Pinelands Commission Wetland Research And Monitoring
Pinelands Ecology
Water-level Monitoring
Frog and Toad Monitoring
Watershed Assessments
Pinelands-wide WQ Monitoring
Natural and Created Wetlands
Upcoming EDC Study
New Jersey Pinelands

- ~1 million acres
- 22% of New Jersey
- Sand and gravel soils
- Acidic soil and water
- Kirkwood-Cohansey aquifer
Annual precipitation ~49 in/yr
Precipitation increasing over time
One-half percolates and other half ET
90% of streamflow is groundwater discharge
Water “tea colored” from iron and organic matter
Often called blackwaters along the Atlantic Coastal Plain

Low pH (3.5 to 4.5)
Low concentrations of ions (soft water)
Low nutrient concentrations
Plants and Animals

~1,350 plant and animal species
~135 plant and animal species are rare
Wildfire

Fire frequency varies among habitat types
Adapted (thick bark, re-sprouts, rhizomes, disturbance, etc.)
Wildfire

Shrubs re-sprout quickly
Epicormic and basal sprouting
Thinner forest with smaller tree crowns or...
Wildfire

...dense pine regeneration from seed
Dwarf Pitch Pine Plains

~12,000 acres of pitch pine and shrub oaks with highest fire frequency
Genetically short, crooked, precocious with serotinous stem cones
Goal is ~20,000 acres per year to reduce fuel and break the ladder.

Most RxB done in February and March.
Human Disturbance

Historically cut over for fuel and charcoal
Excavations for iron, sand, gravel, and clay mining
Succession is slow
Forested Habitats

~70% forested

Range of upland and wetland habitat types
Forested Habitats: Open Pitch Pine

Widely spaced heavily branched pitch pine trees
Open understory of lichens, heather, sand myrtle, pixie, etc.
Open sand patches
Forested Habitats: Open Pitch Pine
Nesting and denning habitat for corn snakes and pine snakes

Forested Habitats: Open Pitch Pine
Forested Habitats: Upland Oak-pine

Black, white, scarlet, chestnut, and post oaks
Pitch and short-leaf pine
Shrub oaks, black huckleberry, low-bush blueberry
Forested Habitats: Upland Pine-oak

Same species, but pine dominated canopy
Forested Habitats: Pitch Pine Lowland

Pitch pine dominated with many shrub species
Mineral soil wetland
Red maple with black gum, pitch pine, and Atlantic white cedar
Various shrub and Sphagnum species
Organic soil wetland
Forested Habitats: Atlantic White Cedar Swamp

Atlantic white cedar and red maple
Various shrub and Sphagnum species
Organic soil wetland
Aquatic Habitats: Coastal Plain Ponds

Usually dry in summer and support rare plants and animals
Aquatic Habitats: Excavated Ponds

Many are similar to natural ponds.
Aquatic Habitats: Streams

Sluggish and quiet with sand, gravel, and wood
Aquatic Habitats: Streams

Tea colored and forested
Stable flooded conditions lead to habitat conversion
Aquatic Habitats: Other Impoundments

Past industrial activities and now developed or recreation lakes
Aquatic Habitats: Abandoned Cranberry Bogs

~11,000 acres in 1919 to ~3,600 acres now
Shallow with lily pads, herbs, and shrubs and maintained by beaver
Aquatic Habitats: Abandoned Cranberry Reservoirs

Upstream water reserves for cranberry harvest
LTEM: Forest Water-level Monitoring

NPS funded

35 forest plots
5 plots for 29 y
30 plots for 12 y

5 forest types
- Pine-oak upland
- Pitch pine lowland
- Pine-hardwood lowland
- Hardwood swamp
- Cedar swamp
1” PVC observation wells
Monthly under baseflow conditions

USGS gaging stations
Applications

Developed hydrology-vegetation models to predict changes in individual species, wetland-indicator groups, and forest types from potential groundwater withdrawals.

