

Foxborough Witch Pond Wells IBT Update

**Massachusetts Water Resources
Commission March 14, 2013**

Linda M. Hutchins, Hydrologist
Department of Conservation and Recreation
Boston, Massachusetts

Foxborough Wells 14 and 15

- IBT approved 1.44 MGD from Tenmile to Taunton basin with conditions
 - Baseline and Operational Monitoring/Reporting Requirements
 - Water Level shutoff thresholds to protect wetlands
 - Wetland monitoring
- Pumped at 0.2 MGD combined in summers 2010-2012

Foxborough Witch Pond Swamp

- Atlantic White Cedar (AWC) swamp
- Bungay Brook with 0.4 sq mi watershed
- Hessel's Hairstreak Rare and Endangered Species dependent on the Atlantic white cedar swamp ecosystem
- Spotted turtle also present and protected in IBT approval
- Shrub layer berry bushes nectar source for Hessel's Hairstreak

Spotted Turtle



Hessel's Hairstreak

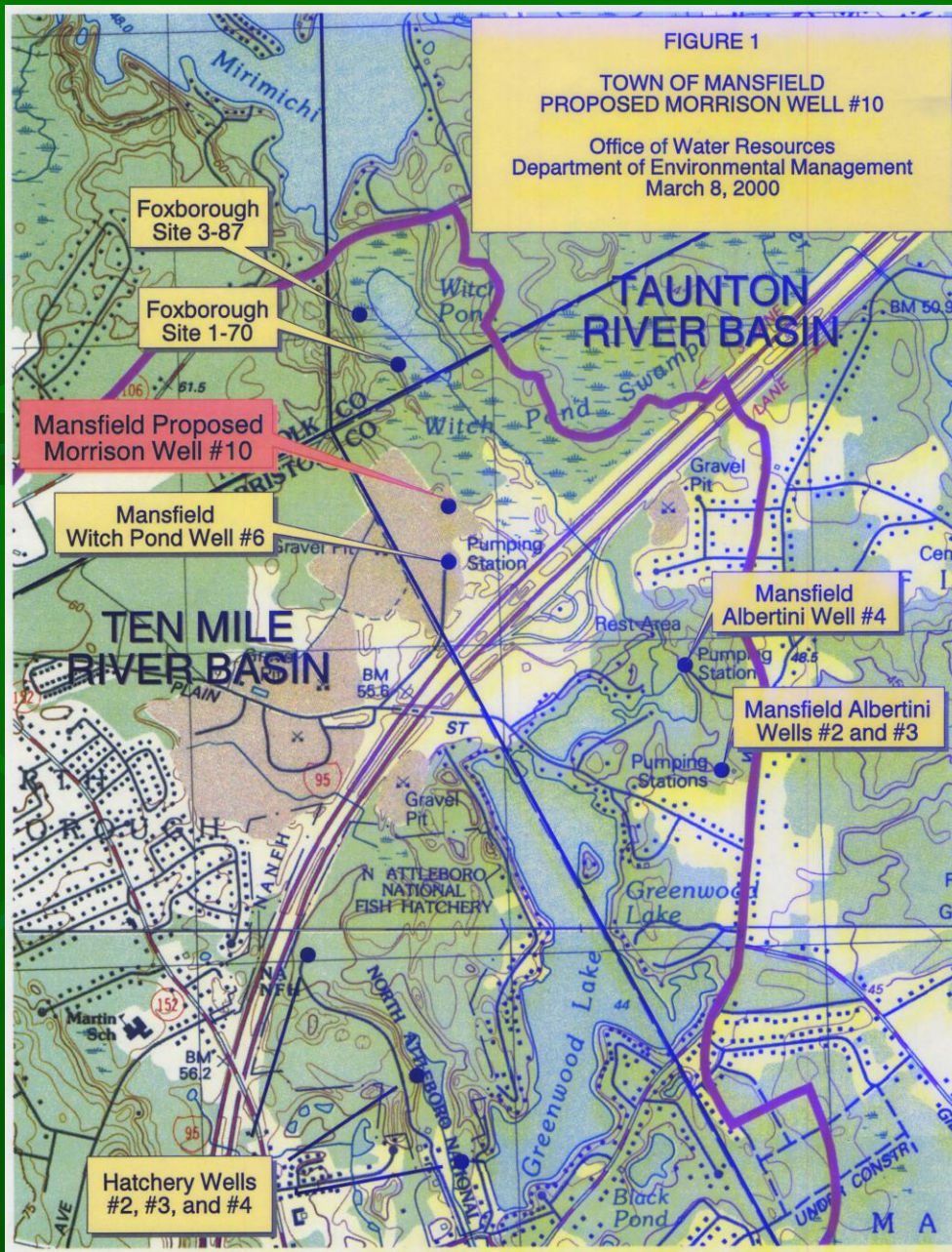


IBT Mandate: Impacts to Wetlands and Dependent Flora and Fauna

