



## Understanding Landowner and Municipal Official Perceptions of Water Quality in a Local Watershed

Shorna Broussard Allred, Margaret Kurth, Carolyn Klocker, & Allison Chatrychan

### What is Water Quality?

Water quality is a term that describes the physical, chemical, and biological properties of water, usually with respect to its use for a particular purpose. Water that may be safe enough to wash your car may not be clean enough to drink or may be harmful to aquatic animals and plants. Water quality standards help define the levels at which certain substances can be found in our water and still be safe for different uses. Human dimensions research can help us understand resident and municipal official perceptions of water quality.

### What Threatens Water Quality?

While the Clean Water Act of 1972 alleviated much of the water quality degradation by pollution from identifiable sources (point sources), addressing pollution from more diffuse, nonpoint sources remains a challenge. Nonpoint source pollution does not enter streams and lakes via a pipe discharge but is carried to water bodies by rain or snow that runs off and through the surrounding landscape. The close connection between water bodies and their surrounding landscape makes water quality susceptible to negative effects of land-use change. Traditional development typically decreases the natural water filtration and storage mechanisms that exist in a watershed (wetlands, open space, streamside vegetation, etc.). The Wappinger Creek Watershed can serve as a case study on the threat that development poses to water quality in a major tributary of the lower Hudson River.

### Why is it Important to Understand Perceptions?

Improvements in water quality cannot be made through regulation alone but also require the involvement of local communities. While municipal officials can and should use water quality data to guide their land-use decisions, it is also critical that they recognize the distinct human dimension of

water quality issues. The collective decisions of landowners can have enormous ramifications for water quality.

Understanding landowner perceptions helps local officials:

- Maintain and build the public's trust that local government will address residents' concerns and show that local officials are responsive to those concerns;
- Create communication messages that resonate with the public and to which they will respond;
- Understand residents' attitudes about who is responsible for protecting water quality;
- Understand landowner willingness to maintain or change their behavior to improve water quality;
- Identify problems that arise in the watershed which residents are often the first to experience; and
- Identify misconceptions that residents may hold about what problems exist, especially those that are invisible to untrained observers.

When municipal officials understand their own perspectives as well as those of landowners, they can align priorities and create responsive policies.

