Request to designate the Trout Park Nature Preserve ground water system as Class III – Special Resource Ground Water [35 Ill. Adm. Code 620.230(b)]

Submitted to the
Illinois Environmental Protection Agency
Division of Public Water Supply
By the
Illinois Nature Preserves Commission

February 2011

On behalf of the Illinois Nature Preserves Commission, the Illinois Environmental Protection Agency is hereby requested to designate a 4.9 square mile (3,109 acre) tract related to the ground-water system for Trout Park Nature Preserve as a Class III – Special Resource Ground Water Area pursuant to 35 Ill. Adm. Code 620.230(b). Following is supporting information as required in said rule for the designation.

I. A general description of the site and surrounding land use.

Trout Park Nature Preserve consists of two parcels of land that total 26.8 acres. It is located in Section 1, Township 41 North, Range 8 East of the Third Principal Meridian in Kane County, Illinois (Figure 1). The rich and unique plant and animal assemblages at the site have been recognized since the 1920s (McFall and Karnes 1995) and the special nature of the site helped make it an early tourist attraction. Protection efforts for the site began when local conservationists held a campaign that resulted in the City of Elgin acquiring a portion of the property in 1922 (Greenberg 2002). The site was dedicated as a nature preserve in 1972 and is owned by the City of Elgin. A volunteer group, Friends of Trout Park, assists with site maintenance.

Trout Park Nature Preserve is located in the Morainal Section of the Northeastern Morainal Natural Division of Illinois. The site is notable due to the presence of a rare wetland community known as a forested fen. Only 14.5 acres of forested fen survive in Illinois; 9.5 acres in Trout Park Nature Preserve and 5.0 acres in the nearby Chicago Junior School Fen Natural Heritage Landmark (White 1978, Byers 2000). Forested fens occupy calcareous seepages where muck or peat soils support tree growth, including the northern white cedar (*Thuja occidentalis*) at Trout Park (Paulson and Bowles 1986).

