

Eel River

Planning for large scale Atlantic White Cedar restoration

The Ecology and Management of Atlantic White Cedar

June 9-11th, Greenville, North Carolina

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Eel River Project Performance criteria

- 1) Dam removal / fish passage restoration
- 2) Restore stream / improve habitat
- 3) Restore at least some bog areas
- 4) Diversity of wetland habitats (Atlantic White Cedar?)
- 5) Educational opportunities / interpretive signs
- 6) Walking trails

Location:
3.5 miles from
Plymouth,
MA

Area enlarged in next slide

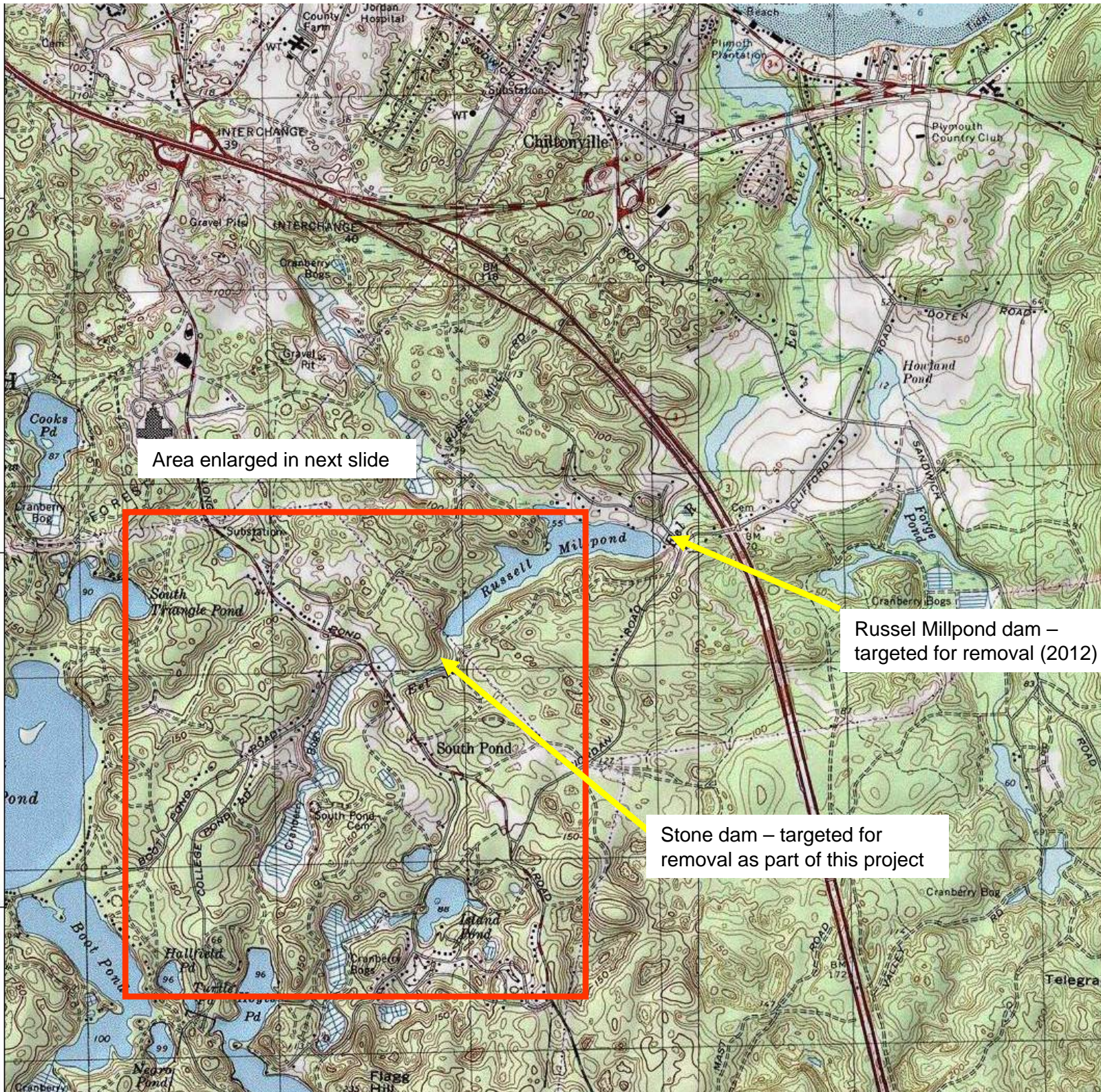
Russel Millpond dam –
targeted for removal (2012)

