Off-setting Pollutant Loads: Wetland Restoration Partnership Benefits Water Quality and Wildlife in Eastern North Carolina

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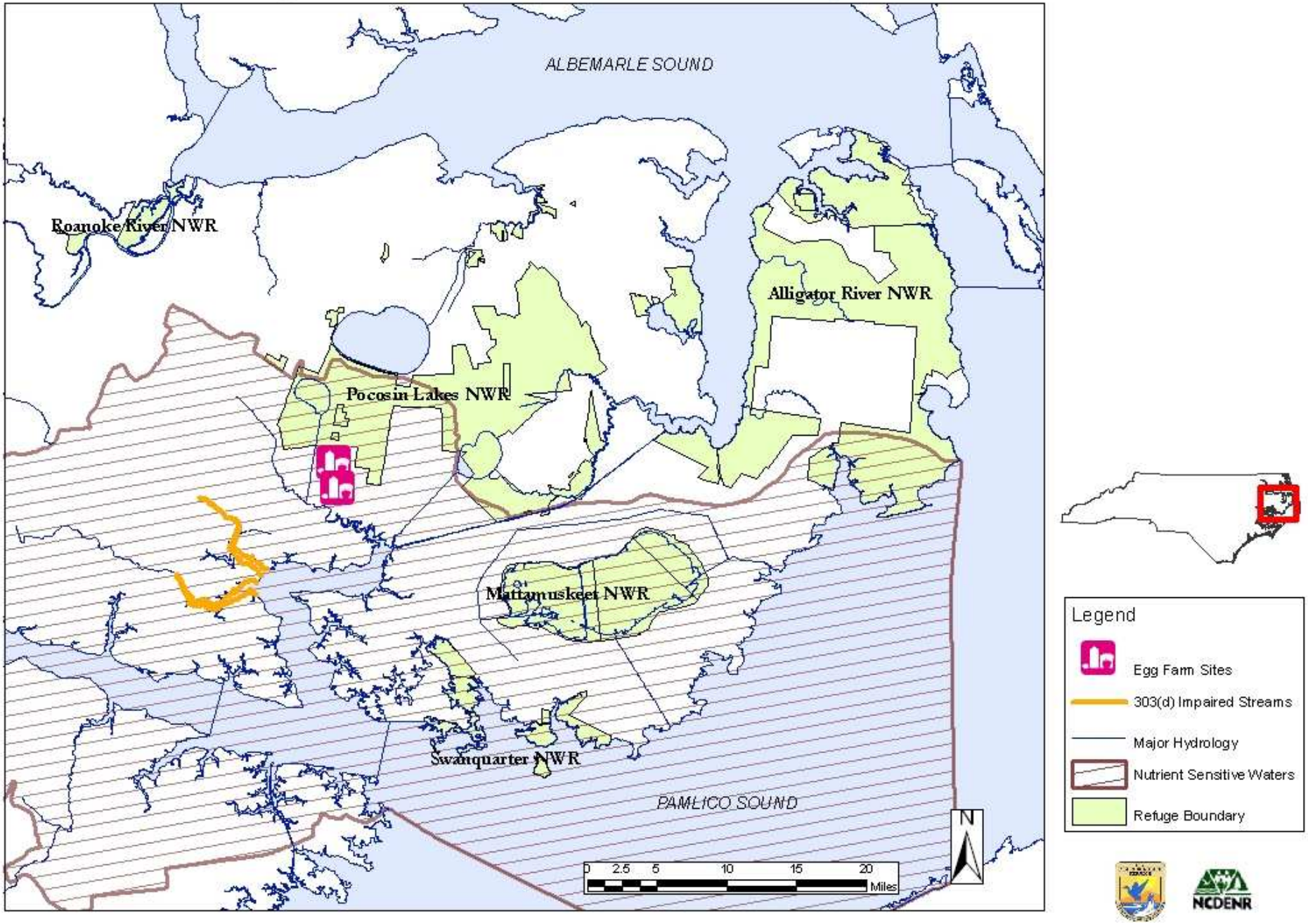
Overview

- Project History
- EC Program Nexus
- Wetland Restoration Partnership
  - Restoration approach
  - Benefits of restoration
- Project Implications
- Summary