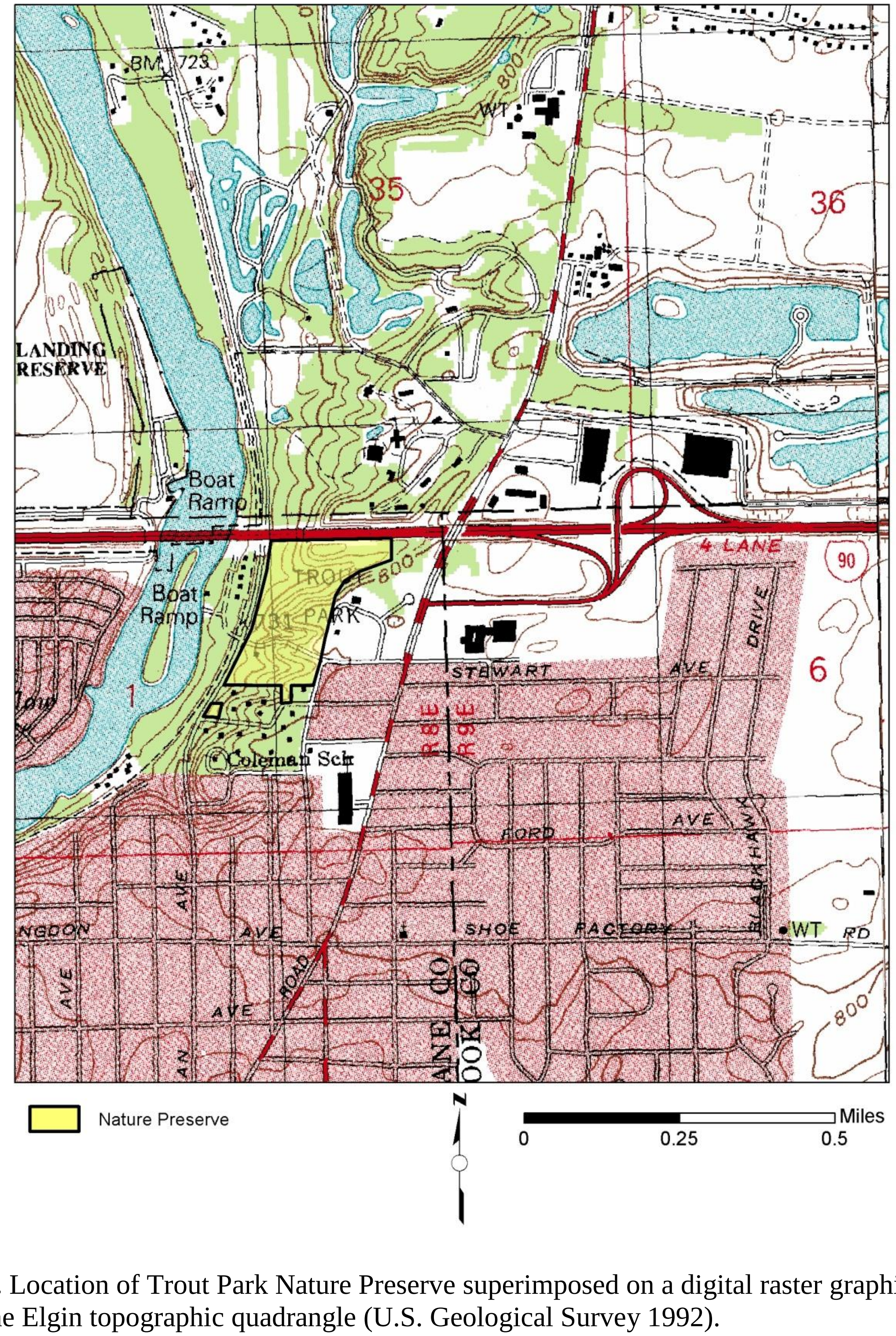


Figure 1. Location of Trout Park Nature Preserve superimposed on a digital raster graphic based on the Elgin topographic quadrangle (U.S. Geological Survey 1992).

Varied topography and calcareous seeps and springs create habitat for a rich and unique assemblage of plants and animals. This hydrogeologic setting is the result of the preserve's location along the flanks of the Fox River Valley and the presence of large deposits of unconsolidated glacial sand and gravel in upland areas to the east and north. As precipitation infiltrates topographically higher areas and flows towards the fen, it becomes enriched with dissolved minerals. Discharge occurs in depressions and along slopes, providing a consistent supply of mineral-rich groundwater to specialized plant communities. Ravines shelter these communities and, combined with the cold seeps, create a microclimate that is hospitable to plants and animals that are usually only found in more northern locations. The site is documented to support three state-listed plants, including the state-endangered purple-flowering raspberry (*Rubus odoratus*) and the state-threatened forked aster (*Aster furcatus*) and dwarf raspberry (*Rubus pubescens*) (Table 1).

Table 1. State-listed plant and animal species at Trout Park Nature Preserve (pers. comm. with Jenny Skufca, Illinois Nature Preserves Commission, April 2010).

Scientific name	**Common name**	**Status**
Plants:		
Rubus odoratus	purple-flowering raspberry	State endangered
Rubus pubescens	dwarf raspberry	State threatened
Aster furcatus	forked aster	State threatened

Geology, hydrology, and land use in the vicinity of Trout Park Nature Preserve have been previously considered in a study of groundwater vulnerability of Illinois nature preserves by Locke et al. (1997a). The site assessment by Locke et al. (1997b) is reproduced in the appendix. Topography slopes rapidly downward from east to west across the preserve from uplands down to the Fox River floodplain, creating a 60-foot elevation change in less than 1000 feet. Soils present include the Waupecan, Fox, Rodman, and Dresden upland soils and Houghton Muck soils in the ravine bottoms and low-lying areas. Following the lithostratigraphic nomenclature of Hansel and Johnson (1996), the glacial units present in the region include sand and gravel outwash deposits of the Henry and Equality Formations of the Mason Group and glacial till (diamicton) deposits of the Haeger and Yorkville Members of the Wedron Group. These unlithified Quaternary units overlay Silurian limestone and dolomite bedrock that occurs at depths ranging from approximately 25 feet in the vicinity of the floodplain to more than 100 feet in the uplands. Surface water may flow into the preserve from upland areas, but no channels were readily apparent during the 1996 site assessment. Groundwater springs and seeps are prominent features of the site, with springs forming into rapidly flowing streams. All surface-water features discharge to the Fox River to the west. The major site alteration is Interstate 90, which was constructed in the 1950's and bisects the original fen habitat, splitting it into Trout Park Nature Preserve and the Chicago Junior School Natural Heritage Landmark. No other significant on-site hydrologic alterations have been identified, although the site has been used in the past for tourism ventures, which included trout stocking in the springs, water bottling of spring water, and infrastructure associated with an adjacent amusement park. Roadways surround the preserve, including I-90 to the north, Route 25 to the east, Trout Park Boulevard to the south, and Duncan Avenue to the west. A baseball park is located immediately east of the park at the top of the hill. Parking and trail development are present on-site, and two gas pipelines and one underground cable are present along Trout Park Boulevard.

II. A topographical map or other map of suitable scale denoting location of the dedicated nature preserve.

Figure 1 shows the topography and location of Trout Park Nature Preserve.

III. A general description of the existing groundwater quality at and surrounding the dedicated nature preserve.

Termed "forested fens" by the Illinois Natural Areas Inventory (White 1978), the preserve contains specialized natural communities adapted to the presence of cool, mineral-rich groundwater discharge. The continuation of these communities to present day indicates the current groundwater system may still retain important groundwater flow and geochemical characteristics responsible for the formation of the communities. The potential for groundwater contamination has been categorized as "high" due to the permeability of surficial geologic materials and the presence of development adjacent to and upgradient of the preserve (Locke et al. 1997a and b).