### Research Methods

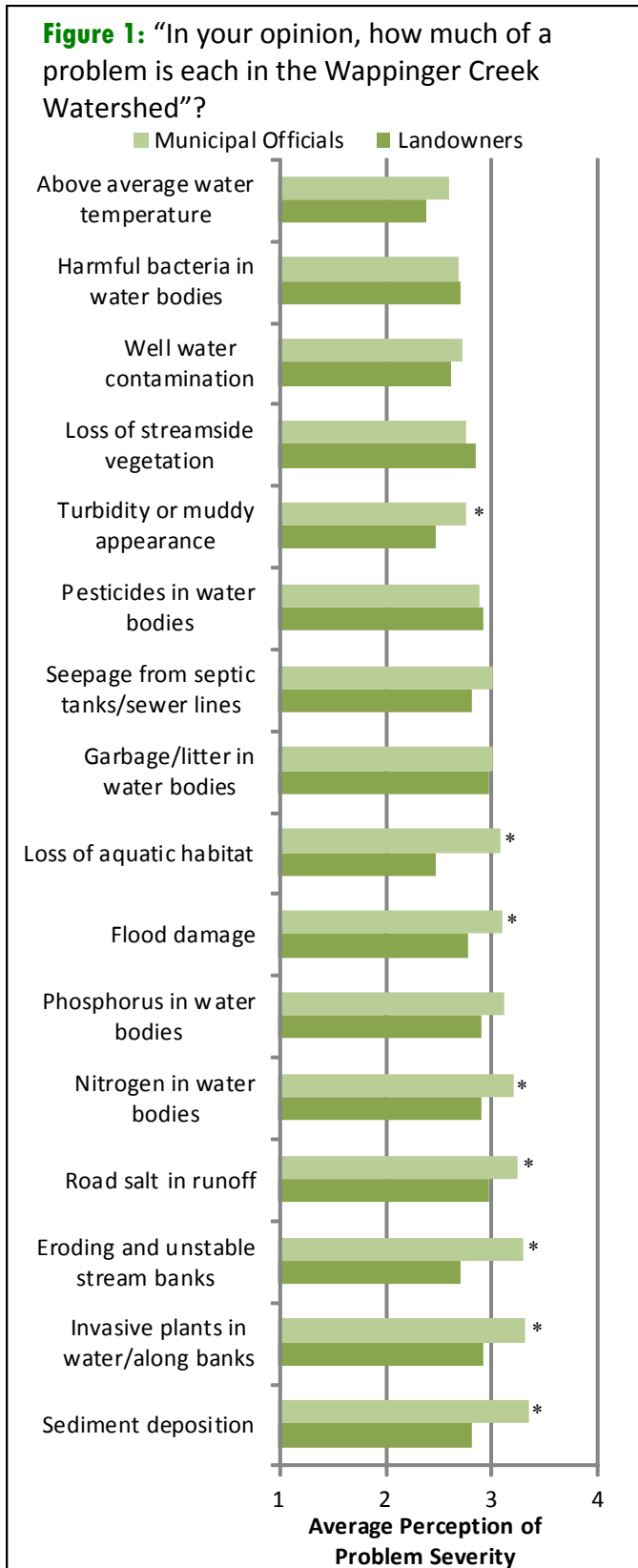
In the Spring and Summer of 2009, researchers at Cornell Cooperative Extension and the Human Dimensions Research Unit sent a questionnaire to 1,422 landowners (response rate = 26%) and 326 municipal officials (response rate = 32%) in the 13 municipalities of the Wappinger Creek Watershed in Dutchess County, New York to collect data to inform outreach and education efforts in the watershed. This factsheet reports on the water quality perceptions (i.e. attitudes, views, awareness, and concerns) of landowners and municipal officials, how closely



their perceptions compare to scientifically identified problems in the watershed, and the factors that influence perceptions.

### Perceptions of Water Quality

Figure 1 shows the average responses of landowners and municipal officials regarding the extent to which they believe each is a problem in their watershed.



Municipal officials perceive many of the problems in the watershed as more severe than landowners do and the difference in response is statistically significant for more than half of the water quality problems. Additionally, the frequency of “don’t know” responses by landowners was more than 50% for nearly half of the watershed problems including pesticides, harmful bacteria, above average water temperature, nitrogen, and phosphorus in water bodies as well as seepage from septic tanks/sewer lines and well water contamination. The higher severity ratings given to watershed problems by municipal officials, along with their greater degree of certainty may be due to their responsibility to manage watershed quality at the local level. However, their greater certainty and concern does not necessarily mean they are more aware. Bringing municipal officials’ desire to address watershed problems in line with landowners’ priorities will need to be carried out through communication about the issues.

### Concerns about Watershed Problems

In addition to rating the severity of watershed problems, survey respondents were asked to choose those problems that are of top concern to them (Table 1).

|                 | <b>Municipal Officials</b>               | <b>Landowners</b>   |
|-----------------|--|---|
| 1 <sup>st</sup> | Sediment deposition (40%)                | Garbage in and around water bodies (42%)                                    |
| 2 <sup>nd</sup> | Road salt runoff (36%)                   | Seepage from septic tanks (31%)   |
| 3 <sup>rd</sup> | Garbage in and around water bodies (24%) | Pesticides in water (29%)   |
| 4 <sup>th</sup> | Harmful bacteria in water (24%)          | Loss of habitat for trout/aquatic species & Harmful bacteria in water (25%) |
| 5 <sup>th</sup> | Eroding and unstable banks (26%)         | Well water contamination (23%)  |

### Watershed Condition

While stakeholder perceptions should guide local policies and management actions, these actions must also be grounded in the watershed conditions. Cornell Cooperative Extension Dutchess County held a meeting in May 2010 during which stakeholders of the Wappinger Creek Watershed

reinforced that comparing perceptions with scientifically identified water quality problems is a priority for them. Although data does not exist for all the problems asked about in the survey, the available data can provide a basis for comparison and prioritization. Table 2 identifies the most critical causes and effects of pollution in the watershed as outlined in the Natural Resource Management Plan for the Wappinger Creek. The management plan aims to guide municipalities in their decision-making to improve the conditions of the watershed.