- 313 CMR 4.05(5)
- “Consider other streamflow dependent *ecosystems* and water uses when evaluating the impacts of a proposed interbasin transfer.
- ...significance of wetlands and *dependent flora and fauna* and effects of the withdrawal thereon.”

IBT Timeline

Time	Item
Sept 2001	WRC IBT Approval with conditions
May 2007	WRC Monitoring Plan Approval
Oct 2009	WRC Baseline Monitoring Report Approval
Dec 2009	Witch Pond Wells begin operation
2010 2011 2012	Well shutoff thresholds hit summer 2010 Foxborough shut wells down summers 2011, 2012 Annual monitoring reports submitted/reviewed
2011	Agencies indicate initial concern pumping impacts on wetlands
2012-present	Correspondence, meetings between Foxborough, EEA, DEP, DCR, DFG



Wells in headwaters of Tenmile

Small drainage area to wells

Underflow across basin divide
 from Lake Mirimichi helps
 support WP system

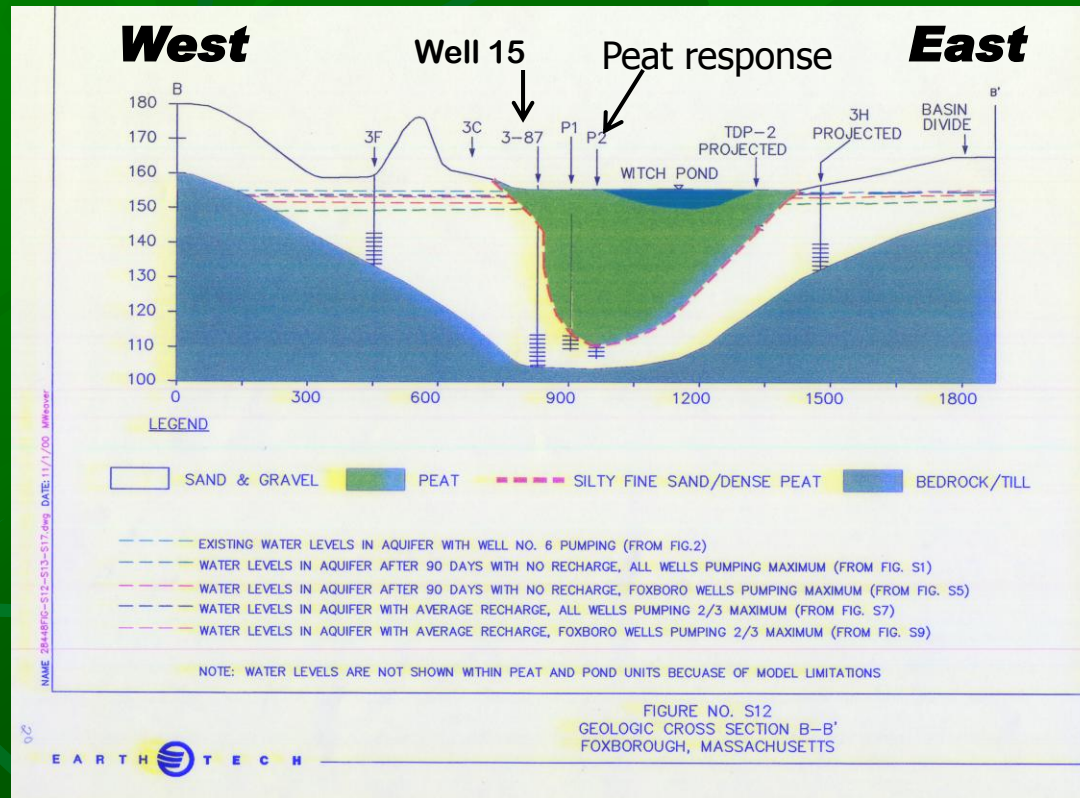
Bungay Brook outflow controlled
 by bedrock near Route 95