Fens belong to a type of wetlands called *peatlands*. Soil and water chemistry affect the development and structure of peatland ecosystems. Factors such as pH, mineral concentrations, available nutrients, and cation exchange capacity can greatly influence the types of vegetation present as well as their productivity (Mitsch and Gosselink 2000a). The geochemical conditions associated with fens result in circumneutral to high pH values, with extremely rich minerotrophic fens having pH values typically greater than 6.5 (Glaser 1987, Mitsch and Gosselink 2000a). A one-time pH measurement taken from a spring in the preserve recorded a pH level of 7.8 (Locke et al. 1997b). Additionally, the influx of groundwater moderates summer temperature extremes and allows some species to live in Illinois fens that are more common to areas farther north. This includes an isolated pocket of white cedar trees, which are common in more northern boreal regions but are near the southern extent of their reach at Trout Park. Thus, changes in groundwater temperature or pH, especially acidification, could adversely affect these plant communities.

Increased nutrient inputs to the preserve could also be detrimental to sensitive plant communities at Trout Park. Significant enrichment of nutrients (e.g., nitrogen, phosphorous) can drastically shift community structure and decrease species richness, with species that typify fen wetlands being specifically sensitive to this type of enrichment (U.S. Environmental Protection Agency 1990, Drexler and Bedford 2002). One constituent of particular concern is nitrate, which can control ecosystem dynamics because nitrogen is a major limiting nutrient for peatland productivity (Mitsch and Gosselink 2000a). Residential drainage in the area is one potential source of nitrate contamination.

High concentrations of dissolved solids may also present a risk to the specialized plant communities present at Trout Park. This type of pollution can be derived from domestic, industrial, and transportation sources, including septic systems and roadway deicing agents. Concentrations of dissolved solids were used by Panno et al. (1999) to explain the degradation of fen vegetation in a similar northeastern Illinois fen-wetland complex. In that study, contaminant plumes were coincident with a loss of wetland biodiversity, with native species being replaced by more generalist species. Of specific concern is the presence of roadways adjacent to the preserve, especially I-90. Deicing agents applied to adjacent roadways can affect the preserve by entering groundwater upgradient of the site, as well as by direct runoff and salt spray.

Other potential threats to Trout Park include groundwater withdrawals, mining, and land alterations that affect regional hydrogeology. If new or existing wells withdraw water from the same permeable geologic units that contribute groundwater to the site, the wells could lower groundwater levels and adversely affect groundwater-dependent ecological communities. Additionally, the presence of consistent groundwater flow to the preserve depends on the occurrence of extensive sand and gravel deposits located topographically higher than and upgradient from the preserve. Thus, any activities (e.g., construction of mine pits or ponds) that remove or alter these deposits could alter the quality and quantity of groundwater discharging at the preserve. Mining also may expose groundwater to the atmosphere, allowing dilution of dissolved minerals or changes in temperature that may affect geochemistry of the groundwater.

Other land-use changes within groundwater recharge areas can alter the quality and quantity of groundwater inputs to the preserve. Natural landscapes facilitate infiltration, in part by minimizing runoff. In contrast, urban and residential landscapes contain larger areas of impermeable, paved, or compacted surfaces and dense turf grasses. These surfaces provide little to no infiltration and instead allow water to run off into streams or sewers, thus decreasing groundwater input to the site.

IV. A general geologic profile of the dedicated nature preserve based on the most reasonable available information including, but not limited to, geologic maps and subsurface groundwater flow direction.

A general geologic profile for the site was developed by Locke et al. (1997b) and is provided as part of the site vulnerability assessment reproduced in the appendix. The modern landscape around Trout Park Nature Preserve reflects past glacial activity, with thick deposits of glacial till (diamictons) alternating and inter-bedding with coarser-grained outwash deposits (Hansel and Johnson 1996). In the region of Trout Park, approximately 25 to more than 100 feet of unconsolidated glacial deposits (depending on topographic position) overlay Silurian dolomite and limestone bedrock. Locally, these glacial deposits include the Henry Formation (a coarse-grained outwash deposit), the Haeger Member of the Lemont Formation (a coarse-grained diamicton), and the Yorkville Member of the Lemont Formation (a clayey diamicton). Extensive sand and gravel deposits of the Henry Formation are present at land surface in the preserve, extending to the east and north. The Haeger Member of the Lemont Formation outcrops at land surface well east of the preserve but interbeds with the Henry Formation and generally consists of a gravelly, sandy loam. Combined, the two units create an aquifer that extends to the east and north of the preserve, with the topographically highest point of the aquifer occurring three miles northeast of the preserve. The permeability of these surficial units was one factor in the determination by Locke et al. (1997a and b) that the preserve had a "high" vulnerability to groundwater contamination, with surface contaminants being capable of being transmitted into and through the aquifer. The Yorkville Member generally acts as an aquitard, with clay-rich portions impeding downward groundwater movement and facilitating groundwater discharge in the bluff face from the overlying coarse-grained units.