Stone dam – targeted for
removal as part of this project

41°56,000' N

41°55,000' N

41°54,000' N



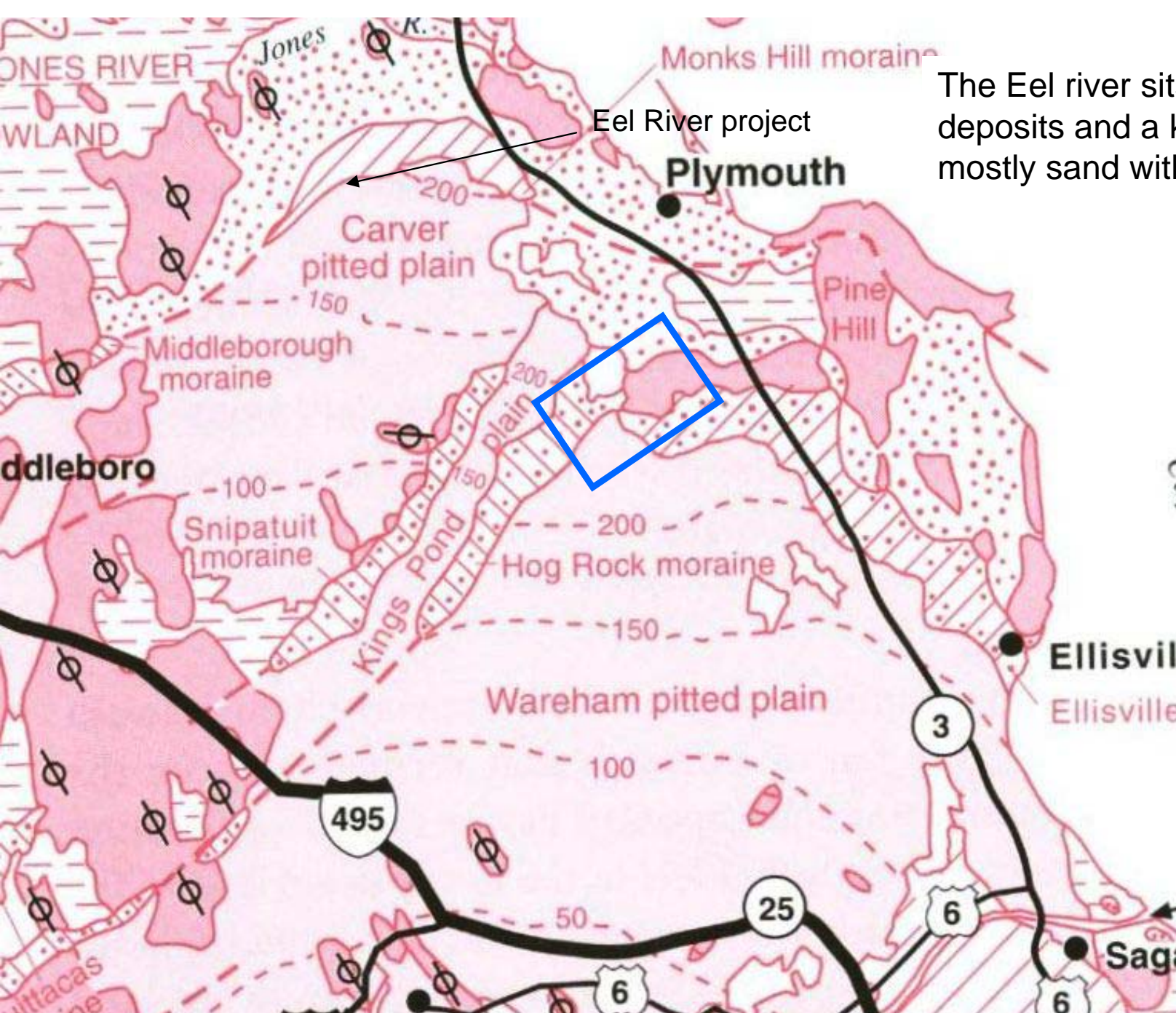


Stone Dam

Plymouth Township has
700+ kettle hole bogs

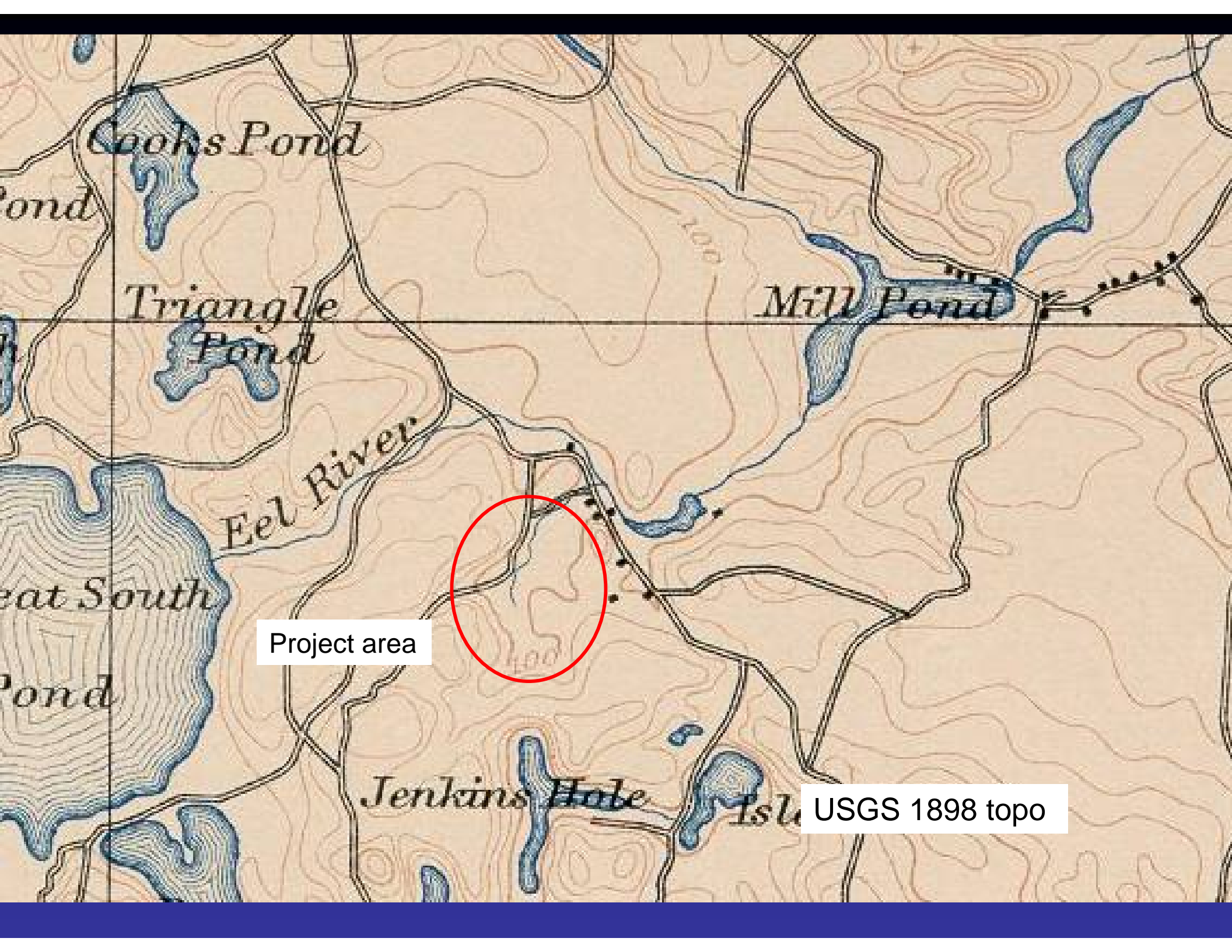
Most have been
converted to
cranberry culture

Bog complex



The Eel river sits at the junction of till deposits and a kame delta, so is mostly sand with some gravel

- | | | | |
|---|---|---|---|
|  moraine |  kame and kame deltas |  glacial lake deposits |  till deposits |
|  kame moraine |  glacial stream deposits |  drumlin | |