Mansfield wells adjacent to Witch
 Pond Swamp (IBT Approval)

Attleboro releases water from
 Lake Mirimichi (Legislated)

Plainville wells near Lake
 Mirimichi (IBT approval)

Foxborough IBT Conceptual Model: silt and peat layers limit hydraulic connection between surface water features and the lower sand and gravel aquifer.



WRC Decision: "Monitoring the deep peat layer is intended to allow observation of potential drying from the base of the peat layer as a result of hydraulic influence from the underlying aquifer." (page 22)

Conditions for Witch Pond Wells: Compliance water levels and monitoring

- Maintain near-surface water level in AWC swamp
- Stop pumping during dry conditions to prevent desiccation/hydrocompaction/compression of peat layer;
- Limit aquifer drawdown beneath wetlands and Witch Pond;
- Preserve swamp flooding (seasonal inundation);
- Compliance water levels in peat, aquifer, Witch Pond
- Wetland/plant composition monitoring

Peat Concerns

- Peat composed of organic material (woody debris), shrinks and swells = *elastic* (spongy)
- Deep peat supports weight of overlying peat and water, relying on interstitial water pressure
- If water pressure in deep peat (level) declines, could cause structural compression/collapse (wood lignin breaks)
- Peat can remain saturated but still compress
- Dewatering at peat surface can also cause peat hydrocompaction
- Damage can be irreversible (elasticity is not infinite)

