Expanding National Wetlands Inventory Data to Predict Wetland Functions for Watersheds

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FWS Classification System

- Characteristics Emphasized
  - Vegetation
  - Hydrology
  - Salinity
  - Soils and substrates
  - Human impacts

Classification Hierarchy

- System - Marine, Estuarine, Palustrine, Riverine, and Lacustrine
- Class – vegetation types (EM, SS, FO, AB); nonvegetated types (US, RS, UB)
- Subclass – further breakdown of class
- Modifiers
  - Water regime (tidal/nontidal hydrologies)
  - Water chemistry (salinity/pH)
  - Soil (organic/mineral)
  - Special (h, x, d, f, b, etc.)

National Wetlands Inventory Data

- Maps
- Statistics
- Reports
  - Status
    - National (based on statistical sampling)
    - State/Local (based on mapping)
  - Trends
    - National (based on statistical sampling)
    - Regional (based on statistical sampling)
    - Local (based on mapping)

NWI Reporting

- National/Regional Status & Trends
  - Acres of wetlands lost by major type
    - PEM, PFO, PSS, PUB, E2EM, E2US…etc
- State and Local Status
  - Acres of wetlands by specific types
- Local Trends
  - Acres of wetland lost by specific types
    - Down to subclass, water regime, and special modifiers

Conterminous U.S. Wetlands 1997

- 95% of wetlands = Palustrine (100.2M)
  - 51% Forested
  - 25% Emergent
  - 18% Scrub-Shrub
  - 6% Pond
- 5% = Estuarine (4.6M)
  - 74% Emergent
  - 13% Scrub-Shrub
  - 13% Nonvegetated

Some Questions

- How many wetlands are there?
- What is the size range of wetlands?
- What is the average size of a given wetland type?
- How many wetlands are in various size classes?

Other Questions

How much acreage and how many wetlands

- occur along rivers? along streams? in lake basins?
- are isolated? are sources of streams?
- have inflow but no outflow? are connected to other wetlands?

What types of ponds are there and what is their extent?

- Natural vs. Artificial
- Surrounding land (cropland, urban, forest, etc.)
- Different types of natural ponds

What is the significant of wetland losses, gains, and changes in type? How has this affected wetland functions?

You can’t get that information easily from the NWI database…so….

Need to add other wetland properties to the NWI wetlands or perform GIS analyses to extract data.

Needed Characteristics

- Need information
  - Landscape position
  - Landform
  - Water flow direction
  - Further classification of waterbodies (e.g., pond types)
- Most of these features can be interpreted from the maps/photos during the NWI data production phase

Value of Enhancing the NWI Database

- Better characterization of wetlands for national wetland database
- Perform landscape-level functional assessments
- Help assess significance of wetland losses
- Note: This is not classification for classification sake; the objective is to increase the functionality of the national wetland database to predict wetland functions.

Add New Descriptors to the NWI Database

LLWW Descriptors

- Landscape Position - relationship between a wetland and an adjacent waterbody or not
- Landform - shape or physical form
- Water Flow Path - directional flow of water
- Waterbody Type – more specificity

Landscape Position – Marine and Estuarine

Essentially same as Cowardin et al. types.

Landscape Position - Lentic

Lacustrine wetlands plus palustrine wetlands along lakes and reservoir (e.g., in the “lake basin”) and likely affected by lake levels

Landscape Position - Lotic

RIVER

STREAM

Palustrine wetlands along rivers and streams subject to periodic flooding.

Landscape Position - Terrene

Many palustrine types

- Isolated wetlands
- Flatwood wetlands
- Stream-source wetlands
- Wetlands decoupled from water

Landforms

- Slope
- Island
- Fringe
- Floodplain (basin, flat)
- Interfluve (basin, flat)
- Basin
- Flat

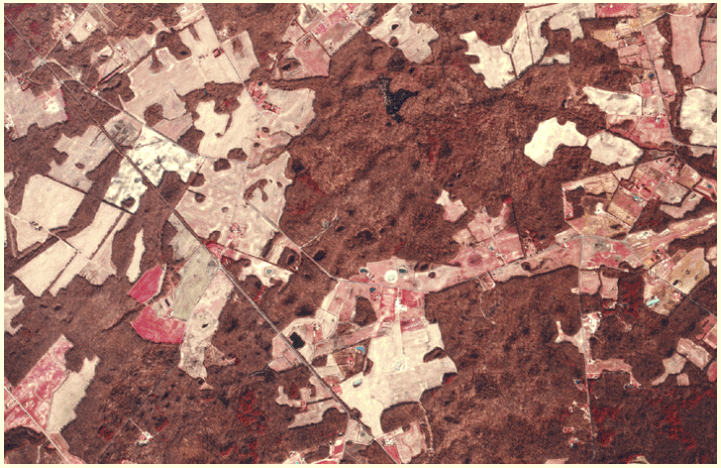
Fringe

Wetlands in water most of the time (including floating bogs and semipermanent marshes), in creekbeds, and along estuarine and marine shores (with unrestricted tidal flow).