Long-term changes in water levels of different forest communities (analysis pending)
NPS funded

37 Coastal-plain ponds

30 Partial-record ponds
4 to 20 years

7 Continuous-record ponds
4 to 12 years
Pressure transducer, communication cable, and desiccant
Installed in metal pipe with metal screened point at bottom
LTEM: Pond Water-level Monitoring

Collects water-level data every hour
Download data every two months
Chytrid fungus and Ranavirus in the Pinelands
Decontamination adds time and cost to monitoring
Applications

Developed hydrology-vegetation models to predict changes in pond vegetation from potential groundwater withdrawals

Long-term changes in pond water levels (analysis pending)

Create synthetic hydrographs from partial-record ponds (analysis pending)

Anuran example…
LTEM: Pond Water-level Monitoring

- Water Depth (cm)
- Actual
- -5 cm
- -10 cm
- -15 cm
- -20 cm
- -25 cm
- -30 cm
- -35 cm
- -40 cm
- -45 cm
- -50 cm

Month:
- A
- M
- J
- S
- O

The graph shows the water level changes over the months from A to O, with actual water levels and various offsets indicating different levels of water depth.
LTEM: Pond Water-level Monitoring

% Metamorphs Surviving vs Reduction Scenarios (cm)

- Spring Peeper
- S. Leopard Frog
- PB Treefrog
LTEM: Anuran Monitoring

NPS funded

20 natural and excavated ponds

Mullica River Watershed

Interface of forest and human-altered land

4x per year
March
April
May
June
LTEM: Anuran Monitoring

Nighttime vocalization surveys
Northern Gray Treefrog

% Occurrence at 20 Ponds

Median # Calling

% Occurrence

Mean # Calling

1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015

0
10
20
30
40
50
60
70
LTEM: Watershed Assessments

- NPS funded
- Mullica River
- Rancocas Creek
- Great Egg Harbor River
- Barnegat Bay

- 273 WQ sites
- 202 vegetation sites
- 253 fish sites
- 194 anuran sites

Two survey rounds
Stream Vegetation Surveys

Aquatic plants
Stream-channel surveys

Wetland plants
2-meter-wide belt transect surveys along the bank
Impoundment Vegetation Surveys

Added for second round of surveys

LTEM: Watershed Assessments
LTEM: Watershed Assessments

Electofish and seine fish in streams
Seine fish in impoundments
Nighttime anuran vocalization surveys
Delineate watersheds and determine land use
Land Use Impacts

Water Quality

- 273 water-quality sites across the Pinelands
- pH 3.8 to 8.0
- SC 24.0 to 331.0
Upstream Upland Land Uses

Water-quality Degradation
- Nutrient enrichment
- Increased dissolved solids
- Elevated pH

Altered Aquatic Communities
- Non-native plants
- Non-native fish
- Non-native frogs
LTEM: Pinelands-wide WQ Monitoring

NPS funded

47 Sites

Mullica River
Rancocas Creek
Great Egg Harbor River
Barnegat Bay

pH
Specific conductance

4x per year
April
June
August
October
Off-stream Impacts

Surrounding Land-use Activities
- Development
- Upland agriculture

Water-quality Degradation?
- Nutrient enrichment?
- Increased dissolved solids?
- Elevated pH?

Altered Aquatic Communities?
- Non-native species invasion?
Surrounding land use
Distance-based measure
Pond-vulnerability and Created-wetland Studies

EPA funded

Natural ponds (99)
Excavated Ponds (52)
Stormwater basins (46)

Water level
pH and SC
Vegetation
Anurans
Fish
Odonates

Compare functional equivalency
Pesticides and Pathogens

Kelly Smalling from USGS NJ Water Science Center
8 ponds, 8 xponds, and 8 stormwater basins
Water, sediment, tadpole food, and tadpoles
~100 current-use pesticides
Swab for chytrid fungus

Completed all field work on both studies
Data management, analysis, and writing next
Endocrine Disruption Study

Point and Non-point Sources of Endocrine Disrupting Compounds and the Potential Effects on Fish and Frogs in the New Jersey Pinelands

Funded by William Penn Foundation - Academy of Natural Sciences
Pinelands Commission, NJ USGS, WV USGS, WV CRU
Streams above and below STPs
Ponds and stormwater basins
Water Chemistry

7 natural phytoestrogens and mycotoxins
35 hormones and hormone conjugates
74 other compounds that include:

(surfactants, fragrances, antioxidants, disinfectants, food additives, plastic components, industrial solvents, polycyclic aromatic hydrocarbons, fecal and plant sterols, phosphate flame retardants, and high-use domestic pesticides)
Endocrine Disruption Study

Fish and Frogs

Hormone activity
estrogenicity, androgenicity, glucocorticoids, vitellogenin (in bass)

Gender
skewed sex ratio can indicate endocrine disruption

Occurrence of testicular oocytes
simultaneous presence of male and female gonadal tissue or intersex

Parasites
an indicator of a suppressed immune system which may be linked to EDCs

Start sampling in 2017