BLACKACRE HYDROLOGY STUDY, 2011

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Introduction

The purpose of hydrologic research at Blackacre State Nature Preserve includes defining the watershed within and adjacent to the Preserve. Recent degradation of water quality has prompted the need for an increased understanding of hydrologic processes affecting water flows within Blackacre. Quality and volume of surface water flows is directly related to the characteristics and usage of adjacent lands. Lands adjacent to the preserve have experienced rapid and dramatic changes due to recent development, and effects of this development may be correlated to changes in water quality and volume.

Definition of Problem

Several pressing issues require research:

- Previous water quality research has found that increases in the volume of water entering Cattail Pond has resulted siltation and habitat alteration. Contributors to this increased volume should be determined.
- Increased turbidity has recently occurred in Spring House Pond and Pasture Pond #4 indicating a surge in sediment deposition. The source should be determined to prevent reduced oxygen levels in the ponds.
- Intermittent streambeds show signs of heavy erosion, indicating high runoff volumes during rainfall events. Sources of this runoff should be determined, and if possible, mitigation efforts should be implemented with adjacent landowner cooperation.
- *E. coli* levels vary widely among water bodies on the Preserve. Determining water sources may allow for remedies where high contamination levels exist.

Proposed Solution

The ultimate goal of the research is to define how water travels through and interacts with Blackacre. This will provide an understanding of how the Preserve's subwatershed relates to the larger watershed of the region. Groundwater studies will determine the flow of water through the Preserve using Rhodamine WT. This dye is often used by the USGS and has shown to be harmless to any biological life it encounters. The direction of groundwater flow will be beneficial in determining if the increased residential and commercial areas surrounding Blackacre are responsible for the amplified hydrologic problems the Preserve is facing. Core samples will be obtained from several locations around the grounds in order to conclude the origin of sediments within the samples. This will aid in identifying which locations on the

Preserve are experiencing higher flow volumes and if this is affected by adjacent properties. The soil samples will also be tested for petroleum as will water samples. This will aid in indicating if there is increased runoff from nearby streets due to poor drainage. The dimensions for the auger are 2.5 cm in diameter and 25 cm in length, care will be taken to reduce impact on the land. Aerial imagery and on-the-ground data collection will be interfaced with ArcGIS software to analyze the surface water flows through the property. Low-lying areas and areas of low terrain gradient are insufficiently analyzed through aerial imagery. Desk work will be complemented with field work for both the surface and ground water studies. Impact on the land will be very minimal, and will consist of travelling Blackacre on foot, several small core samples, and tracer dye. Foot travel will be restricted to existing trails whenever possible.

NB: Report of the study will be posted in Spring, 2012.