Floodplain

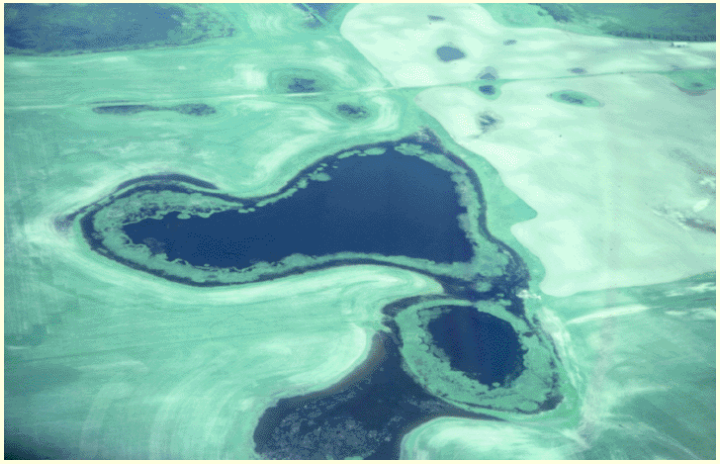
Wetlands on alluvial soils subject to flooding (on the 100-year floodplain)

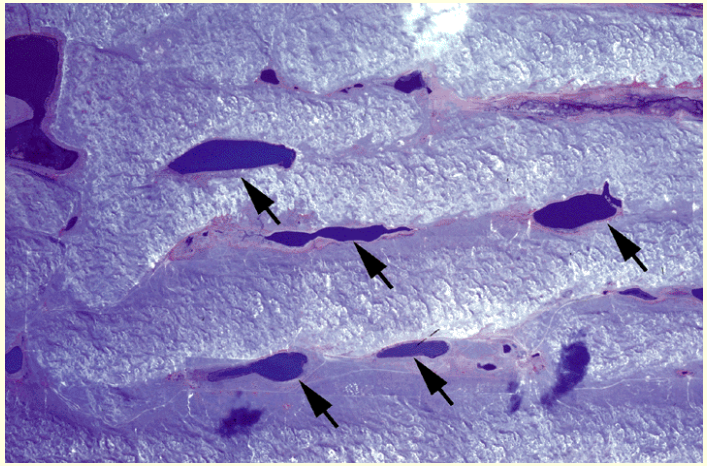
Interfluve



Wetlands on interstream divides (interfluves) – broad flats between streams.

Basin – depressional wetlands





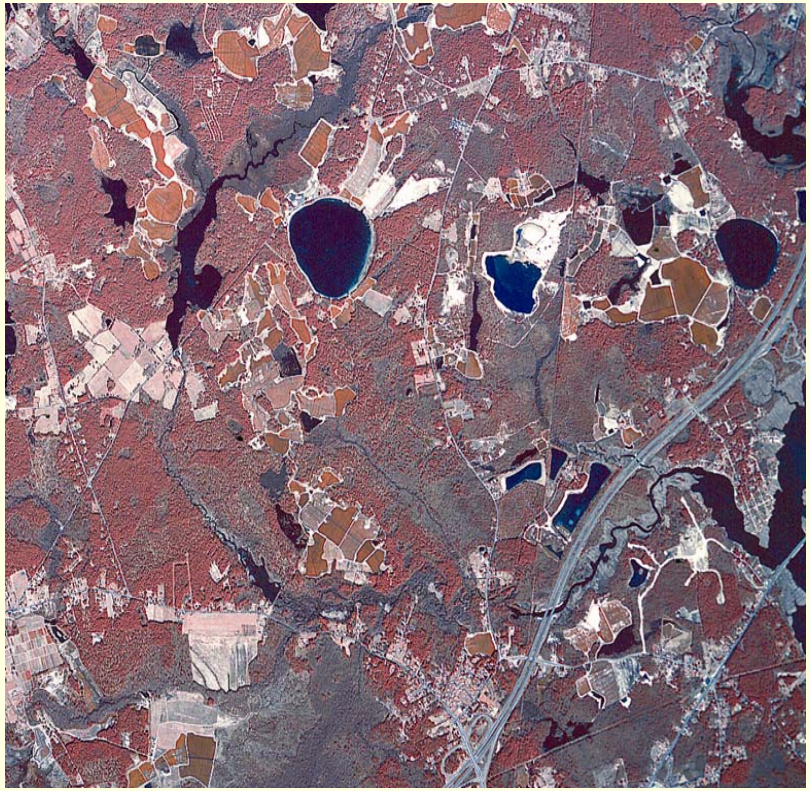
Water Flow Path

- Bidirectional Tidal
- Bidirectional Nontidal
- Throughflow (perennial, intermittent, entrenched, artificial)
- Outflow (perennial, intermittent, artificial)
- Inflow
- Isolated
- Paludified

Waterbody Types

- River and Stream Gradients (tidal, dammed, intermittent, high, middle, and low)
- Lakes (e.g., natural, dammed river valley-reservoir, other dammed, excavated)
- Ponds (e.g., natural, artificial, beaver, sinkhole, farm, golf, prairie pothole, vernal, stormwater treatment, sewage lagoon)
- Estuary (e.g., drowned river valley, bar-built)
- Ocean (e.g., open, reef-protected, atoll, fjord)

Map or Photo Interpretation



Study Areas – Classification/Reports Completed

- Casco Bay Watershed (ME)
- New York City Water Supply Watersheds
- 11 Small watersheds (NY)
- Coastal Bays Watershed (MD)
- Nanticoke River Watershed (MD/DE)
  - 1998 and Pre-settlement analyses
- Pennsylvania Coastal Zone

Study Areas – Classification Completed and In Review

- Cape Cod and the Islands (MA)
- New Jersey (entire state)

Study Areas – Classification in Progress/Reports planned for 2010

- Rhode Island (entire state)
- Long Island, New York
- Horry and Jasper Cos., South Carolina
- Mississippi Coastal Zone
- Texas coastal sites – Houston, Galveston, and Corpus Christi
- Michigan watershed (MI DEQ effort)
- Pilot areas elsewhere