A regional groundwater contribution area (GCA) and an adjusted surface watershed area (ASWA) were developed following the methods of Locke et al. (2005). A potentiometric map for the surficial aquifer was created using historical groundwater data from water-well records (Illinois State Geological Survey 2010), topographic data, and surface water-level elevations taken from U.S. Geological Survey topographic maps (U.S. Geological Survey 1992 and 1993). A regional GCA for the aquifer was developed using flow-net analysis (Figure 2). Additionally, a lower aquifer was identified from water-well records. This aquifer appears to be confined to semi-confined and may contribute groundwater to the lower elevations on the far west side of the preserve. However, available data were insufficient to adequately determine the lower aquifer's extent, potentiometry, and relative amount of groundwater contribution. Therefore, no GCA was determined for the lower aquifer. Based on local geology, the lower aquifer likely plays a less influential role in the geochemical composition of water at the preserve as compared with the surficial aquifer, but may still be hydraulically connected to the preserve and therefore could affect water levels and geochemistry toward the western edge of the preserve. Additional data is needed to better characterize the lower aquifer.

The regional GCA covers a 2,962-acre area that extends east and northeast of the preserve. This area was combined with the adjusted surface watershed area (ASWA) to create the final GCA (Figure 3). The final GCA extends east and northeast of the preserve and covers 4.9 square miles (3,109 acres). The final GCA is an appropriate area to be considered for Class III designation. Land cover within the final GCA is summarized in Table 2 and illustrated in Figure 4.

V. A description of the interrelationship between groundwater and the nature of the site.

Hydrology is the most important factor in the establishment and persistence of wetland ecosystems (Mitsch and Gosselink 2000b), so any activities that alter hydrology have the potential to adversely affect wetland and wetland-related ecosystems. At Trout Park, persistent groundwater discharge supports peat development and associated specialized high-quality natural communities, and continued input of groundwater rich in dissolved minerals is essential to preserving the site.

Acknowledgements

The preceding material is based upon work supported by the Illinois Department of Natural Resources (Illinois Nature Preserves Commission) under Contract No. IDNR RC09DFP01. Any opinions, findings, conclusions, and recommendations expressed in this publication are those of the authors and do not necessarily reflect the views of the Illinois State Geological Survey (ISGS), Illinois Nature Preserves Commission (INPC), or Illinois Department of Natural Resources (IDNR). Contributors to this report include staff of the ISGS and Jenny Skufca of the INPC. Publication of this report is authorized by the Director, Illinois State Geological Survey, Institute of Natural Resource Sustainability, University of Illinois, Urbana-Champaign.