Cooks Pond

Pond

Triangle Pond

Mill Pond

Eel River

Great South

Pond

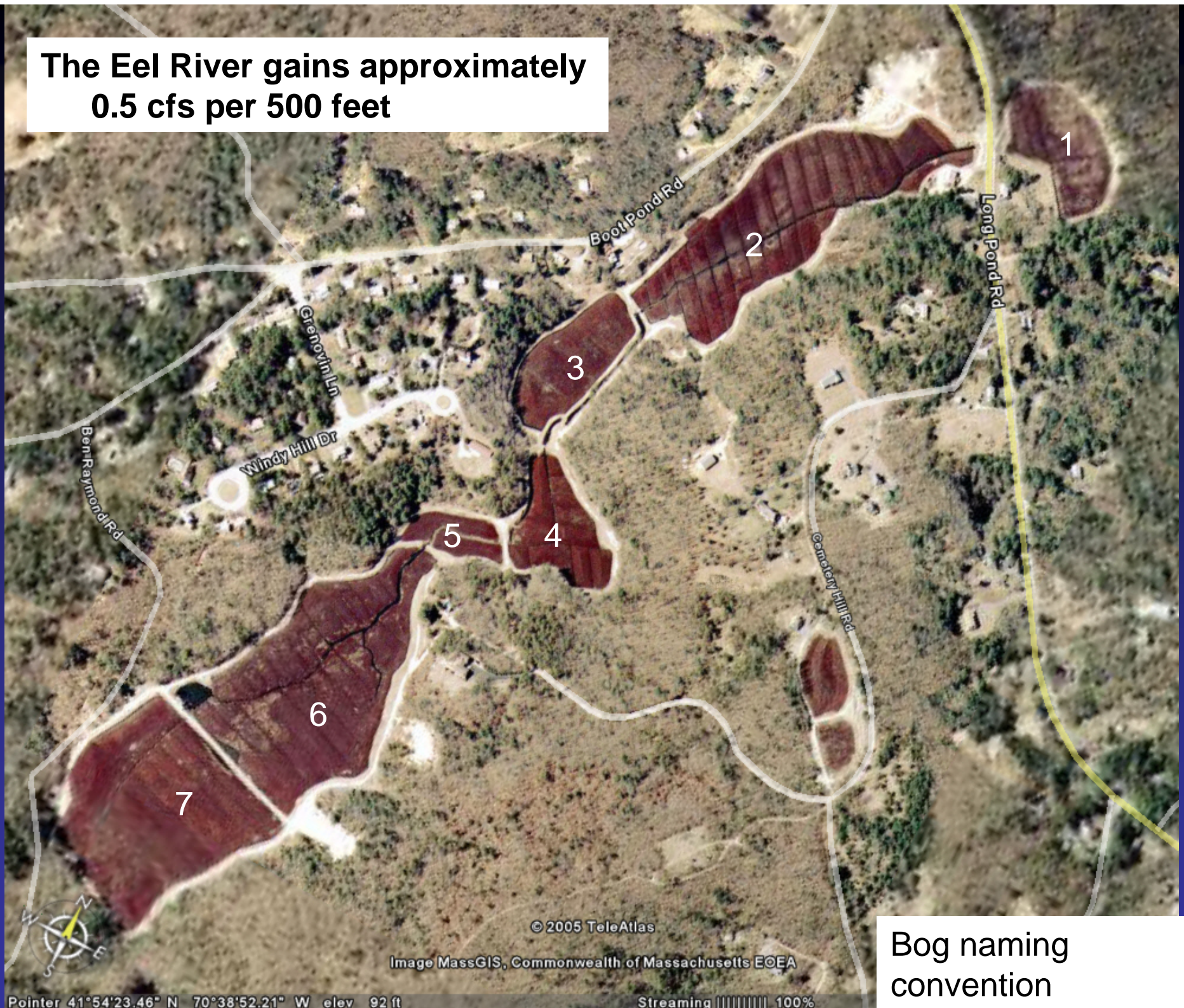
Project area

Jenkins Hole

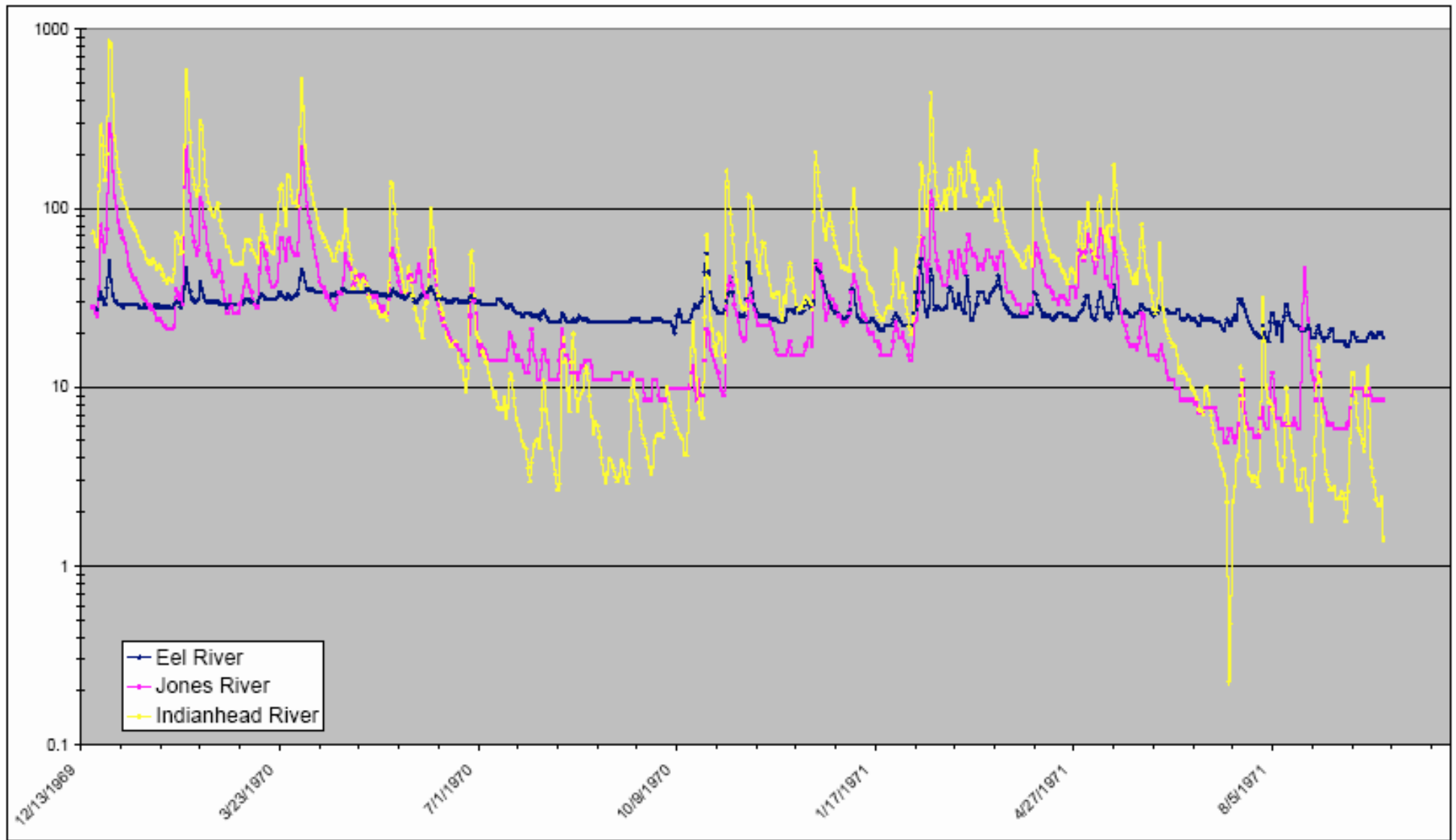
Isle

USGS 1898 topo

The Eel River gains approximately
0.5 cfs per 500 feet



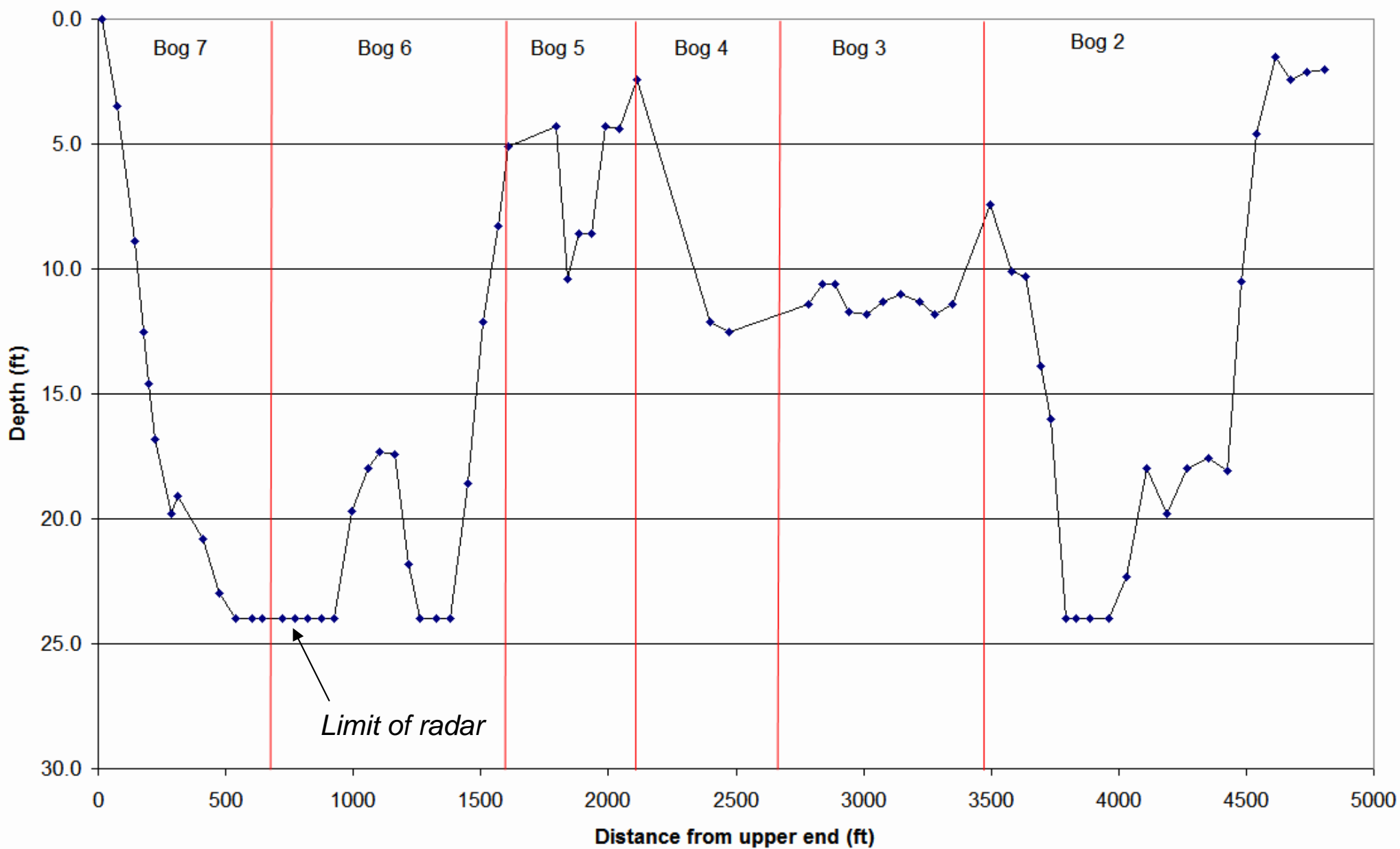
Bog naming
convention



Eel river and nearby streams - flow at USGS gauge

The Eel River is dominated by groundwater flow