**Table 2:** Causes and Effects of Pollution in the Wappinger Creek Watershed as Identified by the Natural Resource Management Plan, 2000.

|  |
|--|
| <b>Causes:</b>   |
| <p>Nonpoint source pollution from:</p> <ul style="list-style-type: none"> <li>-Septic seepage of nutrients and bacteria</li> <li>-Overland runoff carrying pollutants</li> </ul> <p>Loss of vegetated buffers along streams and lakes<br/>Growth pressure</p>  |
| <b>Effects:</b>  |
| <p>Water that does not meet water quality standards for its designated uses</p> <ul style="list-style-type: none"> <li>-Contaminated drinking water wells</li> <li>-Lakes and streams filled in with sediment</li> <li>-Eutrophication of lakes and ponds</li> <li>-Excessive aquatic weed growth</li> </ul> |

### Other Water Quality Problems

**Degradation of downstream lake:** Wappinger Lake, located just north of the outlet of the creek into the Hudson River, acts as a sink for substances that travel downstream and is an indicator of water quality issues for the watershed. The primary nonpoint source pollutants in the watershed, sediment and phosphorous, have accumulated in the Lake and degraded its value as a drinking water source and recreational resource<sup>1</sup>.

**Harmful bacteria:** Bacteria is carried to water bodies from source on the landscape such as faulty septic systems and agricultural operations. Muddy appearance of water bodies may indicate that bacteria levels are too high for recreation such as swimming. (Natural Resource Management Plan, 2000).

**Flood damage:** Damage associated with flooding has increased. Flooding is caused by the intensity of the rainfall but also exacerbated by increasing impervious surfaces in the watershed which amplifies flooding impacts and damage (Strayer, 2007).

**Loss of aquatic habitat:** Long and short term trends of declining biologic communities have been observed, probably as a result of land development pressures on aquatic habitats (Stainbrook, 2006).

**Invasive Plants:** There is excessive invasive weed growth, especially in the Southern end of the watershed where Water Chestnut carpets water bodies.

### Comparing Local Perceptions with Science

- While municipal officials recognized that eroding and unstable stream banks are a problem, they did not rate the probable cause of the problem, loss of streamside vegetation, as being equally severe.
- Both landowners and municipal officials rated the severity of nitrogen and phosphorous equally, while the DEC identifies excess phosphorous as a more critical problem. This is likely because nitrogen and phosphorus have a similar effect on the watershed and education efforts often do not differentiate between the two.
- Road salt in runoff is rated as the second most severe problem on average by landowners and the fourth most severe by municipal officials. Local data is largely unpublished but information about degradation of local water bodies by salt is spreading through outreach and education efforts.
- While there is little published data on the effects of pesticides on water bodies in the Wappinger Creek Watershed, landowners and municipal officials rated the problem of pesticides in water bodies as moderate in severity, possibly because of the presence of agricultural areas in the upper part of the watershed.
- Municipal officials rated sediment deposition as the most severe problem and are most concerned with this problem. This is in line with the scientific conclusion that sediment is a primary nonpoint source pollutant in the watershed.
- Landowners reported great concern with garbage and litter in and around water bodies. This indicates that the appearance of the watershed is a priority for landowners.
- Research indicates that seepage from septic systems is a substantial problem in the watershed, but neither stakeholder group rated the problem as greater than moderate, on average.