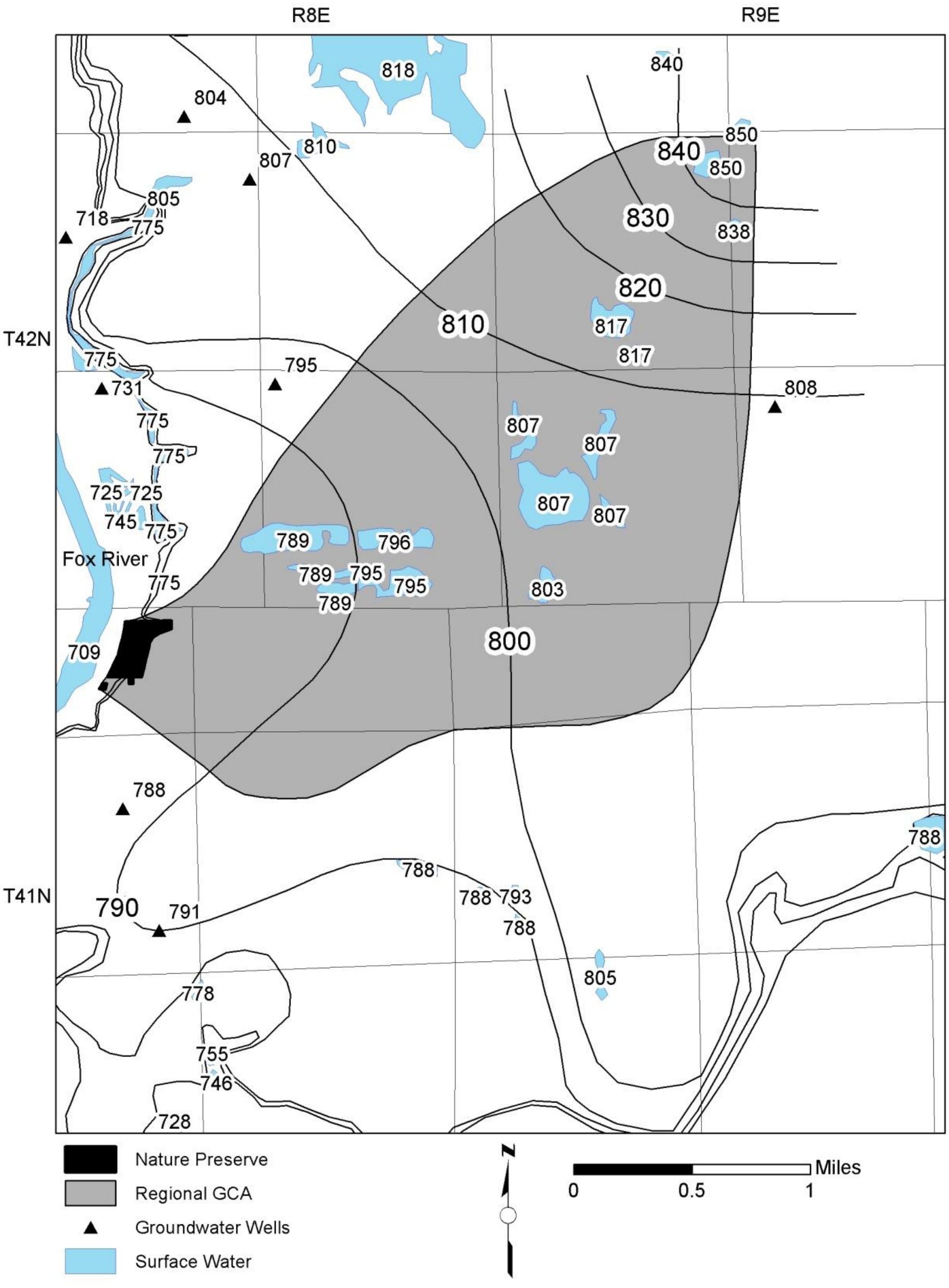


Figure 2. Groundwater and surface-water elevations, potentiometric contours, and regional GCA for Trout Park Nature Preserve. Groundwater data were derived from historical water-well records (Illinois State Geological Survey 2010) and surface-water elevations were derived from U.S. Geological Survey topographic maps (U.S. Geological Survey 1992 and 1993).

Figure 3. Comparison of the regional GCA, ASWA, and final GCA for Trout Park Nature Preserve.

Table 2. Summary of land cover within the final GCA for Trout Park Nature Preserve. Data used for this analysis were described by Luman et al. (2004). Satellite imagery was acquired during the spring, summer, and fall seasons of 1999 and 2000 and possesses a 30x30-meter ground spatial resolution.

Land Use/Land Cover Type	**Acres**	**Percent**
Agricultural Land - Corn	195.1	6.3
Agricultural Land - Soybeans	334.2	10.8
Agricultural Land - Other Small Grains and Hay	11.1	0.4
Forested Land - Upland	270.2	8.7
Forested Land - Partial Canopy/Savannah Upland	73.5	2.4
Urban Land – High Density	384.4	12.4
Urban Land – Low/Medium Density	682.0	21.9
Urban Land - Urban Open Space	890.9	28.7
Wetland - Shallow Marsh/Wet Meadow	76.0	2.4
Wetland – Deep Marsh	3.1	0.1
Wetland - Floodplain Forest	2.1	<0.1
Other - Surface Water	184.8	5.9
Other - Barren and Exposed Land	1.7	<0.1
Totals	3,109.0	100.0