Eel River - Peat depths



Sand Depth

- 100 probes (rebar)
- 9 test pits



The bog system has a perimeter road for excellent site access



3

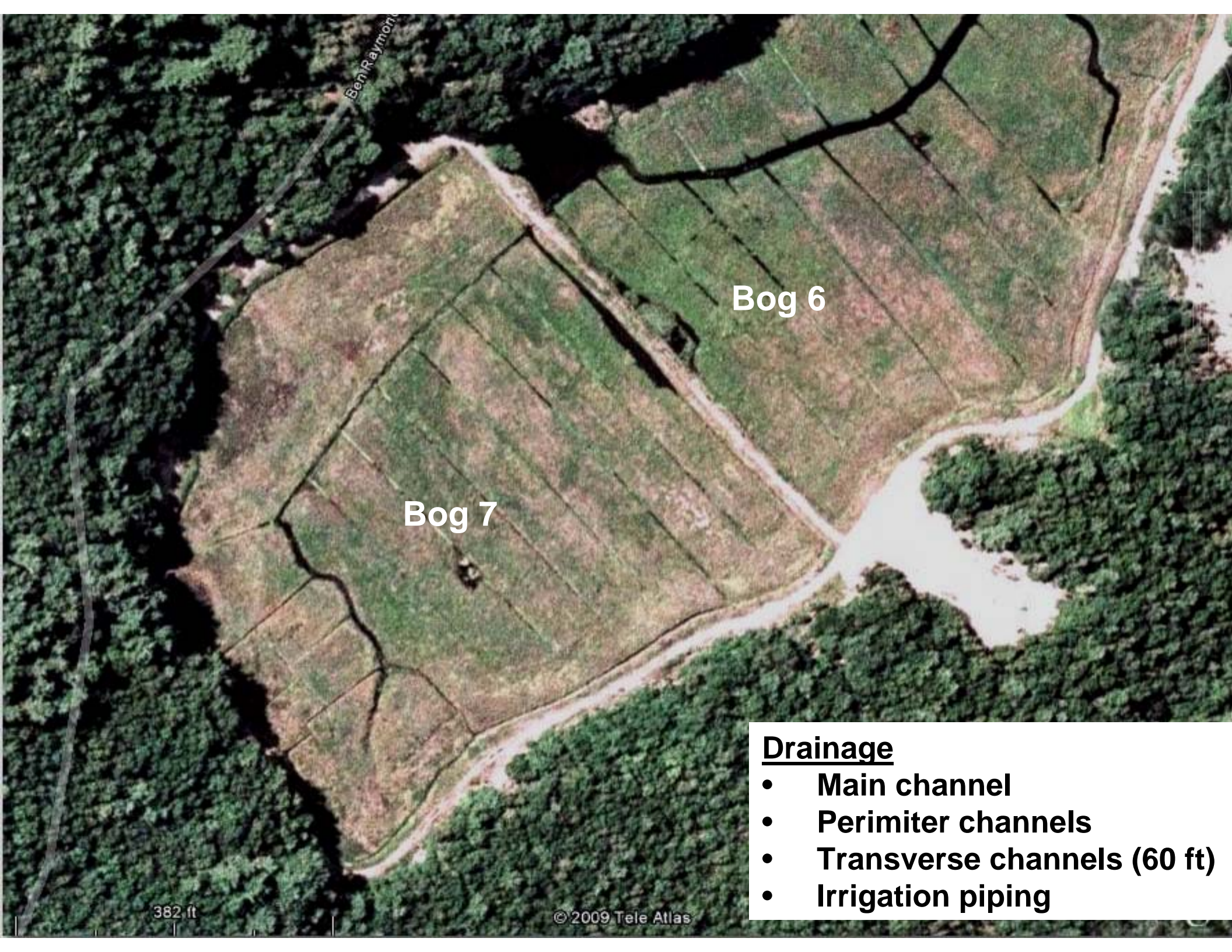
4

5

Bog 6

Bog 7

Looking East



Ben Raymond

Bog 6

Bog 7

Drainage

- Main channel
- Perimeter channels
- Transverse channels (60 ft)
- Irrigation piping

382 ft

© 2009 Tele Atlas

Looking west along Bog 6/7 berm



Side ditch