Watershed Characterization/Assessment Reports

- Introduction
- Methods
- Results
  - Wetland Characterization – tables/maps
    - NWI Types
    - LLWW Types
    - Pond and Other Waterbody Types
  - Wetland Functional Assessment – tables/maps
    - 9-11 Functions
  - Other topics – (OPTIONAL)
    - Wetland Trends, Threat Indices?
    - Wetland Restoration Sites
    - Watershed Condition – Natural Habitat Integrity Indices

Wetland Reports

- Reports will be posted online at NWI website:

http://www.fws.gov/nwi/

U.S. Fish & Wildlife Service

Wetlands of the Sodus Creek Watershed

Wayne County, New York

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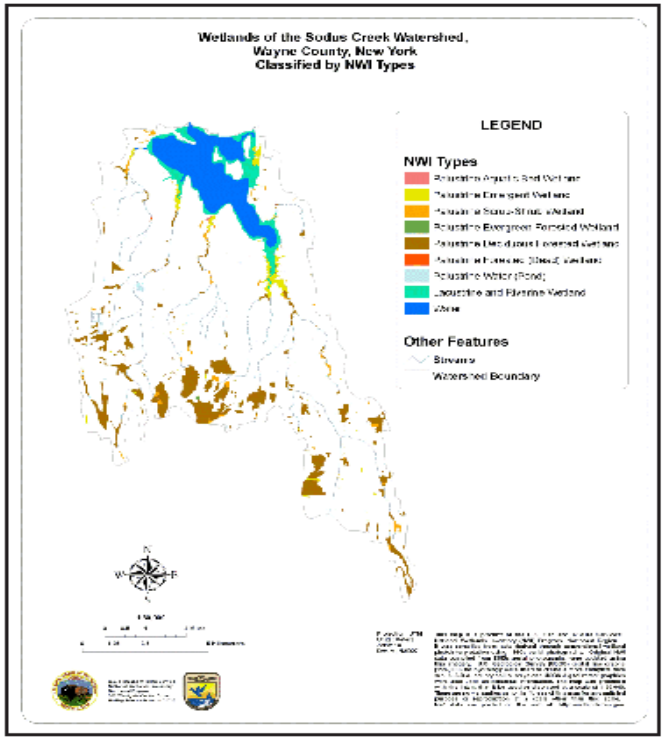
September 2006