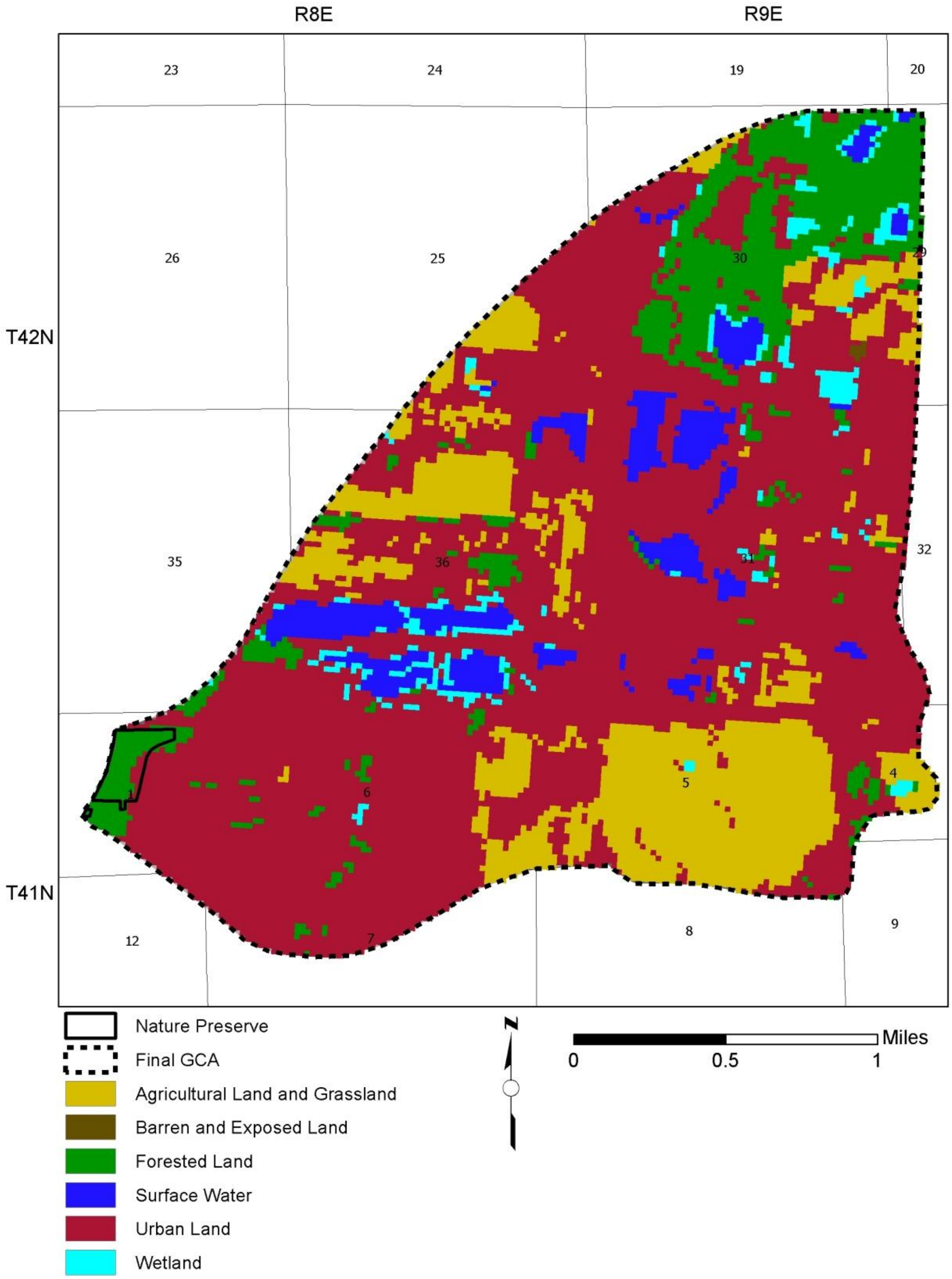


Figure 4. Generalized land cover and final GCA for Trout Park Nature Preserve.

Literature Cited

Byers, S.M., 2000, Fens: more than "peat with calcareous seepage…": Illinois Audubon Magazine (fall edition): pp. 8-13.

Drexler, J.Z., and Bedford, B.L., 2002, Pathways of nutrient loading and impacts on plant diversity in a New York peatland: Wetlands Vol. 22, No. 2, pp. 263-281.

Glaser, P.H., 1987, The Ecology of Patterned Boreal Peatlands of Northern Minnesota: A Community Profile: Biological Report 85 (7.14), U.S. Fish and Wildlife Service, Washington D.C., 98 p.

Greenberg, J., 2002, Of Two Worlds: Wetlands. In A Natural History of the Chicago Region, pp. 136-139, The University of Chicago Press, Chicago, 614 p.

Hansel, A.K., and Johnson, W.H., 1996, Wedron and Mason Groups: Lithostratigraphic Reclassification of Deposits of the Wisconsin Episode, Lake Michigan Lobe Area: Illinois State Geological Survey Bulletin 104, Champaign, Illinois, 116 p.

Illinois State Geological Survey, 2010, Illinois Water Well (ILWATER) Internet Map Service, Illinois State Geological Survey, Champaign, IL. Data accessed from http://www.isgs.illinois.edu/maps-data-pub/wwdb/launchims.shtml

Knight, C.W., Locke, R.A. II, and Miner, J.J., 2010, Selected Scientific and Technical Information about Trout Park Nature Preserve: University of Illinois at Urbana-Champaign, Institute of Natural Resource Sustainability, Illinois State Geological Survey Contract-Grant Report for the Illinois Department of Natural Resources (Illinois Nature Preserves Commission), Champaign, Illinois, 18 p.

Locke, R.A. II, Berg, R.C., Wehrmann, H.A., Miller, M.V., and Keefer, D.A., 1997a, Vulnerability of Illinois Nature Preserves to Potential Ground-Water Contamination Volume I: Methodology and Initial Assessment: Illinois State Water Survey Contract Report 612, Champaign, Illinois, 125 p.

Locke, R.A. II, Berg, R.C., and Mushrush, M.J., 1997b, Vulnerability of Illinois Nature Preserves to Potential Ground-Water Contamination Volume II: Selected Site Data from Vulnerability Assessments and Sensitivity Classifications: Illinois State Water Survey Contract Report 612a, Champaign, Illinois, 427 p.

Locke, R.A. II, Miner, J.J., Sinclair, S.V., Anliker, M.A., Pociask, G.E., Robinson, B.J., and Dey, W.S., 2005, A Method for Estimating Groundwater Contribution Areas for Illinois Nature Preserves and Other Natural Areas: Illinois State Water Survey and Illinois State Geological Survey Contract Report 2005-11, Champaign, Illinois, 57 p.

Luman, D.E., Tweedale, T., Bahnsen, B., and Willis, P., 2004, Illinois Land Cover: 1:500,000-scale color map, 32.5” x 52”, ISGS Illinois Map 12: Illinois State Geological Survey, Champaign Illinois. Companion website and project datasets accessed from http://www.agr.state.il.us/gis/landcover.html on February 23, 2010.

McFall, D., and Karnes, J. (Eds.), 1995, A Directory of Illinois Nature Preserves, Volume 1: Illinois Department of Natural Resources, Springfield, Illinois. 195 p.

Mitsch, W.J., and Gosselink, J.G., 2000a, Peatlands: In Wetlands, pp. 419-467, John Wiley & Sons, New York, 920 p.