Project History

- March 2003 - FWS contacted regarding new large-scale egg production facility
  - 4 million layer hens
  - Estimated NH_3-N emissions of 4.8 million lbs/yr
- Proposed facility location
  - Within one mile of Pocosin Lakes NWR
  - In watershed state-designated as "nutrient sensitive"
  - Within 15 mi of streams 303(d)-listed as "impaired" due to nutrient enrichment from ag sources

Layer Operation Vicinity Map

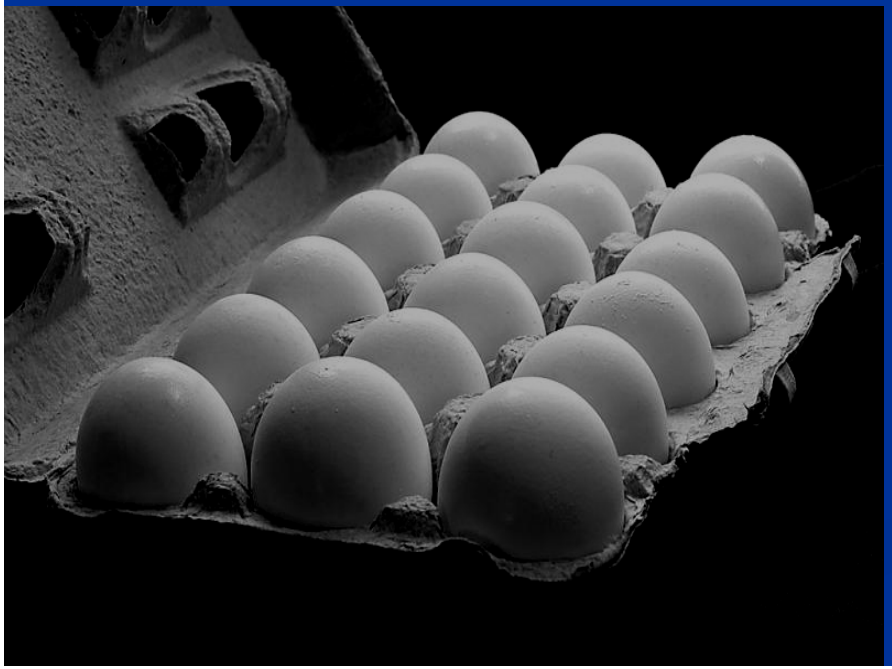



Lake Phelps
Pungo Lake
Pocosin Lakes NWR Boundary
0.5 mile
Prevailing seasonal wind direction
NE
Layer Farm During Construction (7 of 14 houses complete)
Photo: H. Jacobs, PTRF

What is the problem?

Potential for nutrients and other wastes to impact local fish and wildlife, sensitive areas, and the refuge visitor experience

Nitrogen loading to this area is very important because:



1) Existing nutrient over-enrichment
2) Significance of estimated N loads relative to existing sources
3) N loads from facility largely unregulated

Environmental Contaminants Program's Technical Assistance Role

- Pollution Prevention

  Proactively worked with applicant and state during project permitting to ameliorate pollution concerns

- Investigation

  Conduct on-refuge investigation to determine potential effects of operation on refuge resources

- Restoration

  Recommended innovative approach to off-set new N loads through preservation and restoration projects aimed at balancing local N loads

EC Program Role: Prevention

EC Best Management Practices recommendations

- Litter management to reduce NH_3 volatilization
- Exhaust air treatment
- Expanded stream setbacks for land application areas
- Emissions and water quality monitoring
- Implementation of offset projects to prevent a net increase in local watershed nutrient loads

EC Program Role: Prevention

- Recommended BMP and nutrient offsets were not embraced voluntarily by applicant
- State regulators hesitant to require BMPs more stringent than federal CAFO rules without enforceable air and water quality NH_3 standards

so . . . . .

Photo: CTB Inc, http://www.ctbinc.com/

EC Program Role: Investigations

On-refuge investigation initiated in 2005:

- Determine baseline and post-operation atmospheric N deposition to refuge
- Document water quality conditions in refuge waters
- Conduct enrichment bioassays to determine potential water quality degradation / eutrophication

Wet deposition collection site near southern refuge boundary. Photo: S. Ward, USFWS

With minimal success with pollution prevention and an ongoing investigation to determine potential pollutant impacts on-refuge……

where's the happy ending?