Atlantic white cedar swamp



Wetlands plots
monitoring
every 5 years

Hydrology as a
surrogate for
wetlands alteration

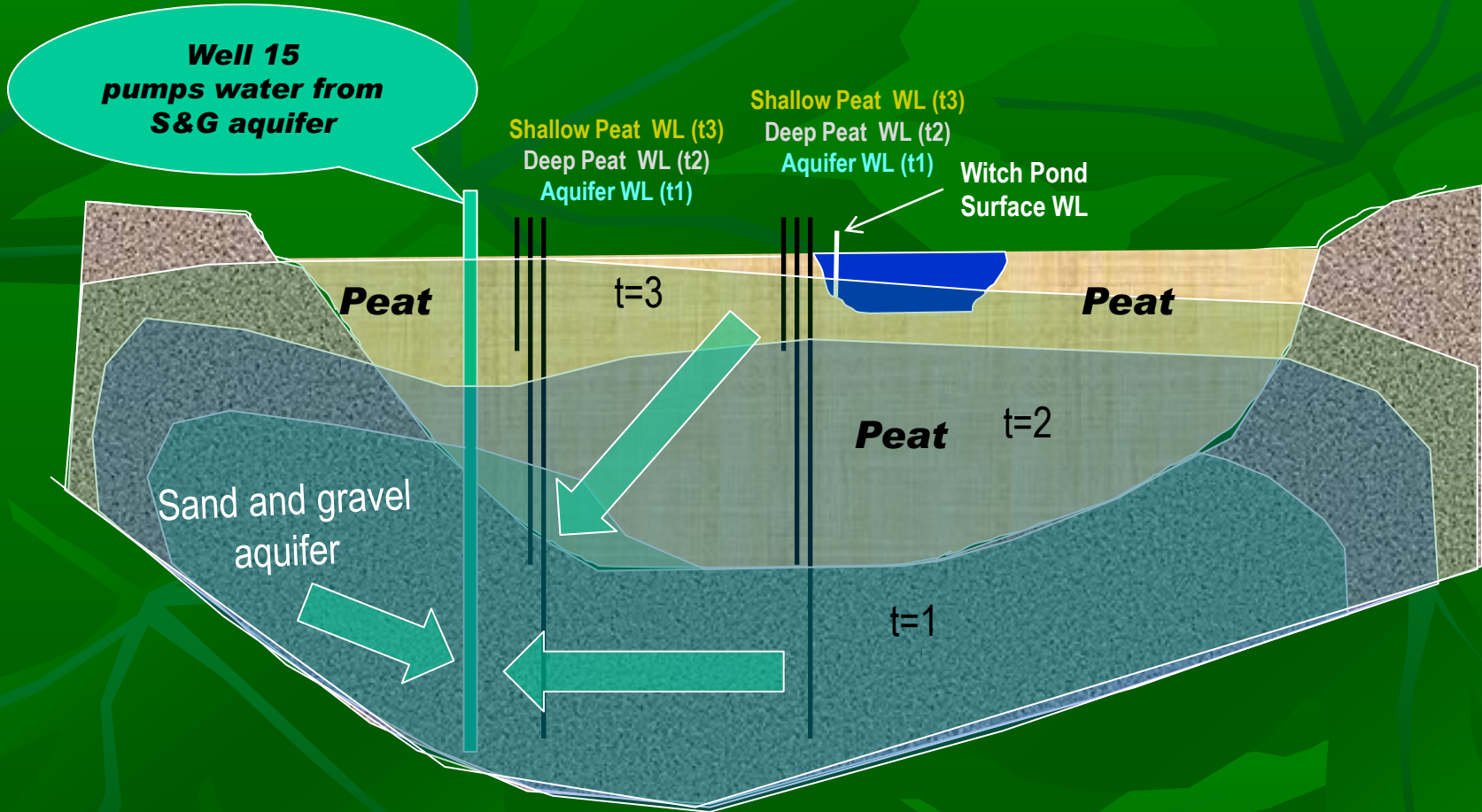


IBT Decision Conditions Adaptive Management

- “During the baseline monitoring period and the first five years of well operation, the threshold levels... will be used to verify the expected hydrologic responses to pumping in the various geologic layers. Following review of data collected..., adjustment of the threshold levels and/or the well usage may be appropriate.”