Mitsch, W.J., and Gosselink, J.G., 2000b, Wetland Hydrology: In Wetlands, pp. 107-153, John Wiley & Sons, New York, 920 p.

Panno, S.V., Nuzzo, V.A., Cartwright, K., Hensel, B.R., and Krapac, I.G., 1999, Impact of urban development on the chemical composition of ground water in a fen-wetland complex: Wetlands Volume 19, No. 1, pp. 236-245.

Paulson, G., and Bowles, M. L., 1986, Master plan for Trout Park Nature Preserve, Kane County, Illinois: Illinois Nature Preserves Commission, Springfield, IL, 36 p.

U.S. Environmental Protection Agency, 1990, Impacts on Quality of Inland Wetlands of the United States: A Survey of Indicators, Techniques, and Applications of Community Level Biomonitoring Data: USEPA Report Number EPA/600/3-90/073.

U.S. Geological Survey, 1992, Elgin Quadrangle, IL, 7.5-Minute Series (Topographic): 1:24,000-scale color map, U.S. Department of the Interior, Geological Survey, Reston, Virginia, 1 sheet.

U.S. Geological Survey, 1993, Streamwood Quadrangle, IL, 7.5-Minute Series (Topographic): 1:24,000-scale color map, U.S. Department of the Interior, Geological Survey, Reston, Virginia, 1 sheet.

White, J., 1978, Illinois Natural Areas Inventory Technical Report, Volume 1: Survey Methods and Results: Illinois Natural Areas Inventory, Urbana, Illinois, xix + 426 p.

Appendix
from Locke et al. (1997b)

Site #: 31 NPC #: 42 Site: Trout Park
County: Kane Location: 1 41N 8E
Acres: 26.0 7.5 Map(s): Elgin
Visit date: 06/21/96 Field crew: RAL HAW
Photos taken? Yes Number: 5
Photo description: R7P5: spring
R7P6: R. Locke sampling north view
R7P7: R. Locke sampling south view
R7P8: A. Wehrmann crossing bridge
R7P9: looking down at Skunk cabbage

SAMPLE INFORMATION
Source: stream

Sample 1 readings were taken just the below upper footbridge on the low path (second footbridge keeping to right as one ascends from lower parking area on Trout Park Blvd.). Location is noted on the topo.

	DATE	TIME	pH	TEMP	SC	ORP
Sample 1	06/21/96	11:30 A	7.8	14.5	920	59

PAST ON-SITE LAND USE:

The fen has been used as an attraction for decades. Water from the springs in the park was bottled for a period of time in the early 1900's.

PRESENT LAND USE:

NO SUBURBAN RESIDENTIAL LAND USES NOTED

INDUSTRIAL/COMMERCIAL/MUNICIPAL

	on site	off site	location & description
pipelines		X	Two Northern Illinois Gas pipelines run along Trout Park Blvd. An IBT underground cable is also present.

Appendix (continued)

from Locke et al. (1997b)

NO AGRICULTURAL LAND USES NOTED

NO RURAL RESIDENTIAL LAND USES NOTED

TRANSPORTATIONAL

	on site	off site	location & description
paved road		X	Paved roads form boundaries on all sides. On the north side is I-90 which actually cuts through a similar environment and separates this nature preserve from the Chicago Junior School property to the north. Other roads are Route 25 (east), Trout Blvd. (south), and Duncan (?) Avenue (west).

Is there potential impact from runoff? Yes. Runoff and salt spray from I-90 as well as all other streets are a possibility.

RECREATIONAL

	on site	off site	location & description
trail development	X		throughout site
parking	X		
other		X	'baseball park' - immediately east at top of hill which is, in part, a water source for the springs on the hillslope below

NO ON-SITE MISCELLANEOUS LAND USES NOTED

Appendix (continued)

from Locke et al. (1997b)

HYDROLOGY:

INPUTS

ground water

Trout Park is noted for the springs which flow out from the gravelly slopes. Springs are assumed to emit where ground water encounters more impermeable clay layers underlying the gravel. It is estimated that ground water from as far east as Barrington Road may contribute to the springs, but this seems a bit too far. Recharge area could certainly reach east of Route 25 though.

surface water

Springs form rapidly flowing streams which travel west to the Fox River.

OUTPUTS

ground water

Springs/seeps discharge on-site and flow to the west. Off-site ground-water flow may also occur to the west.

surface water

Springs/streams discharge out west side of the fen to the Fox River.

GEOLOGY:

Primary geologic origin(s): fluvial/alluvial, glacial

SOIL ASSOCIATION/SERIES

Upland soils: Waupecan, Fox, Rodman, & Dresden soils. Houghton Muck soils are associated with ravine bottoms and lower areas.

QUATERNARY DEPOSITS

Glacial materials are from the Woodfordian Substage of the Wisconsinan Stage. The Henry Formation consists of about 40 feet of sand and gravel outwash which overlies 50 feet of Yorkville Diamicton of the Minooka Moraine. Grayslake Peat/Henry Formation/Yorkville/Member.