With minimal success with pollution prevention and an ongoing investigation to determine potential pollutant impacts on-refuge……

where's the happy ending?

EC technical assistance prompted NCDENR to take action beyond the NPDES permitting process

Photo: S.Ward, USFWS

Recall…

EC Best Management Practice recommendations

- Litter management to reduce NH_3 volatilization
- Exhaust air treatment
- Expanded stream setbacks for land application areas
- Emissions and water quality monitoring

Implementation of offset projects to prevent a net increase in local watershed nutrient loads

. . . NCDENR partnership to achieve nutrient offsets

Nutrient Offset Projects Considered

- Buffer establishment or enhancement
- Restoration of suboptimal agricultural lands or other high priority areas
- Land preservation

Photo: E. Hinesley, NCSU

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EC Program Role: Restoration

EC staff recommended expansion of hydrology restoration underway at Pocosin Lakes NWR as offset


Photo: S.Ward, USFWS

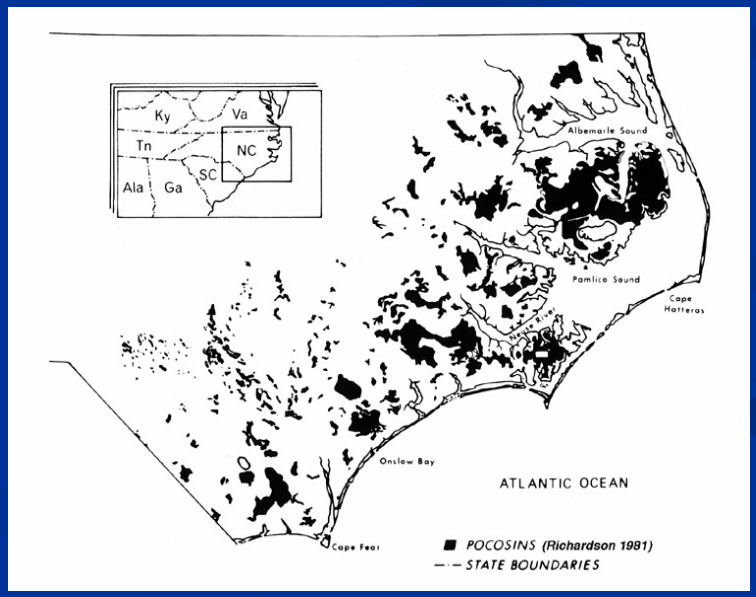
Why?

- Peatland restoration allows substantive nutrient, metal and carbon sequestration benefits
- Meets the Service's goals for restoring important wildlife habitat

What are pocosins?

- unique wetlands (southeastern shrub bogs)
- dense growth of mostly broadleaf evergreen shrubs with scattered pond pine
- thick layer of underlying peat soils (Histosols) act as chemical "sponge" over time
- 70% loss of pocosin habitat in NC since 1962

Healthy pocosin wetlands



1962 pocosin distribution (Richardson 2003)

Pocosin restoration = ideal N offset

- Draining for defunct ag and peat mining operations diminished nutrient (and C & metal) retention
- Aerobic soil conditions in drained peatlands promote organic matter decomposition and loss of N to atmosphere
- Artificial drainage networks enhance nutrient delivery to sensitive downstream waters
- Since acquisition in 1990, hydrology restoration a priority; project would accelerate that effort

Photo: Hollingsworth, USFWS

Restoration Approach

- Install water control structures and culverts
- Use raised roads along the canals as levees
- Re-saturate historically drained areas via rainfall
- Promote sheet flow through water level management

Aerobic Condition		Anaerobic Condition
loss of nutrients, C and Hg via oxidation	→	nutrients, C and Hg sequestration
(SOURCE)		(SINK)

Benefits of Restoration

Nitrogen and carbon sequestration

- Estimated N & C sequestration based on:
  - amount retained in peat as soil genesis is re-established
  - amount retained that would otherwise be lost without hydrology restoration
  - amount retained in the above ground biomass
- Total sequestration potential:
  - 200 lb/ac/year of N
  - 6500 lb/ac/year of C

Photo: S.Ward, USFWS

Recall. . .