Sodus Creek Watershed, NY

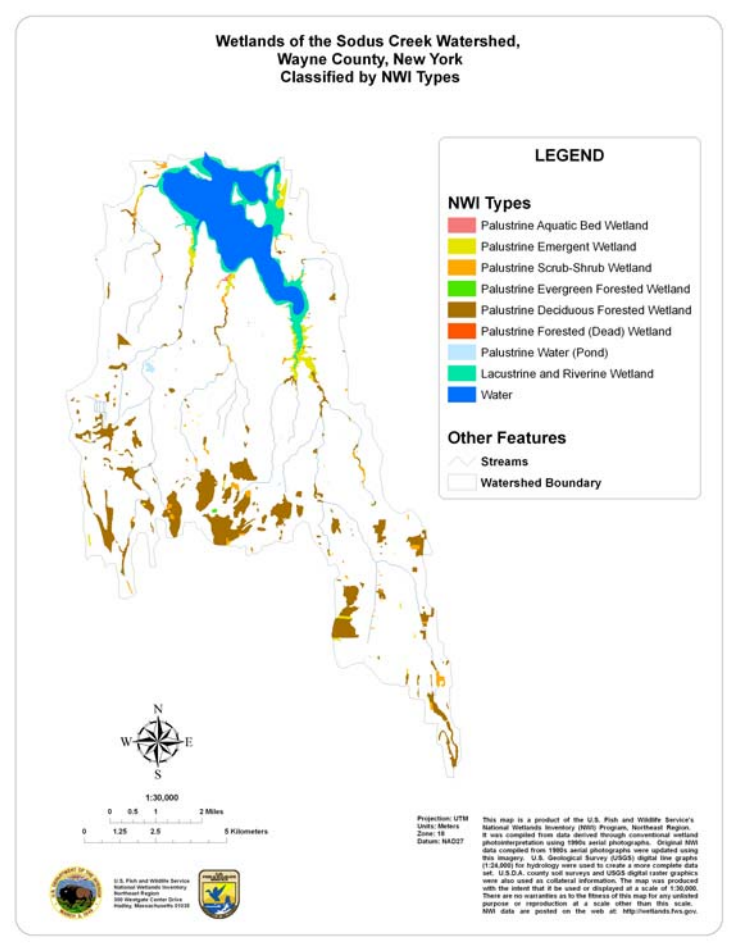
NWI

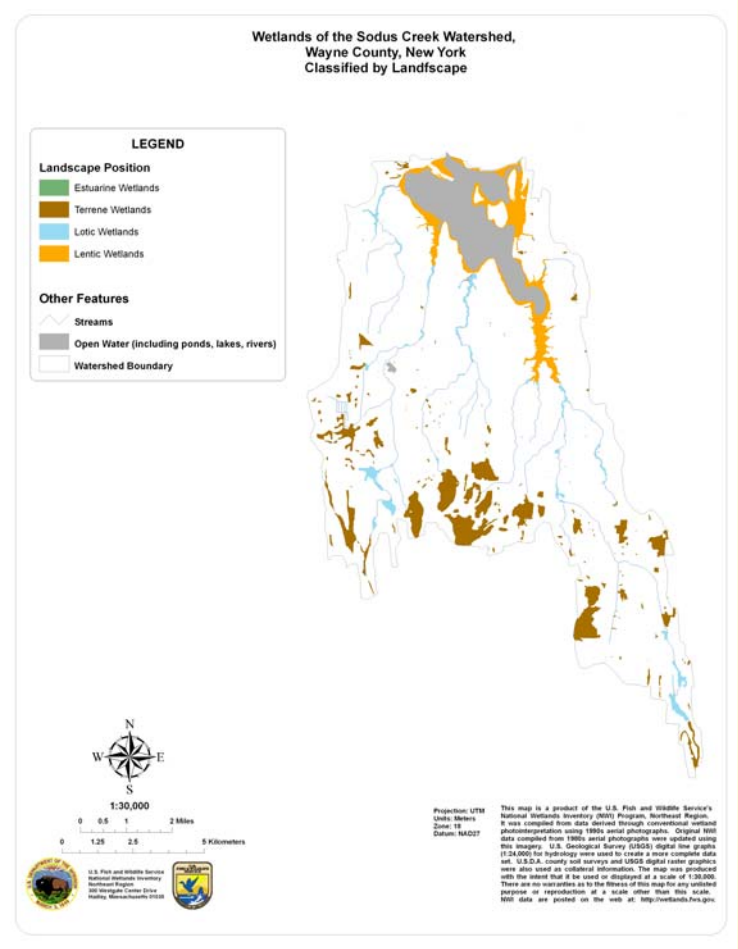
Type	Acres
LAB	11
LUS	882
	(893)
PEM	321
PFO1	2270
PFO4	5
PFO5	2
PSS1	221
PSSS4	12
PUB	47
	(2886)
Total	3779

LLWW

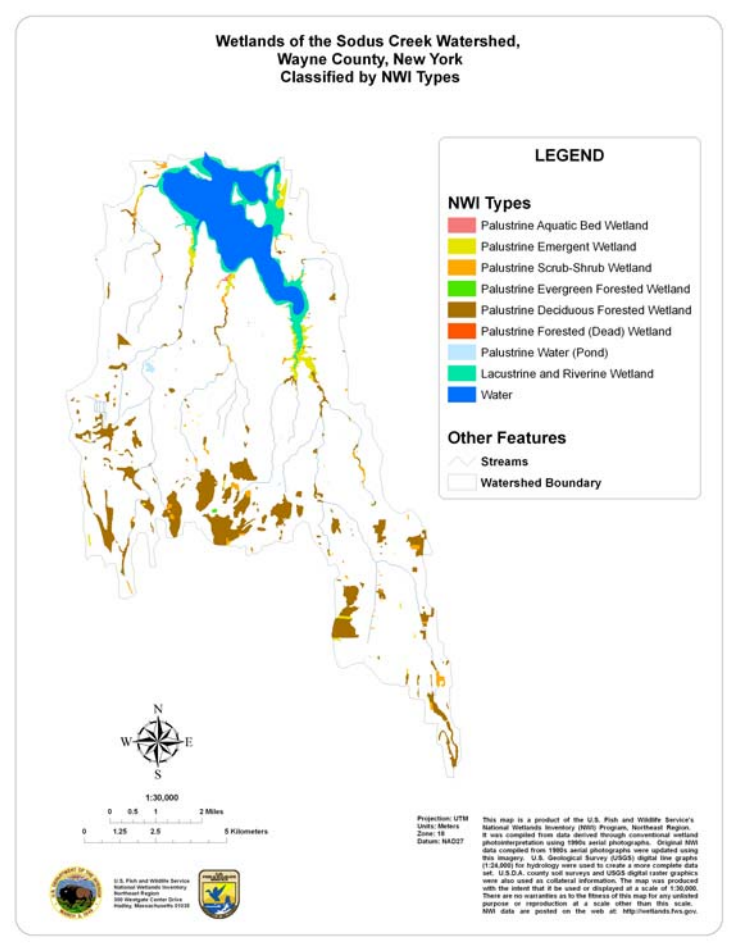
Type	Acres
LEBATH	39
LEFRBI	891
LEFRTH	246
	(1175)
LSBATH	289
LSFLTH	113
LSFRTH	34
	(436)
TEBAIS	560
TEBAOU	1379
TEFLIS	50
TEFLOU	110
TESLOU	15
	(2114)
Ponds	Rest

