

Names of who was on

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TO: HYDROLOGY COMMITTEE (Sy Robbins, Bill Spitz, Henry Ku, Bruno Nemickas, Henry Bokuniewicz, Martin Schoonen, Walter Dawidiak, Jim Bagg, Steven Colabufo, Vito Minei)
CC: Ray Corwin, David Braun (TNC)
FROM: Marilyn Jordan, TNC
DATE: August 4, 1994

re: Management recommendations for freshwater wetlands in the Pine Barrens Preserve; importance of groundwater.

ENCLOSED: Management recommendations for freshwater wetlands (Pine Barrens Draft Plan); References on the importance of groundwater in the hydrology of freshwater wetlands.

1. Recommendations

As indicated in my memo of June 22, I had included the following recommendation in the list of management recommendations for freshwater wetland communities, which I had prepared for the Draft Pine Barrens Plan with the assistance of Dr. David Braun, hydrologist for The Nature Conservancy. Dr. Braun also had suggested two additions to the Committee's recommendations, as noted below.

Recommendation:

4. Development of facilities, or any land use changes, should be carried out in such a way as to avoid impacts on the water quality, or impacts on the inflow/outflow regime, for the groundwater component of wetland hydrologic function. The reason behind this recommendation is the potentially crucial role of groundwater in the hydrologic regime of wetlands. Some wetlands may not be influenced by groundwater, but the groundwater regime should be investigated prior to siting and design of facilities or land use changes.

Applicability of wetlands recommendations:

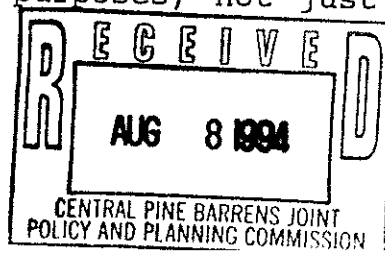
Applicable to all wetlands in the Core Preserve, and to the following wetlands in the Compatible Growth Area: Lake Panamoka, North Pond (near Panamoka), Currans Rd. South Pond, Overton Road Pond).

Suggested addition to wetland recommendation #2 (Braun):

Land use changes should not significantly alter the hydrologic regime of the wetlands (timing, duration, magnitude and frequency of water inputs).

Suggested addition to wetland research recommendations (Braun):

Research is needed on the design of runoff control structures used for ecological purposes, not just for flood control.



After telephone conversations with Sy Robbins and Bill Spitz, I agreed that there was insufficient time for the Hydrology Committee to consider possible endorsement of these additions. Therefore I asked Carol Walsh to delete the above recommendations from the Draft Plan, with the understanding that the Hydrology Committee would consider groundwater issues in future meetings. Dr. Braun is willing to provide additional input by mail or telephone. His attendance at a future meeting of the Committee might be possible, but his availability is limited by his heavy schedule, and his being based in Arlington, Virginia.

Enclosed is a copy of the complete list of recommendations as presented in the Draft Plan. It would be appropriate for the Hydrology Committee to review all of these recommendations, and suggest modifications for the final Plan.

2. References relating to groundwater

Enclosed with this memo is a list of relevant references, and photocopies of at least the first page of each. Most of these references are from commonly available journals (with the exceptions noted below); I can provide full copies upon request.

I am enclosing a copy of all of Chapter 3, and part of Chapter 4, from R. Schneider's Ph.D. thesis (Cornell University), since the thesis is not readily available. I am loaning a complete bound copy of the thesis to Sy Robbins, to be circulated among the members of the Hydrology Committee as needed. Please contact Sy if you wish to see the entire thesis.

Also sent to Sy is a complete copy of Winter 1992, since the book from which it is excerpted may not be readily available.

ANNOTATED REFERENCES

Anderson, M.P. and J. A. Munter. 1981. Seasonal reversal of groundwater flow around lakes and the relevance to stagnation points and lake budgets. *Water Resour. Res.* 4:1139-1150.

Keynoyer, G. J. and M.P. Anderson. 1989. Groundwater's dynamic role in regulating acidity and chemistry in a precipitation-dominated lake. *J. Hydrol.* 109: 287-306. "...groundwater consistently supplies the bulk of the inorganic constituents to the lake [northern Wisconsin, permeable glacial sediment] on an annual basis."

Phillips, P.J. and R. J. Shedlock. 1993. Hydrology and chemistry of groundwater and seasonal ponds in the Atlantic Coastal Plain in Delaware, USA. *J. Hydrol.* 141:157-178. quote: "understanding the hydrochemistry of seasonally ponded wetlands requires intensive study of the adjacent shallow groundwater-flow system."

Schneider, R. L. 1994. Environmental controls of plant species diversity in coastal plain pondshore communities. Dissertation,

Ph.D. Cornell University, N.Y. (Schneider actually measured the rates of groundwater inflow seepage through shorelines of two coastal plain ponds in Sears Bellows County Park. She concluded (p. 53): "...this study shows that there is an invisible groundwater linkage between the pondshore and the surrounding terrestrial habitat... Appropriate strategies to protect coastal plain ponds and their unique plant communities should include measures to protect these upland groundwater resources.")

Shaw, R. D., J. F. Shaw, H. Fricker, and E. E. Prepas. 1990. An integrated approach to quantify groundwater transport of phosphorus to Narrow Lake, Alberta. *Limnol. Oceanogr.* 35:870-886. quote: "Groundwater contributed about 30% of the annual water load to the lake" [small, glacial-terrain lake]... P in pore water was 8 times higher than groundwater ... "rate of groundwater P loading to the lake computed from average seepage flux and average pore water P was $39 \text{ mg m}^{-2} \text{ yr}^{-1}$, and groundwater may be the largest single source of P to epilimnetic water in the lake." (I've misplaced my copy of this reference)

Williams, R. E. 1968. Flow of ground water adjacent to small, closed basins in glacial till. *Water Resour. Res.* 4:777-783

Winter, T. C. 1978. Numerical simulation of steady state three-dimensional groundwater flow near lakes. *Water Resour. Res.* 14:245-254.

Winter, T. C. 1981. Effects of water-table configuration on seepage through lakebeds. *Limnol. Oceanogr.* 26:925-934.

Winter, T. C. 1988. A conceptual framework for assessing cumulative impacts on the hydrology of nontidal wetlands. *Environ. Managmt.* 12:605-620.

Winter, T. C. 1992. A physiographic and climatic framework for hydrologic studies of wetlands. In: R.D. Robarts and M.L. Bothwell, eds. *Aquatic Ecosystems in Semi-Arid Regions: Implications for Resource Management*. N.H.R.I. Symposium Series 7, Environment Canada, Saskatoon.