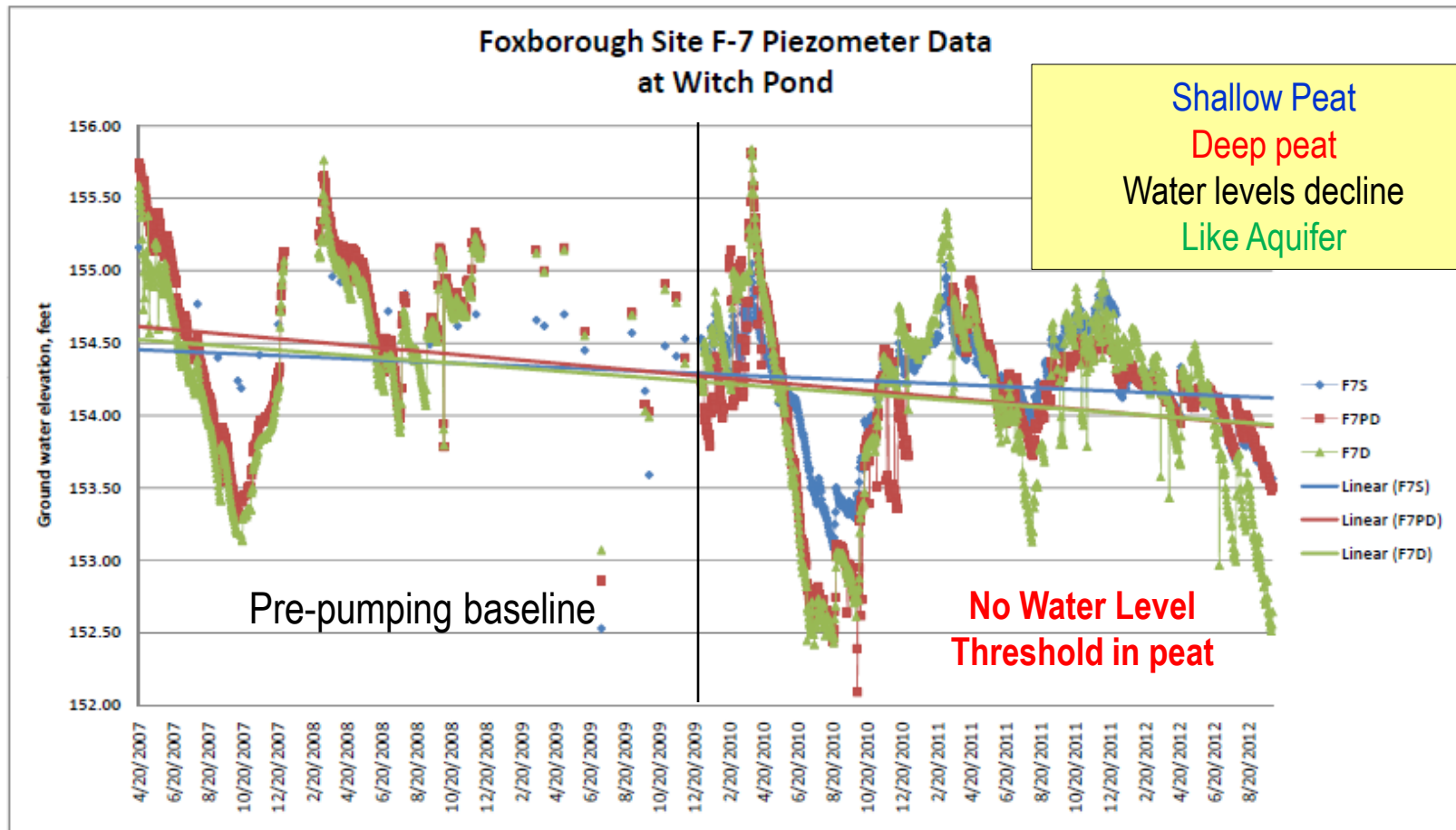


Propagation of Well 15 Impacts measured in observation wells