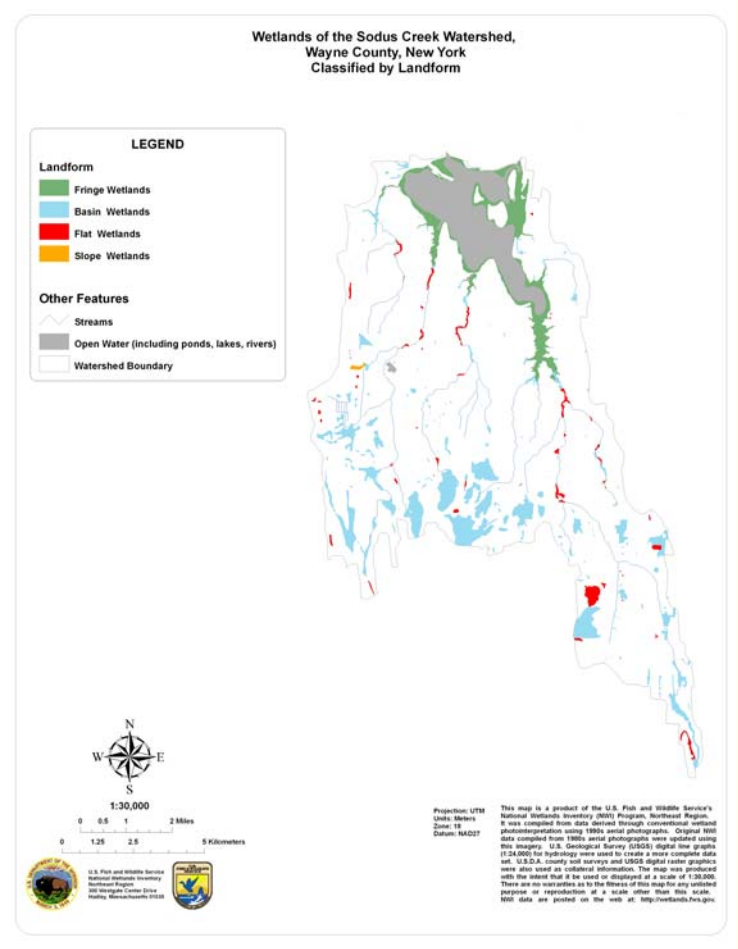
Maps – NWI/Landscape Position



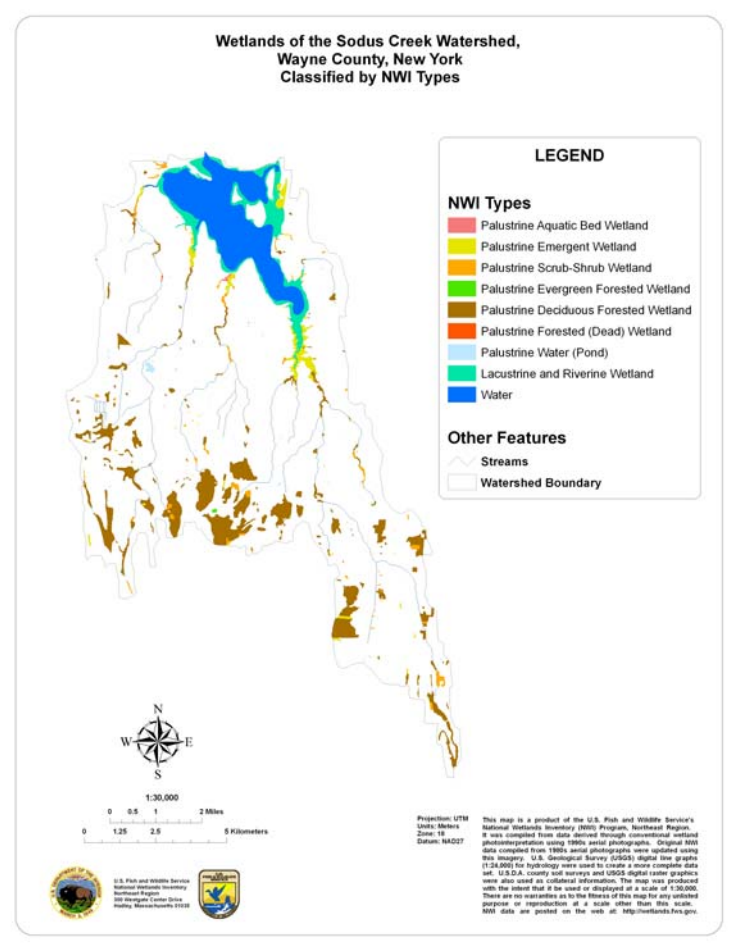


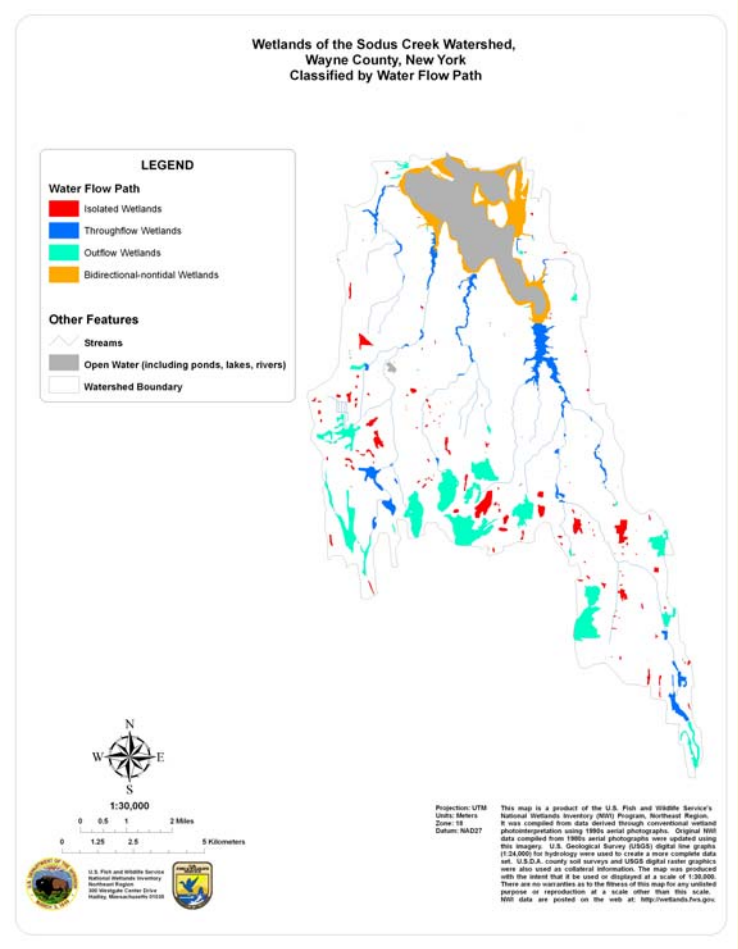
Maps – NWI/Landform





Maps – NWI/Water Flow Path





Preliminary Functional Assessment

- Possible Functions
  - Surface Water Detention
  - Streamflow Maintenance
  - Shoreline Stabilization
  - Nutrient Transformation
  - Coastal Storm Surge Detention
  - Sediment Retention
  - Carbon Sequestration (in development)
  - Fish and Wildlife Habitat

