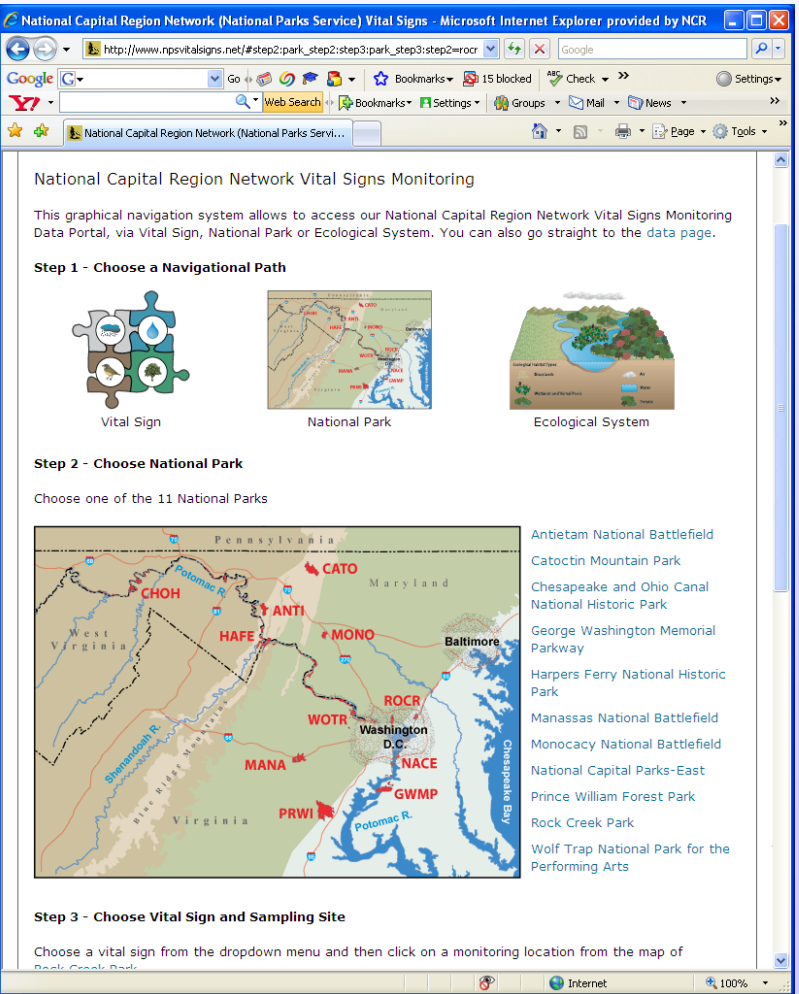
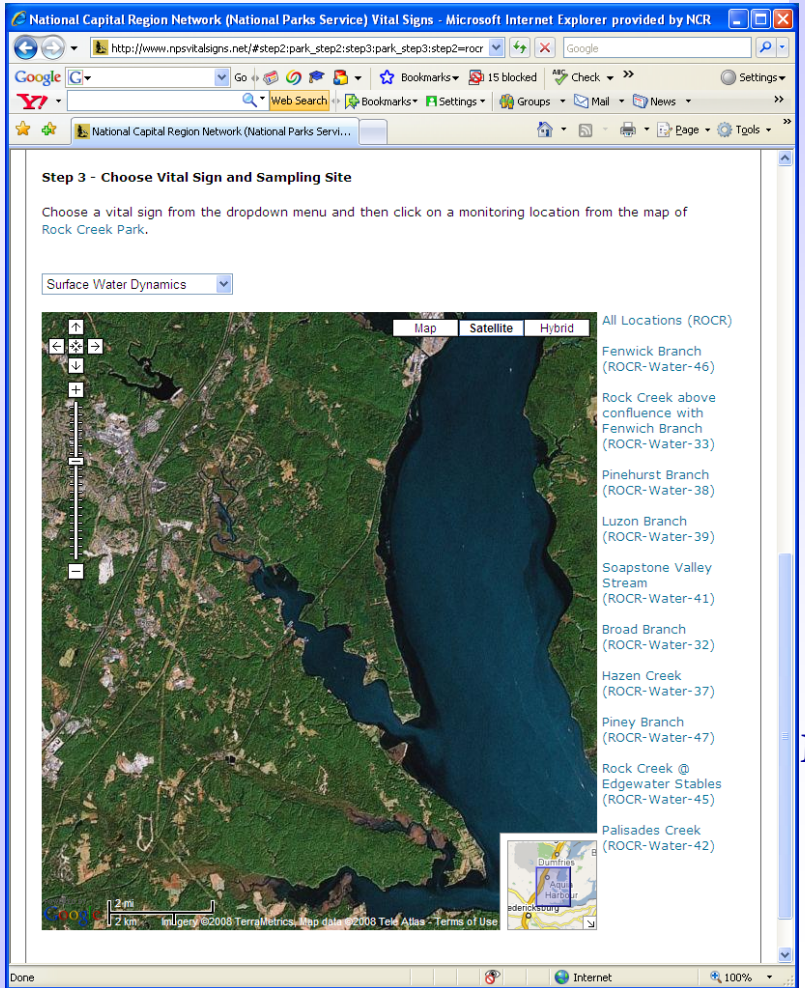
Geospatial Query – by park