Estimated facility NH_3 emissions of 4.8 million lbs/yr (or 3.95 million lb N/yr)

So. . .

Local deposition can vary, but likely range is 10 to 40% of total emissions (or 0.4 to 1.6 million lb N/yr)

Local N deposition (lb/yr) ÷ N retention potential (lbs/acre/yr) = acres restoration needed

2,000 – 7,900 restored acres needed to offset N loads!

Benefits of Restoration

- 16,000 acres drastically altered peatlands targeted for restoration
- Partnership between NCDENR, Coastal Program and Refuges will restore 7,500 acres

Nitrogen Retained (lbs/ year)	Carbon Retained (lbs/ year)
1,500,000	48,375,000

- When complete, 95% of the estimated worst case N deposition scenario will be offset
- Ongoing restoration will more than balance the remaining N load

Restoration Benefits: Water Quality

Currently

- Soil oxidation and loss contribute nutrients, C and Hg to regional waters
- Canal system exacerbates pollutant export
- Excess N and Hg are sources of watershed impairment

Restoration protects water quality by retarding the off-site loss of soil constituents

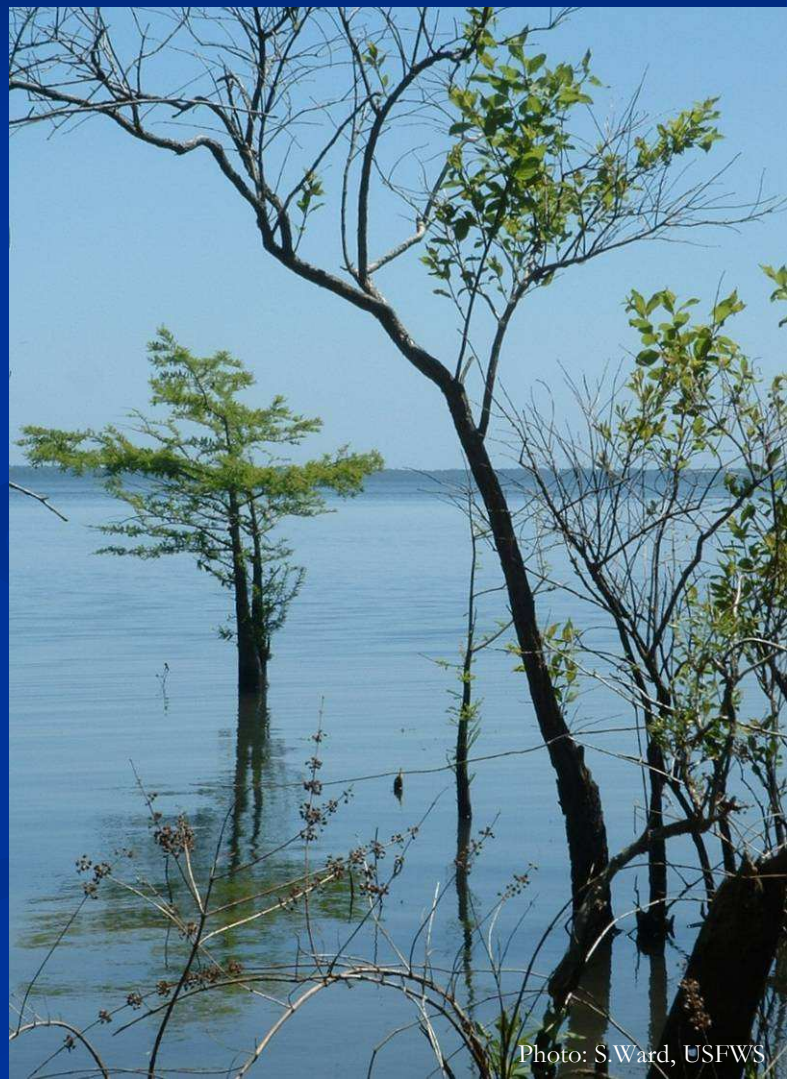
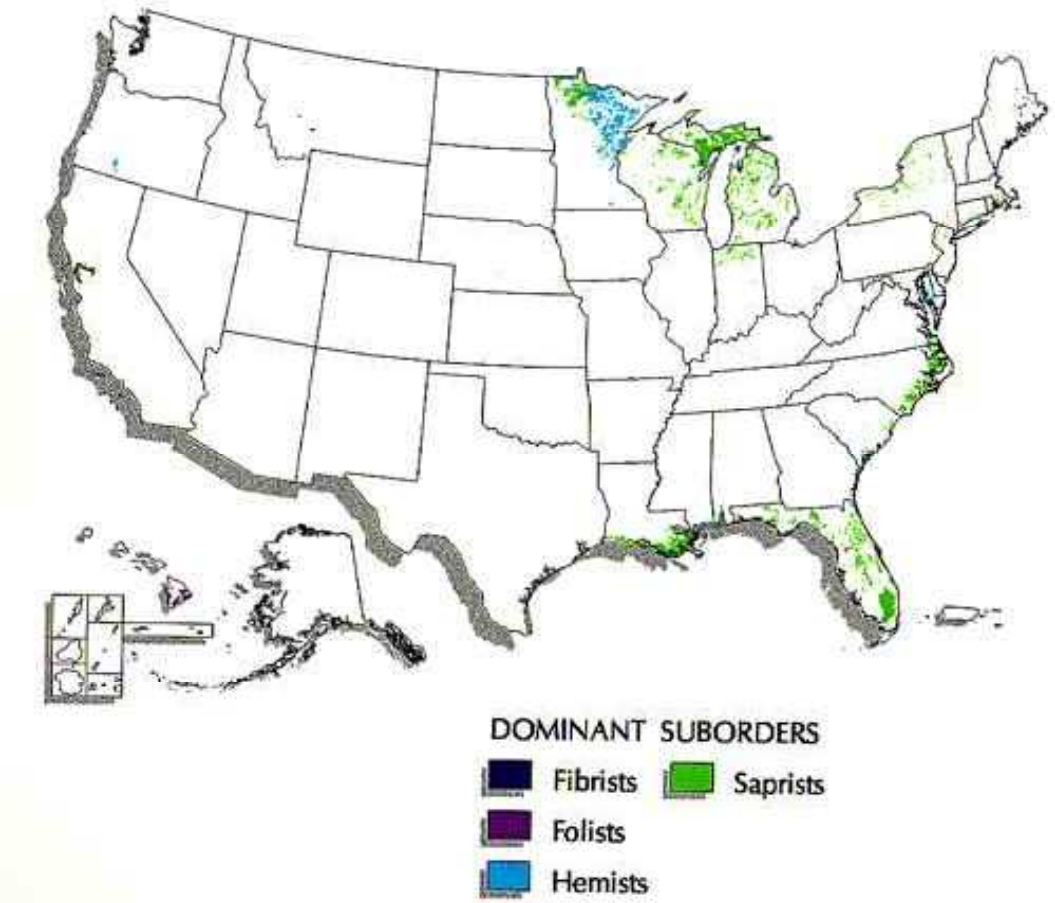