Developing Functional Correlations

- Correlate Functions with Characteristics
  - Some emphasize LLWW descriptors
    - Surface Water Detention
    - Streamflow Maintenance
  - Some only use NWI
    - Nutrient Transformation
    - Habitat for Other Wildlife
    - Carbon Sequestration
  - Others rely on NWI + LLWW
    - Shoreline Stabilization
    - Sediment Retention
    - Habitat for Fish and Shellfish
    - Habitat for Waterfowl and Waterbirds

Coordinated Effort To Develop Correlations

- Reviewed literature
- Worked with wetland specialists in the Northeast
  - Maine Wetland Advisory Group
  - NYCDEP
  - Nanticoke Wetlands Study Group
  - FWS biologists
  - Others
- Recent review by other wetland scientists

Functions – Maps and Stats

SODUS CREEK WATERSHED

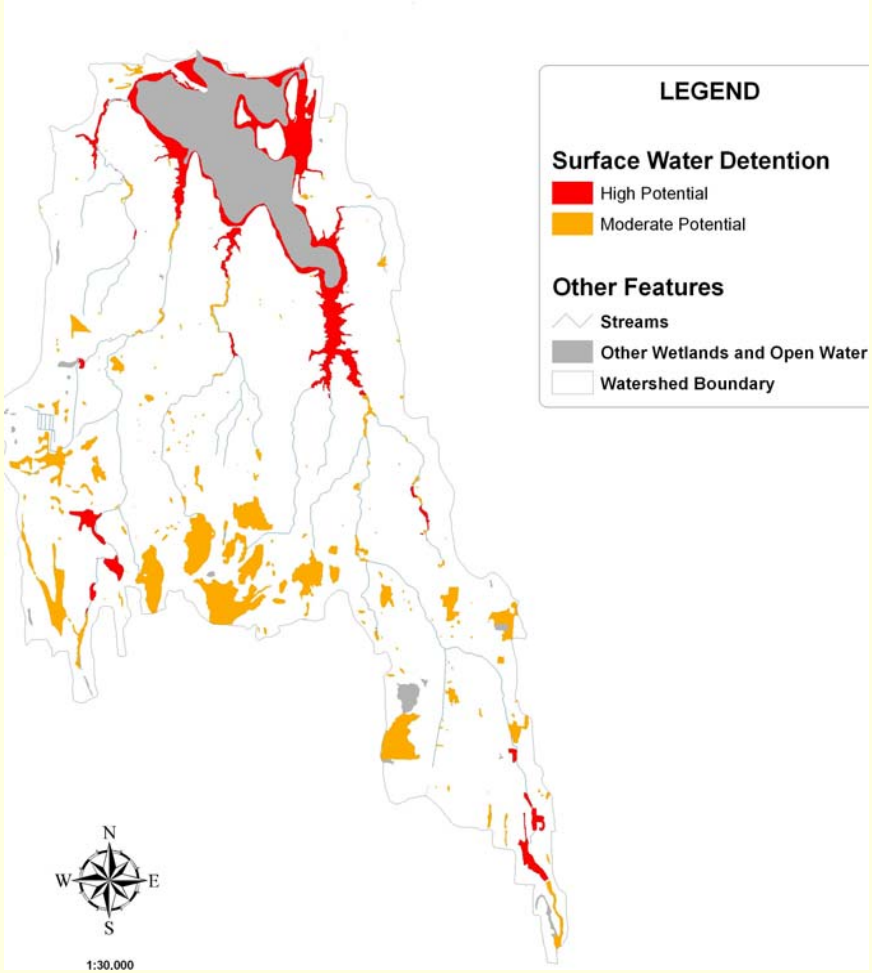
NEW YORK

Surface Water Detention

High = 1515 acres

Moderate = 2090 acres

Approx. 95% of wetlands

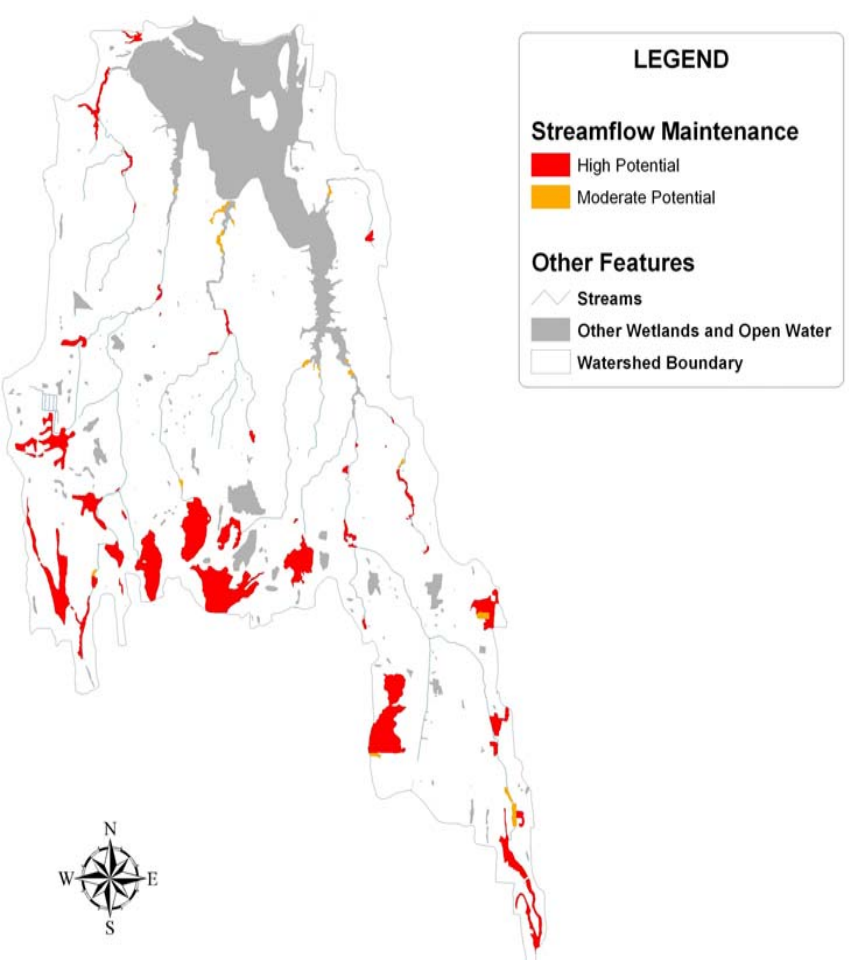


Streamflow Maintenance

High = 1778 acres