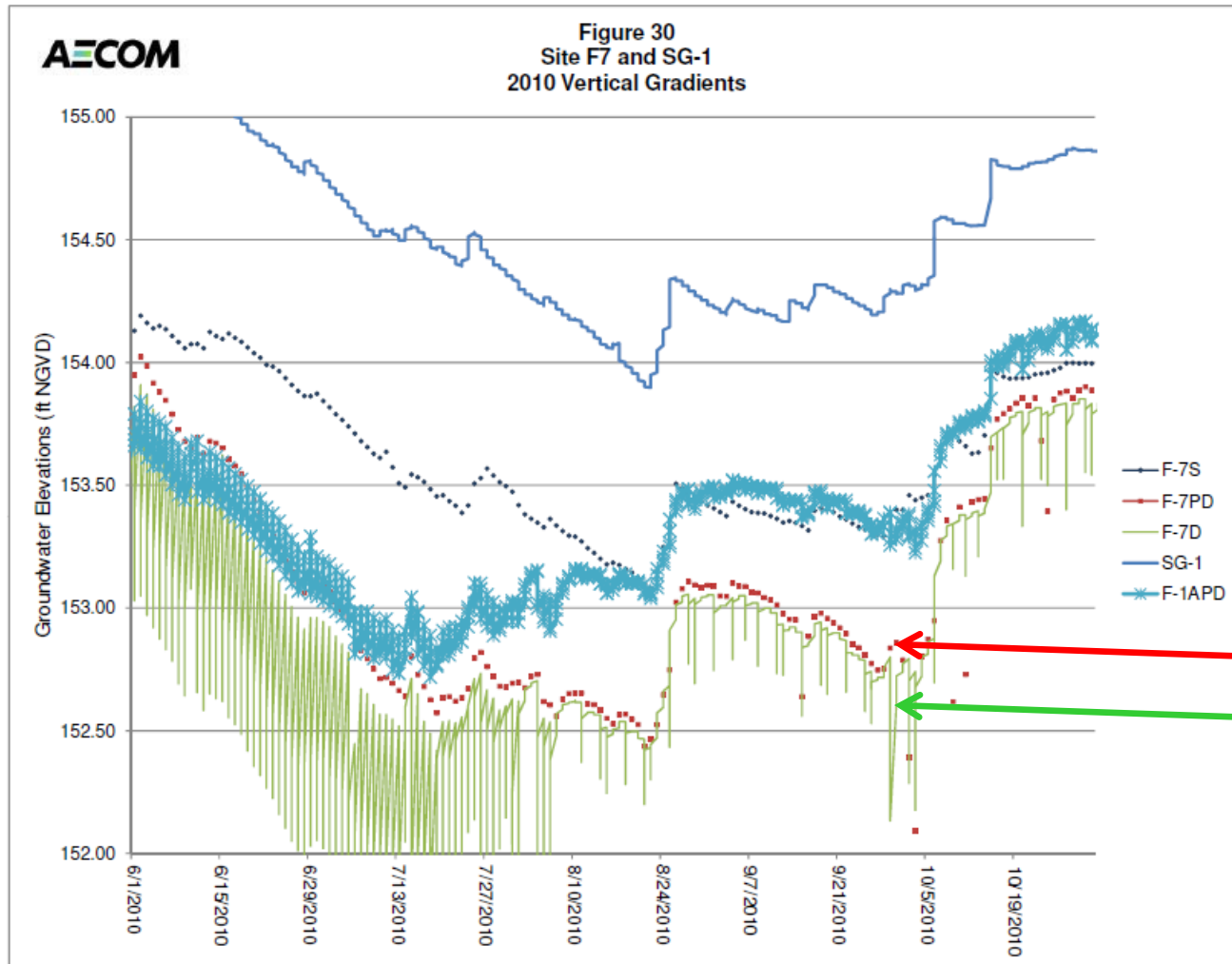
Impacts propagate upward from aquifer to surface over summer season