**Expanded perimeter ditches
will accommodate all
flows, allowing work in the
dry**

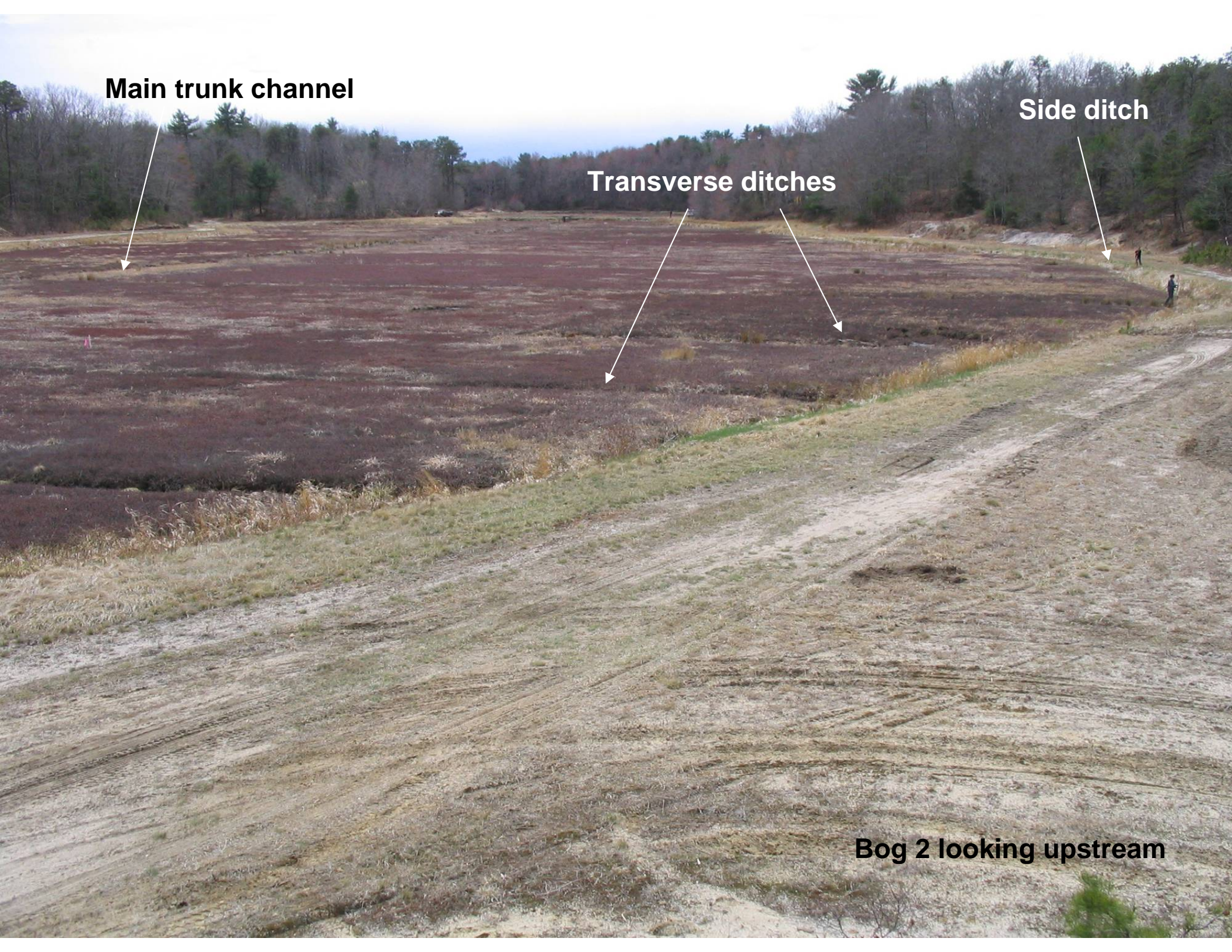
Bog 2 looking north

Main trunk channel

Side ditch

Transverse ditches

Bog 2 looking upstream



- **Sand surface is now between 1-3 feet above streamflow**
- **Peat remains saturated**
- **Most of the cranberries have died off**
- **Botanical surveys have found over 100 native plant species on site**