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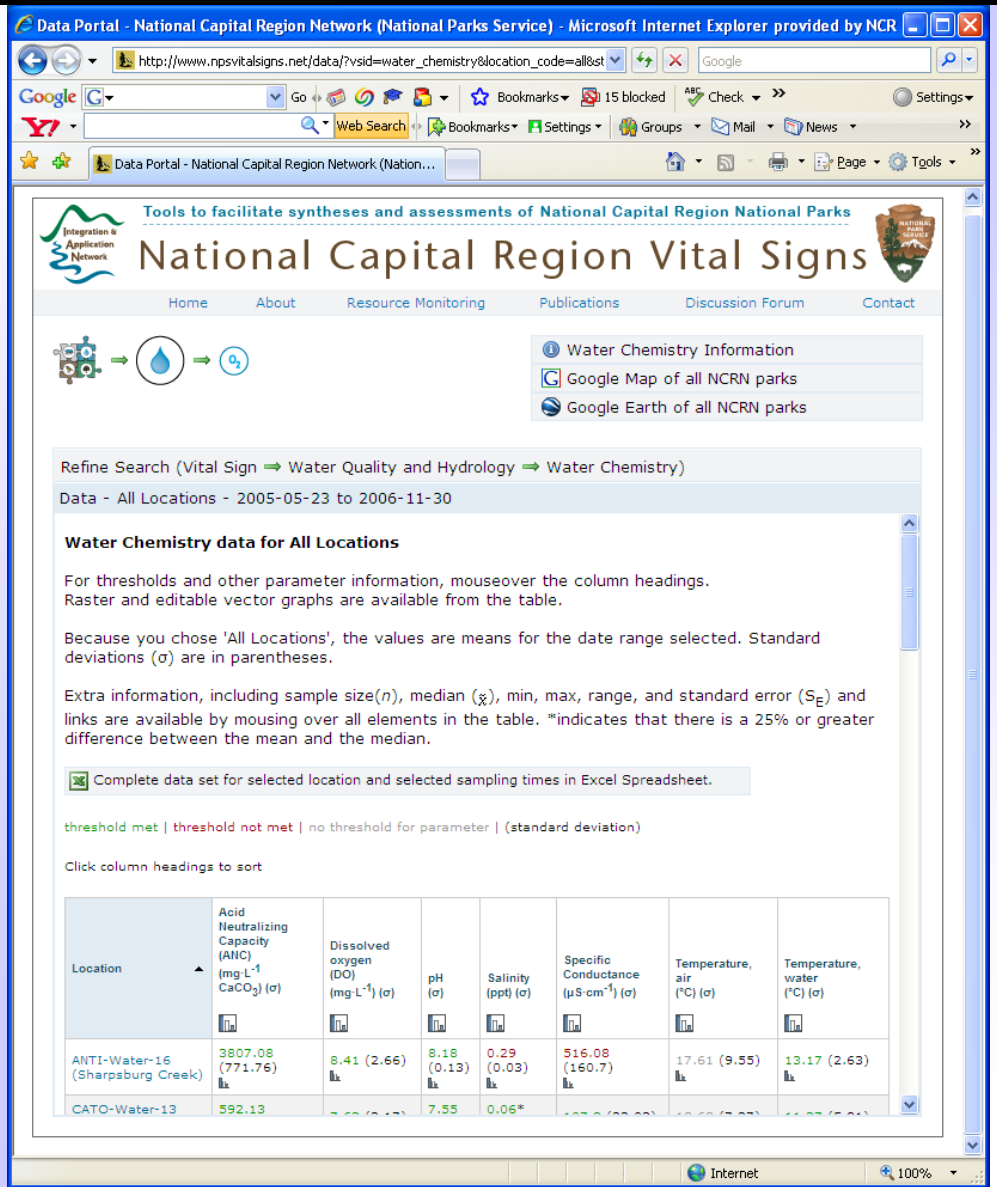
Pre-Defined Data Products



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UMBC – NBII Mid-Atlantic Node

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- ***Mike McGuire***
- National Biological Information Infrastructure
- Funded by USGS and NPS
- Synoptic Integration of multiple data points spatially and temporally
- Prototype data warehouse and visualization

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http://www.umbc.edu/cuere/research.htm

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These products are the result of hard work by:

- Pat Campbell (NCRN)
- Tim Carruthers (IAN)
- Shawn Carter (NCRN)
- Bill Dennison (IAN)
- Lisa Florkowski (UMCES)
- Jane Hawkey (IAN)
- Adrian Jones (IAN)
- Todd Lookingbill (UMCES)
- Mike McGuire (UMBC)
- Giselle Mora (NCR-RLC)
- Jim Pieper (NCRN)
- Jeff Runde (NCR-CUE)
- Geoff Sanders (NCRN)
- Tracey Saxby (IAN)
- John Paul Schmit (NCRN)
- Jane Thomas (IAN)

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QUESTIONS?

http://science.nature.nps.gov/im/units/ncrn/index.cfm

http://www.ncrvitalsigns.net/

http://www.umbc.edu/cuere/research.htm

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