At Witch Pond– shallow and deep peat respond like aquifer to pumping



Long-term water level declines in all geologic layers

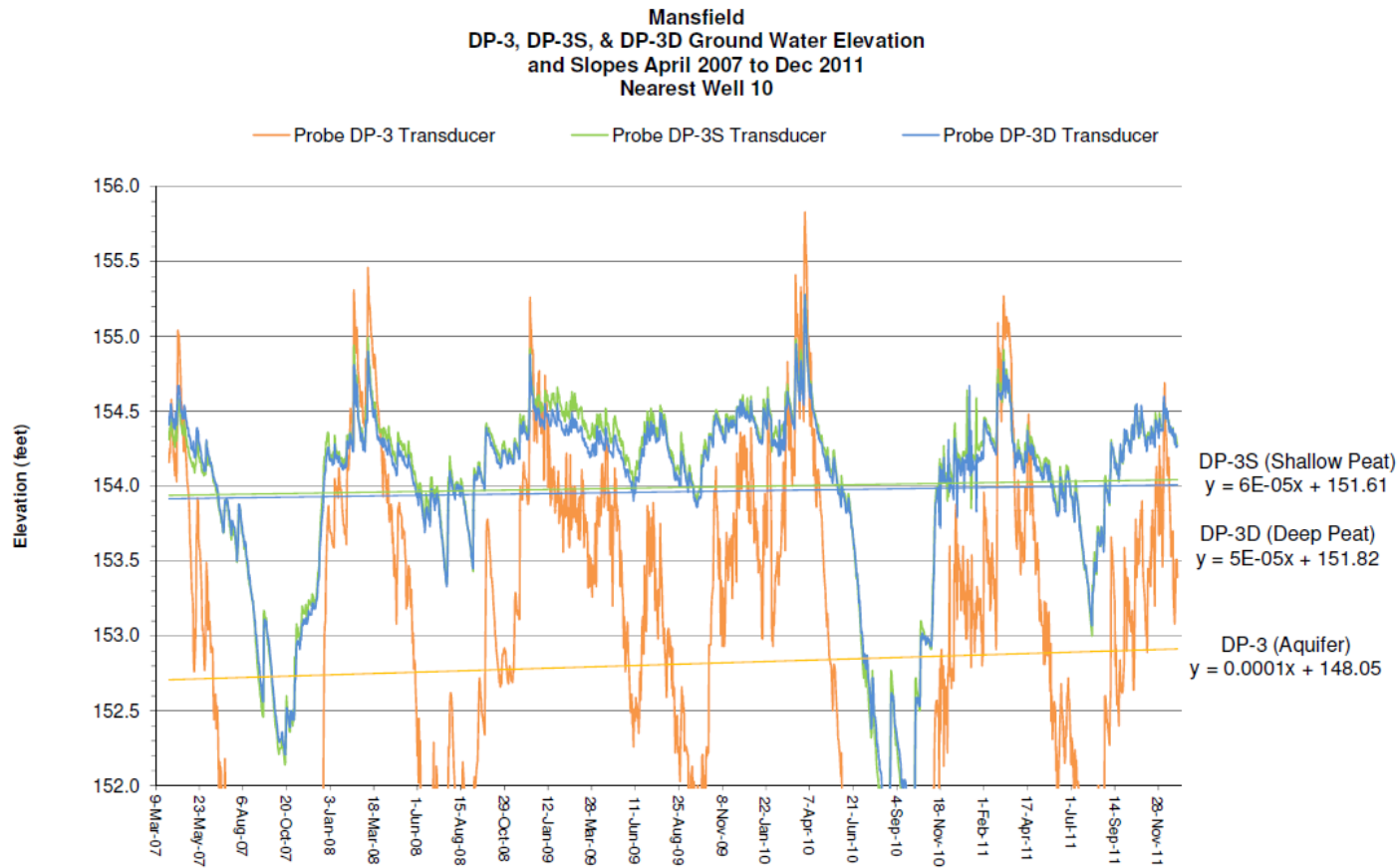
Foxborough Summer 2010



Deep peat and
Aquifer
WL response
are very
similar
At Witch Pond

Response in deep peat defies conceptual model

Mansfield— trend in peat is flat over same time period



Wetlands Monitoring

- Four wetlands monitoring plots within AWC swamp;
- One plot in an ambient location;
- Wetland monitoring plots co-located with peat piezometer for water level measurements;
- Vegetation monitoring once in baseline, once in year 1, year 5, every 5 years thereafter;
- Species structure and composition analysis.

Wetland Monitoring Status

- WRC Decision: "...monitoring should be performed to verify that ... vegetative species that represent sources of nectar to Hessel's Hairstreak butterfly remain intact."
- Baseline completed and accepted in 2007
- 2011 Showed rapid changes in species composition (shift from highbush blueberry to sweet pepperbush— more tolerant of dry conditions)

Summary

- Hydraulic pressure declining in peat;
- Peat pressure decline and compression unacceptable;
- Plant monitoring suggests rapid shift (impact)
- Additional protection is needed for AWC swamp

WRC Role

- Assess and approve measures for additional wetland protection
- IBT Decision Amendment