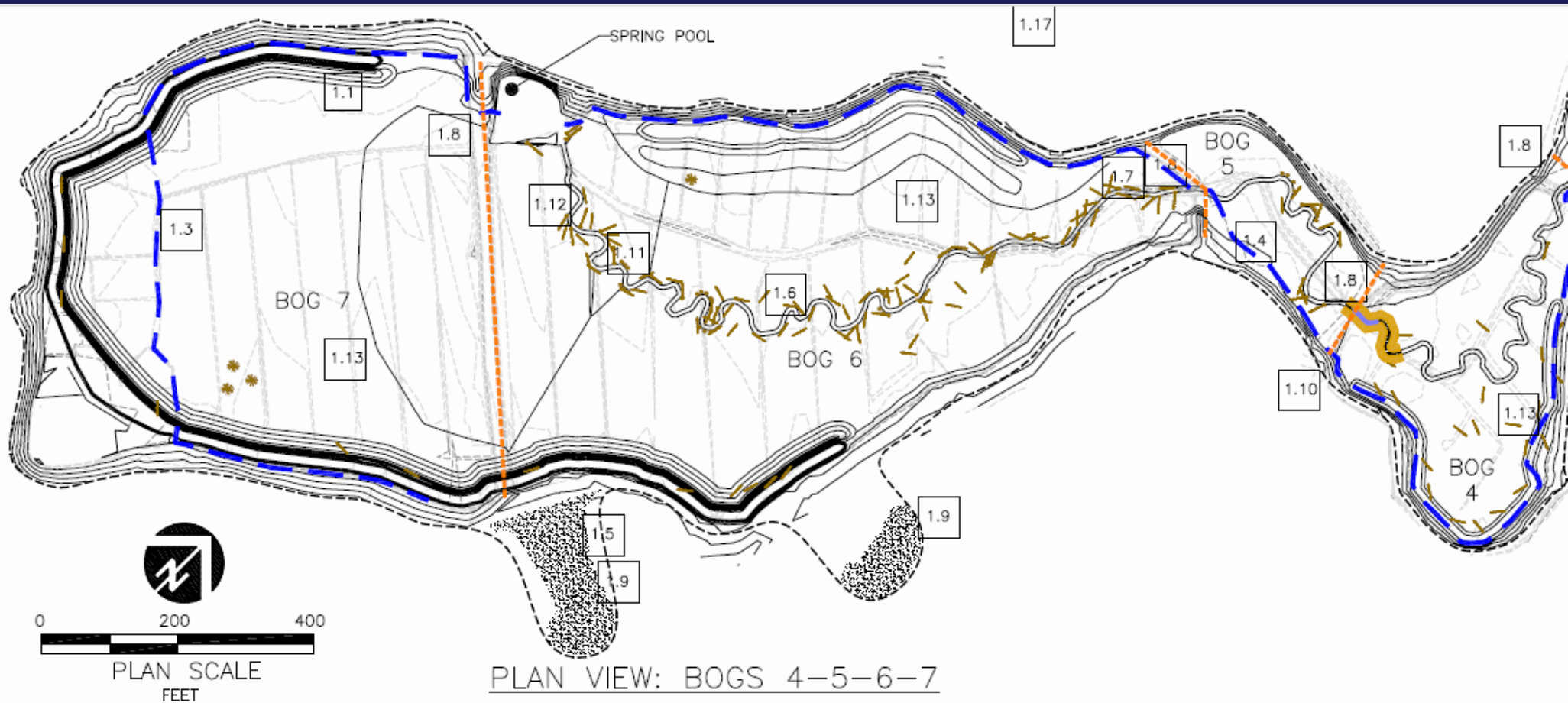
Main trunk channel – Bog 7 looking downstream at berm

Data collection

- Topographic survey
- Groundwater elevation (12 piezometers)
- Baseflow and streamflow
- Soil pH (4.3-6.3)
- Soil nutrients (low N/P)
- Depth of peat (10-30 feet)
- Depth of sand layer (1-3 feet)
- Peat macrofossil identification
- Contaminants (DDT and other pesticides, metals)
- Water chemistry (wetland and stream)
- Wetland plant surveys
- Fish and macroinvertebrate monitoring
- Historical / Archeological