BEDROCK

upper lithology: limestone, dolomite

supplemental description:

Depth to rock depends on topographic relief. Bedrock uplands are to the east and a bedrock valley is associated with Fox River.

Appendix (continued)
from Locke et al. (1997b)

depth: 25 - 100 + feet

GEOMORPHOLOGY
Trout Park Fen occupies the eastern bluff of the Fox River Valley.

TOPOGRAPHY
Topography slopes rapidly from east to west, from the uplands to the Fox River Floodplain. The top of the park is at an elevation of 800 feet while lower portions of the fen are at 740 feet. This is a 60 foot drop in less than 1000 feet (greater than 6% slope).

Potential for Contamination:
of ground water is high.

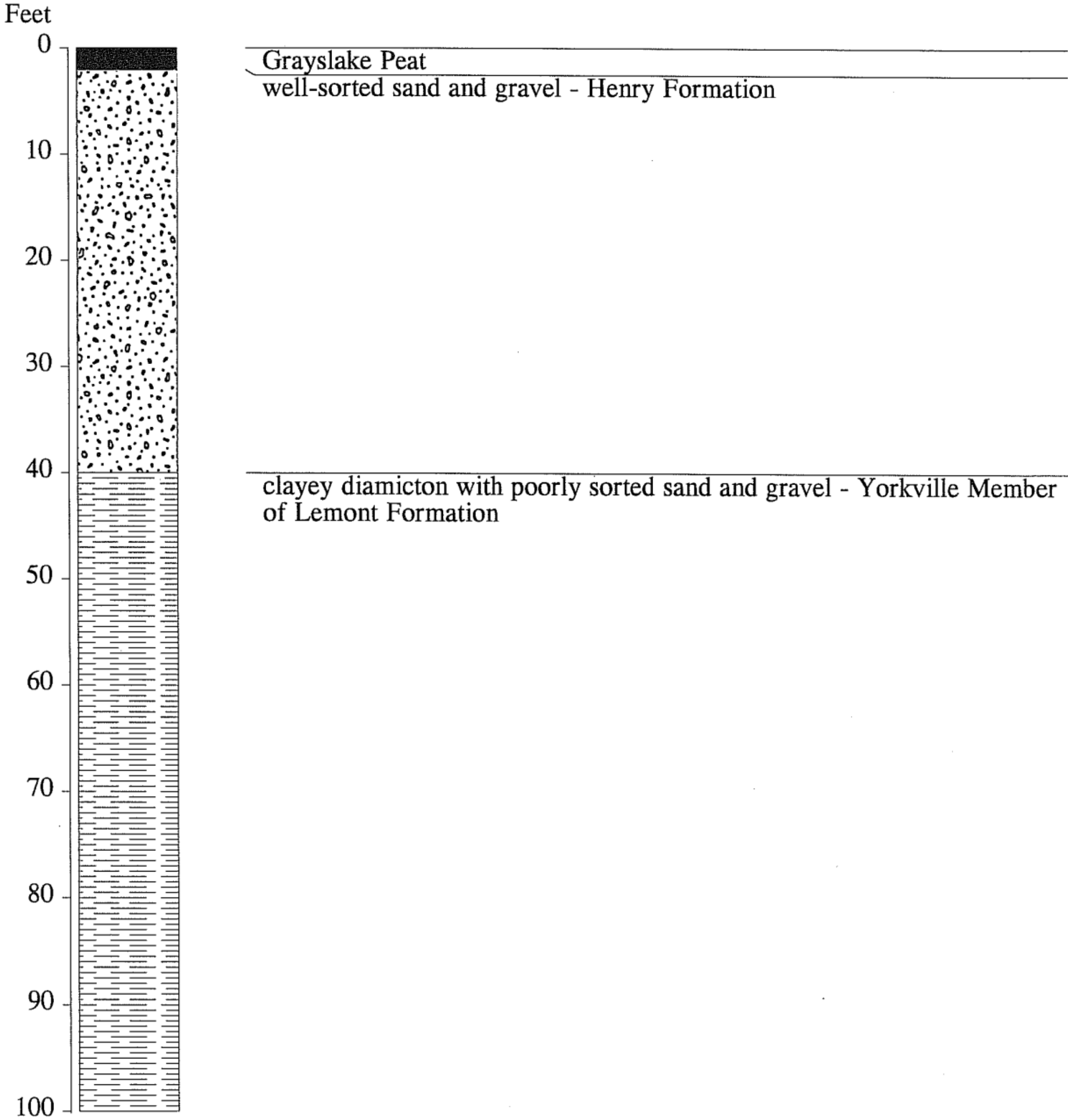
of surface water is moderate.

Initial Assessment of Site Vulnerability:
from ground water is high.
Main problems are infiltration of road runoff and a heavily developed area upgradient of the site.
Geology is sensitive both on- and off-site.
from surface water is moderate.
Road runoff may be a problem.

Appendix (concluded)

from Locke et al. (1997b)

Trout Park Nature Preserve
Kane County - 41N 8E Section 1
750
Stratigraphic Column based on geologic information provided in the dedication proposal



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