Moderate = 92 acres

Approx. 49% of wetlands

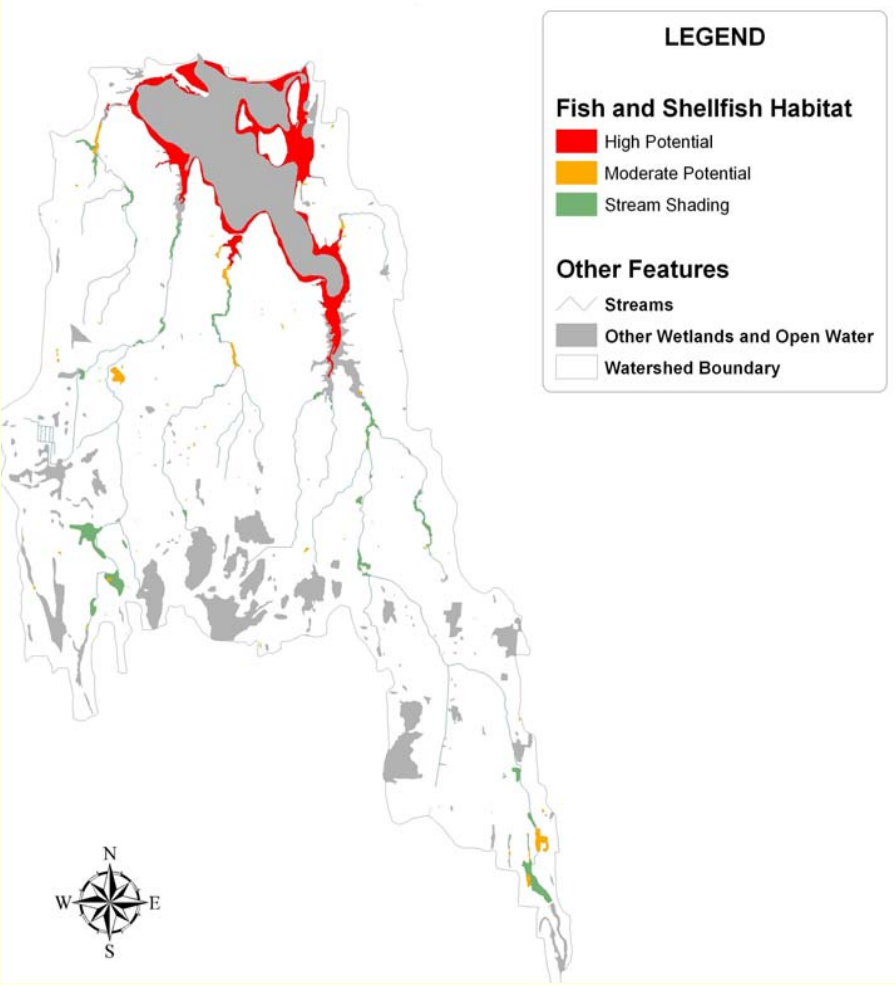


Fish and Shellfish Habitat

High = 926 acres

Moderate = 120 acres

Approx. 28% of wetlands

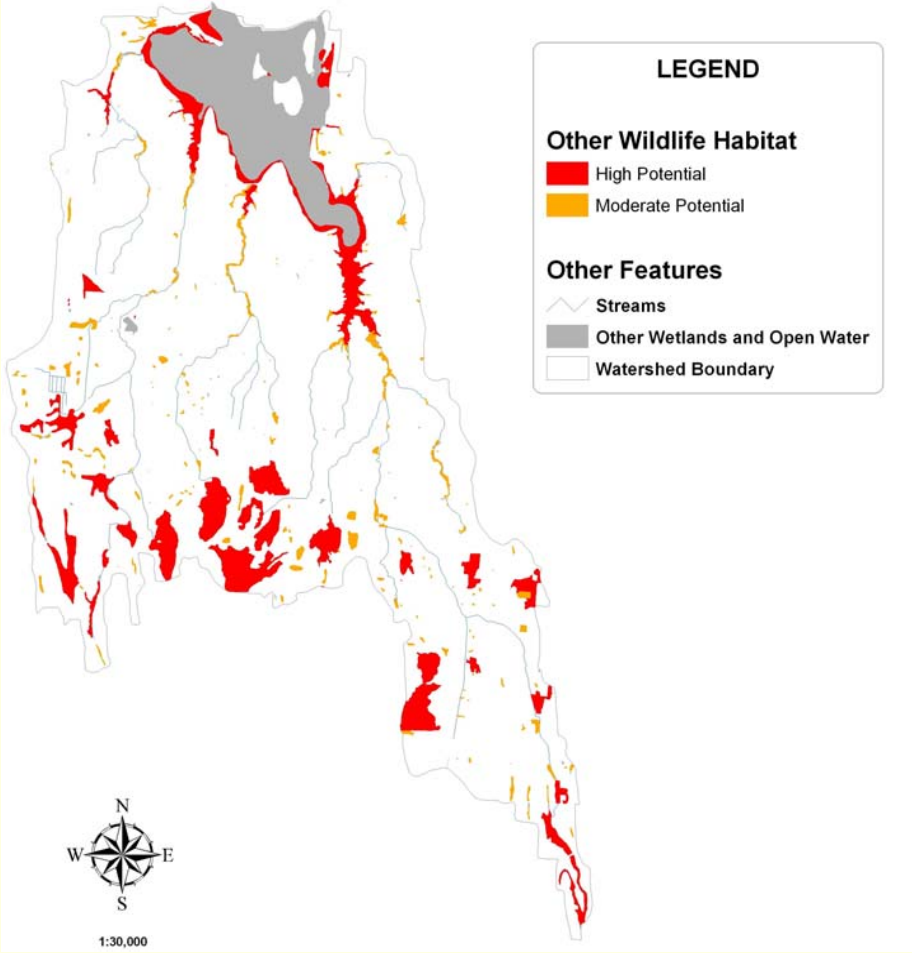


Other Wildlife Habitat

High = 2778 acres

Moderate = 599 acres

Approx. 90% of wetlands



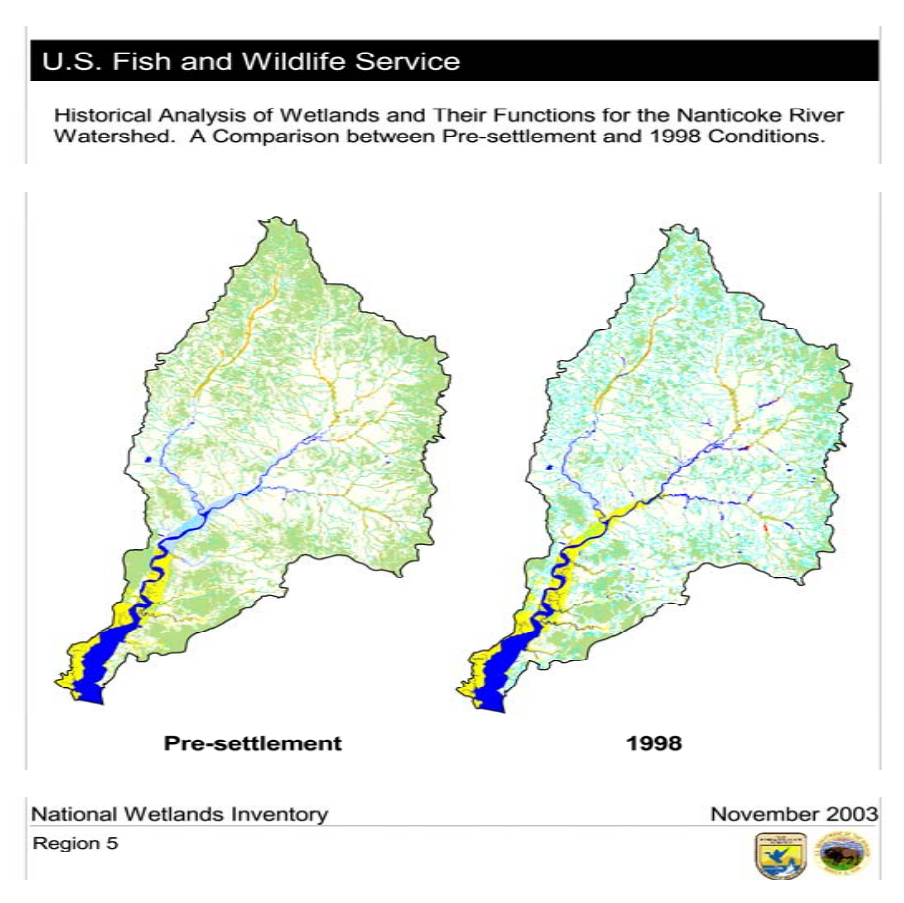
Limitations of Landscape-level Assessment

- First approximation
- Source data limitations
  - All wetlands not shown
  - Possible upland inclusions
  - All streams not shown (can improve by photointerpretation of digital imagery)
  - Age of data
- LLWW wetland classifications were based largely on map interpretation but interpreters now examining aerial photos re: streams (field review variable)
- Correlations between functions and characteristics = work in progress (report available for Northeast US; most applicable nationwide, will conduct major review this year – your participation is welcomed)

Assessing Significance of Wetland Change

- Can also use techniques to:
  - Determine the types of wetlands lost (e.g., vegetated) vs. the types gained (e.g., ponds) and predict functional losses based on additional properties
  - Predict functions of potential wetland restoration sites within a watershed or large geographic area

Historical Analysis – Cumulative Impacts



Functional Losses for Nanticoke

- Surface Water Detention -36%
- Streamflow Maintenance -64%
- Nutrient Transformation -47%
- Sediment Retention -46%
- Coastal Storm Surge Detention -23%
- Fish/Shellfish Habitat -28%
- Waterfowl/Waterbird Habitat -28%
- Other Wildlife Habitat -41%

Uses of Enhanced NWI Data

- Watershed characterization of wetlands
- Landscape-level wetland functional assessments
- Functional loss assessments as part of wetland trend studies
- Restoration planning

Bottomline

- Adding LLWW descriptors to the NWI wetlands increases the functionality of the NWI database and allows reporting on the status and trends of wetland functions for large geographic areas.