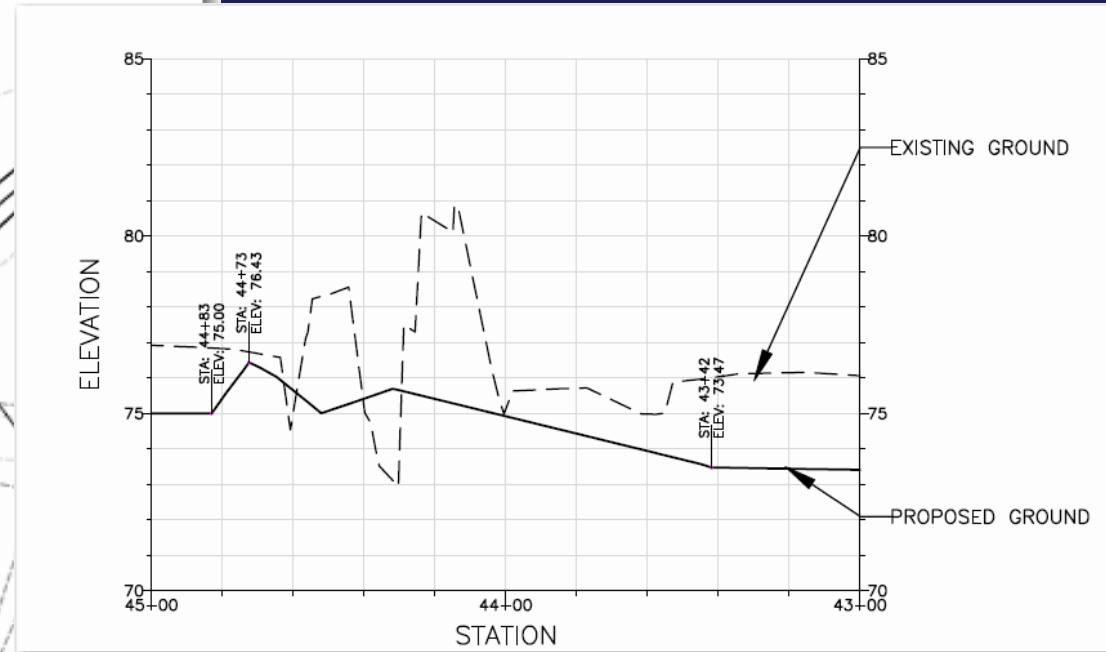
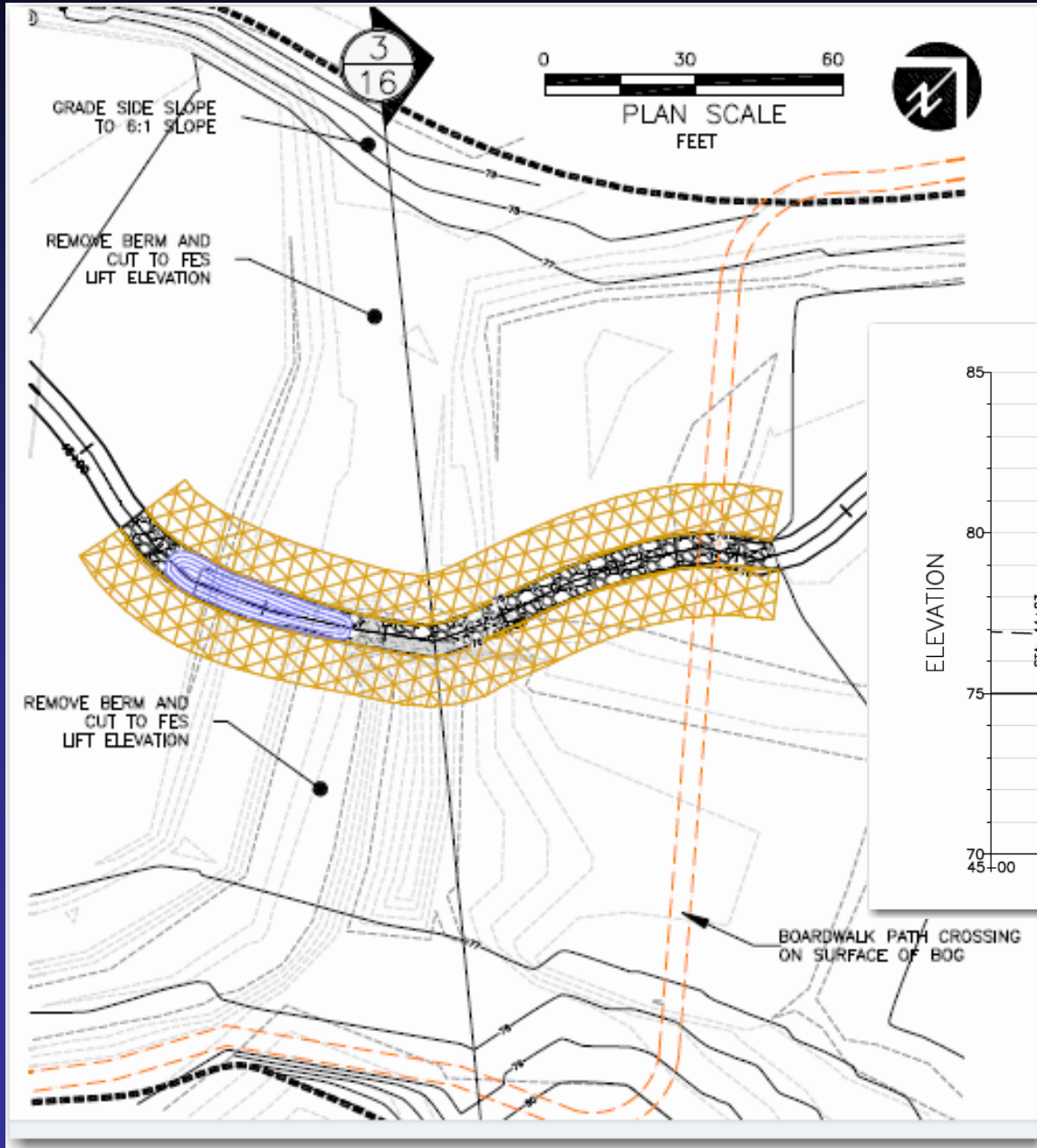
Key Restoration Components

- 5,000 feet of stream restoration
- Small dam removal
- Grade controlling riffles
- Some sand removal



