LAND CONSERVATION AND WATER QUALITY IN THE SARATOGA LAKE WATERSHED

By

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ABSTRACT

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This study examined land conservation and its potential impacts on water quality within the Saratoga Lake watershed. Conserved lands were mapped in GIS from Saratoga County tax parcel, New York State Gap Analysis Project, and World Database on Protected Areas data. These lands were compared with a vegetation map derived from United States Geological Survey land cover data, to analyze the land cover of the watershed as a whole and the conserved lands in particular. Overall, the watershed is approximately 70% forest, with 81 conserved parcels, and conserved forest lands covering 2.17% of the watershed's 210 square mile total area. Since 30% or more wooded land is typically recommended for the maintenance of good water quality, our water is unlikely to be in danger of degradation currently, but will require more extensive forest conservation to ensure its quality for the future in the face of rapid development.

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Introduction

A watershed is a geographic region that drains into a common outlet, such as a stream, river, or lake. The common outlet intimately connects the land, water, and activities taking place in the region. Because of this, water quality (the characteristics of water that make it useful for human applications and ecological functioning) may be strongly influenced by human land use within the watershed.

All land-disturbing activities such as agriculture and construction may cause the addition of sediment to water bodies (Lenat and Crawford 1994). Runoff from agricultural lands often adds nutrients, sediments, and toxic chemicals such as pesticides to water, reducing its quality (Frankenberger 2000). However, water quality degradation due to agricultural land use typically does not occur until these lands represent at least 20% land cover, with significant degradation not occurring until approximately 50% land cover (Wang et al. 1997).

Urban development, however, impacts water quality at

have found water quality degradation to occur with as little as 7-15% impervious surface cover, corresponding to 20-30% urban land use (Barbec et al. 2002; Wang et al. 1997).

Efforts to mitigate these effects have included detention and infiltration ponds and riparian buffers, with mixed success (Barbec et al. 2002). Detention ponds and infiltration setups may reduce water surges by absorbing additional runoff, and may even increase ground water infiltration, but cannot filter and sequester nutrients and toxins as vegetation can (Barbec et al. 2002). Often cited as the panacea of watershed protection, riparian buffers are vegetated areas adjacent to waterbodies. By interrupting the otherwise direct flow of runoff into surface water, these areas help to slow the rate of runoff and decrease erosion while filtering and trapping nutrients, pollutants, and sediments (Guidebook of BMPs 1998; Lowrance et al. 1984; Aldrich and Wyerman 2006). Generally they are between 10-150m wide, but they have been seen to function poorly at less than 30m (Guidebook of BMPs 1998; Lowrance et al. 1984). Moreover, when imperviousness reached 45% in Seattle Washington, riparian buffers ceased to protect the water condition (Barbec et al. 2002). Additionally, water degradation has been found to occur in areas with 100% riparian buffers with as little as 10% imperviousness even where storm water is considered well managed (Barbec et al. 2002; Aldrich and Wyerman 2006). Thus, riparian buffersBa W

2006). The importance of open space

human use and

mapping and legal resources to analyze the conserved lands and vegetation of the region and their implications for current and future water quality.

Methods

First, all lands within the watershed possibly fitting the description of conserved, were selected in GIS (ESRI ArcMap) from Saratoga County tax parcel data (2005). This was done by choosing all parcels with a property class code of 900 of greater (falling into the category "Wild, forested, conservation lands, and public parks") as well as those with the property class description "Park" or "Recreation center."

In addition, interviews were conducted with the New York State Department of Environmental Conservation, Saratoga County Planner's Office, Saratoga Preserving Land and Nature (Saratoga PLAN), the Farmland Trust, and the Wilton Wildlife Preserve and Park to determine if any lands had been missed in the initial GIS search. Further, maps of conserved areas from the 2000 New York Gap Analysis Project (NYGAP) and the 2000 World Database on Protected Areas (WDPA) were also used to verify and expand upon the initial tax parcel search.

Once all of these lands were mapped, the conservation status and restrictions on use were then determined for each of the property classes represented using New York State laws and metadata from NYGAP stewardship file (2000).

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Results

The first search through G

The private forest classification reflects all privately owned, forested lands that do not fit any of the other classifications (Assessor's manual 2006). These may include tree plantations and timber tracts, so inclusion in this category is not enough to prove or disprove a conserved status. (Assessor's manual 2006).

interruption of natural disturbance) (NYGAP 2000). There are no lands of this class in the watershed. Class 2 lands have permanent protection from development and management plans in operation for at least 90% of the land, but may receive uses or management practices that degrade the quality of natural communities (NYGAP 2000). There are four parcels of this class in the watershed (totaling 0.31 square miles), all of which are in the northwest most section where the Adirondack Park boundary crosses though the watershed. Class 3 lands have permanent protection for the majority of the area but are subject to extractive uses of a broad, low-intensity type (i.e., logging) or local, high-intensity type (i.e., mining) (NYGA

Appendix A, Figure 3). Of the conserved lands,

(Kauffman and Brant 2000). Overall, these results indicate that the low level of urbanization and high level of forestation probably mean our water is not significantly compromised on a watershed scale.

However, our water quality may not be sustained in the future given the high rate of growth in the county and lack of conserved lands within the watershed. With the fastest growth rate in the county, it is important that current forest lands are protected from future development. For example,

certainly come against strong opposition, it may be one of the only options to protect water quality in the future if lands are not conserved beforehand.

Further research should be conducted on a number of related issues. First, wetlands are critical areas for permeability and water quality protection. These areas were excluded from my analysis due to discrepancies in the 2001 USGS land cover data, bringing into question their mapping of wetlands. However, the distribution and importance of these lands within the region should be studied in the future. Moreover, the distribution, composition, and importance of riparian buffers within the watershed should be evaluated, since these may also be important in water quality preservation. Impervious surface cover and importance should also be studied.

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Land to lake perspectives: a watershed management plan for Sarat

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Appendix A: Figures

Figure 1: Possibly Conserved Parcels

Figure 2: Conserved Parcels

Figure 3: Watershed Land Cover

Appendix B: Data

Table 1: Condensing USGS Land Cover Classifications for the Entire Watershed

USGS Classification	My Classification	Sq Miles	Subtotals by C