Photo: S.Ward, USFWS

Project Implications

- Wetland restoration, and peatland restoration in particular, has substantial nutrient and carbon sequestration potential
- When prevention is not possible, EC program can support the Service's wetland restoration goals with pollutant offset projects



USDA-NRCS Histosols distribution map
http://soils.usda.gov/technical/classification/orders/histosols_map.html

Project Implications: Climate Change

- Using our C sequestration estimate for peatland restoration (6500 lb C/ac/yr), the project would sequester the amount of C in ~82,000 tons of CO_2/yr

That's equivalent to the average personal CO_2 impact of 11,000 Americans each year

OR

Nearly 1800 times the CO_2 footprint of the Raleigh FO vehicle fleet last year

Source: Inconvenient Truth carbon calculator, climatecrisis.net

Project Implications: Climate Change

- Service wetland restoration projects may be attractive source of credits (and EC program could provide technical basis) in emerging C markets

- Carbon exchange projects largely do not address habitat restoration (opportunity for Service to steer trading to benefit trust resources)

Summary

- Off-setting new pollutant loads with equivalent local pollutant reduction is a sound approach when potential impacts are insufficiently addressed by prevention/minimization efforts
- Wetland restoration is an attractive offset due to pollutant reduction potential and habitat benefits
- Potential for similar restoration projects to be important in carbon markets

EC program technical assistance can foster these opportunities!

Acknowlegdements

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Questions?