Water control

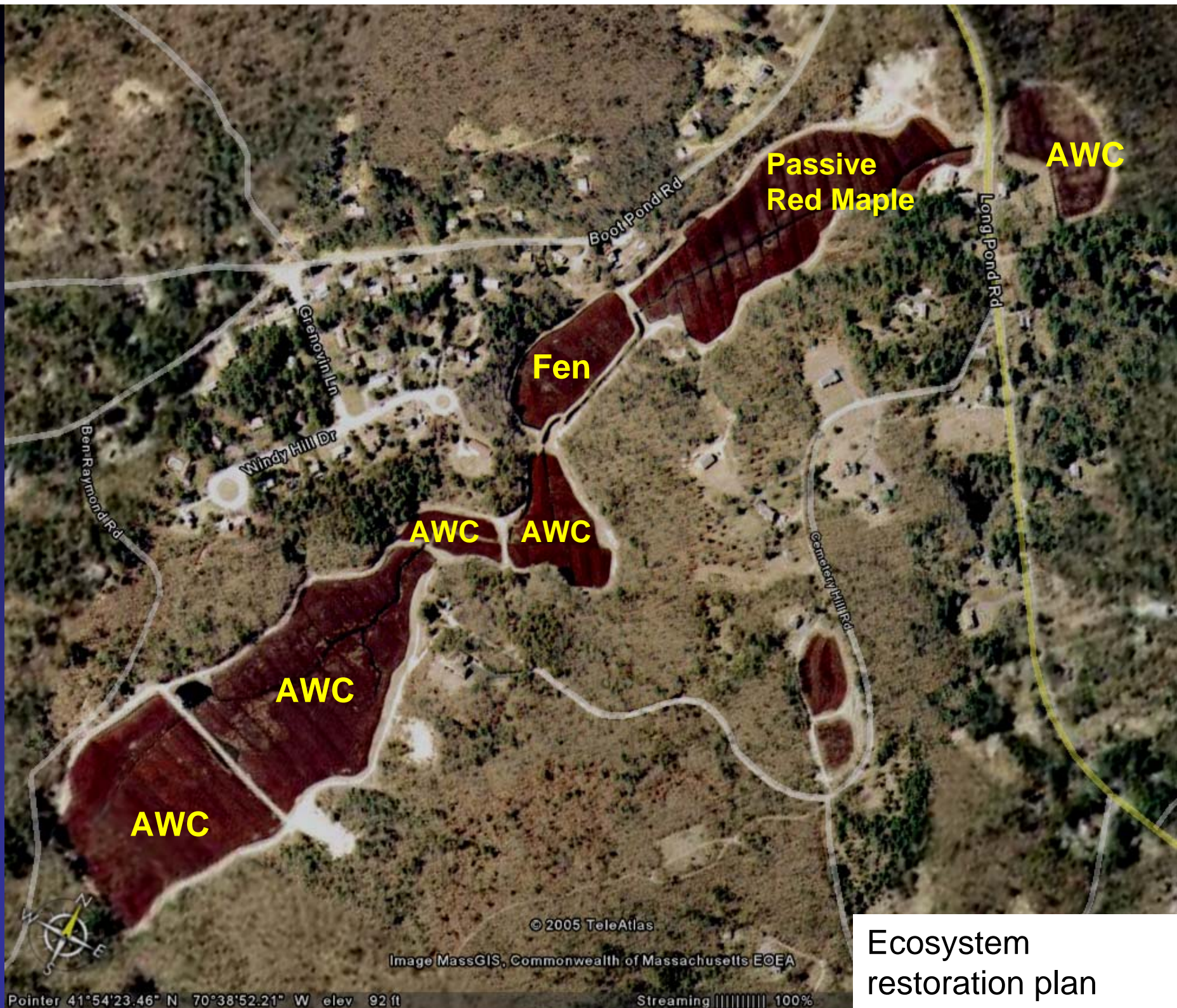
- Grade control riffles



Target Ecosystems

- Atlantic White Cedar Swamp
 - (Bogs 4-7) – 20 acres
 - Forested riparian wetlands (Bog 1, dam) 15 acres
- Fen meadow
 - (Bog 3) 4 acres
- Red Maple swamp
 - (Bog 2) 10 acres





Ecosystem restoration plan

AWC Seed Collection

- Broadest possible genome from local populations
- October 2007
- Underwood, Sheridan and Co.
- 4 sites within 10 miles of Plymouth
- Private lands, public sites

Ponkapoag Bog

AWC Propagation

- Seeds brought to Underwood facility in Maryland
- multi-cell, six-inch deep containers
- mixture of peat moss and sand
- At 6-8 inches, seedlings are potted up to two-gallon containers.



AWC Propagation

- Prior to transfer to 2 gallon pots, seedlings were transported to Western Massachusetts pre-selected growers
 - 12,000 to New England Wildflower Society
 - 5,000 to Reiber Nursery
- Contract with growers for *delivered* trees (September 2009)

New England Wildflower Society

- Constructed two greenhouses for the project
- Followed Underwood Assoc. guidelines for growing



New England Wildflower Society

- 50/50 Peat/sand mix
- Full sun
- 45-50°F
- Mist with ¼ strength Miracid (every 2-3 weeks)
- Lay out pots in plastic lined greenhouses 20ft wide, with a level bottom. Daily watering.
- Ventilation
- Covering removed when warm



Reiber Nursery

- Similar methods
- Slightly better growth than NEWFS



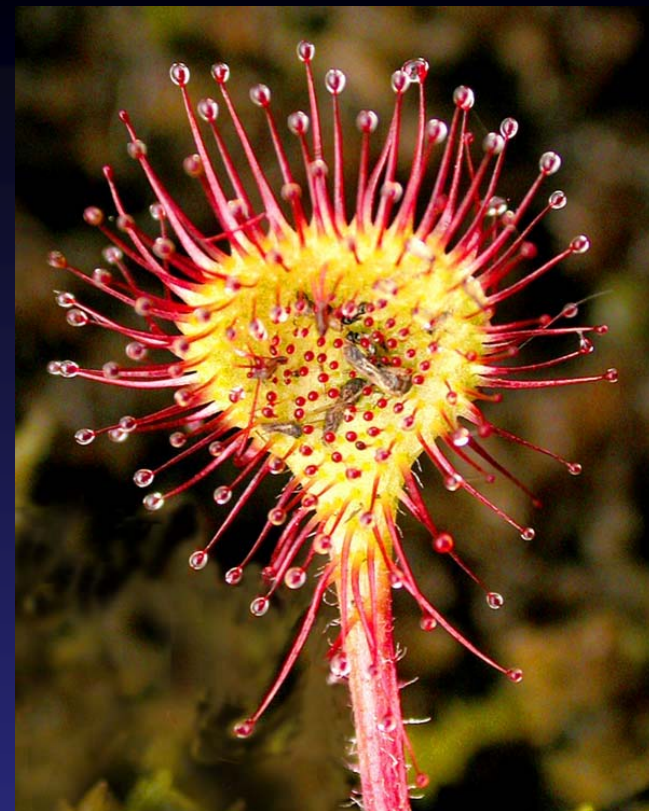
Sphagnum restoration

- Will use methods recommended by Rochefert et al (PRG)
 - On site salvage
 - Off site harvest
- 20 Experimental plots (10' x 10')
- Varying protective treatments
 - Straw mulch
 - Straw blanket
 - Coir blanket
 - Control



Planting plan

- Year 1
 - AWC (17,000)
 - Plugs (14,000)
 - Salvaged mats / plants (variable)
 - Sphagnum
- Year 2
 - Replacement plants only
- Year 3
 - Shrubs (300-400)
 - Sensitive plants (eg. Pitchers, sundews)



Eel River Project status

- Project is 95% funded
- All permits are obtained except for Section 106. MEPA public comment period ends July 31st
- Construction bidding / contractor selection July 2009
- Construction start date – **August 1, 2009!!**

- Projected cost of AWC
 - Unit cost = \$12 per 4 ft tree installed (includes browse protection)
 - Total planting plan - \$177,000
 - = \$4,000 per acre (including AWC)
 - = \$1300 per acre (non AWC plants)

Acknowledgements

- Dr. Phil Sheridan – Meadowview Biological Station
- Dr. Aimlee Laderman
- David Gould and Kim Michaelis - Town of Plymouth
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- Jeremy Bell - Mass Coastal Zone Management
- Alex Hackman, Beth Lambert, Nick Wildman - Mass Riverways
- Brian Graber - American Rivers
- Eric Derleth - USFWS
- Robb Johnson, Alison Bowden - TNC
- Dr. Tony Swinehart, Hilldale College
- Dr. Line Rochefert, Univ. of Laval

Plans available - Town of Plymouth Website
See Dept. of Environmental Management

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