<sup>1</sup>The lake has been placed on the 2010 NYS Section 303(d) List of Impaired Waters and a total maximum daily load (TMDL) for phosphorous and sediment is being developed

## Factors that Affect Perception

There are many factors that can influence perceptions of watershed problems. Some of these factors include experience with and exposure to the water bodies in the watershed, knowledge of the water resources, and information sources. Understanding the factors which may account for awareness, willingness to change behavior, and misconceptions is valuable to tailoring outreach and education that will be effective and resonate with residents.

## Use of the Creek, its Tributaries, and Lakes

Neither landowners nor municipal officials in the Wappinger Creek Watershed reported very frequent use of the creek, its tributaries, or lakes/ponds. Respondents reported enjoying the view most frequently (often or very often) (68% landowners; 62% municipal officials), followed by hiking or walking along water bodies (landowners 34%; municipal officials 34%). Activities such as fishing, canoeing, and swimming or wading were done less frequently (less than 10% of each group reported often or very often use). Increasing and facilitating access and exposure to the Wappinger Creek and the natural environment for both residents and municipal officials may raise awareness of its condition and increase the salience of watershed issues.

## Information and Knowledge

Approximately half of landowners (47.9%) reported that they had sought out water-related information while the other half (52.1%) had not. The most frequently used information sources are a mix of formal and informal types. They include local newspapers, communication with friends and family, Cornell Cooperative Extension Dutchess County (CCEDC), the DEC, and the County Health Dept. Municipal officials were asked about their attendance at workshops on land-use planning to protect natural resources and water quality. Seventy-five percent of municipal officials have attended at least one workshop. Of those that reported participating in trainings, the most frequently attended were the Pace Land-Use Law training (60%), Dutchess County Planning Federation workshop (45%), and CCEDC Environment Program watershed and flooding workshops (39%).

## Aligning Perceptions with Management Priorities

Aligning the perceptions of stakeholders and the research-based priorities for the watershed will help create a holistic approach to watershed protection.

Local officials and community members can work to:

- Increase and facilitate recreational use of water resources by maintaining creek access points and organizing events which get people out on or near the water;
- Make water quality information interesting and accessible so that stakeholders have accurate and easily understandable information;
- Address misconceptions that exist among stakeholders by designing audience-specific outreach and education campaigns;
- Use citizen science programs to involve stakeholders in determining the watershed's condition so that people gain a deeper understanding of water quality issues;
- Create a working partnership between residents and local government officials that will foster trust and a place where citizens can share first hand experiences they have with watershed problems.

## References

Dutchess County Environmental Management Council, Dutchess County Soil and Water Conservation District, Wappinger Creek Watershed Planning Committee and Dutchess County Water Quality Strategy Committee. 2000. *Natural Resource Management Plan for the Wappinger Creek Watershed*. <http://www.hudsonwatershed.org/plans09/wappinger.pdf>

Stainbrook, K.M., Limburg, K.E., Daniels, R.A., and R.E. Schmidt. 2006. Long-term changes in ecosystem health of two Hudson Valley watersheds, New York, USA, 1936-2001. *Hydrobiologia*, 571:313-327.

Strayer, D. (2007, April 22). Flooding is caused by more than just rainfall. *The Poughkeepsie Journal*. Retrieved from [http://www.fishkillcreekwatershed.org/FCWC/media/PoJo\\_04\\_22\\_07.htm](http://www.fishkillcreekwatershed.org/FCWC/media/PoJo_04_22_07.htm)

### Author Contact Information:

Shorna Broussard Allred, Ph.D.  
Associate Professor  
Department of Natural Resources  
Human Dimensions Research Unit  
Cornell University  
Office: (607) 255-2149  
[www.human-dimensions.org](http://www.human-dimensions.org)

### TO CITE THIS REPORT:

Broussard Allred, S., Kurth, M., Klocker, C. and A. Chatrychan. 2011. *Understanding Landowner and Municipal Official Perceptions of Water Quality in a Local Watershed*. Cornell University Human Dimensions Research Unit (HDRU), HDRU Outreach Series Publication No. 11-1, January 2011.

This project was funded in part by a grant from the New York State Environmental Protection Fund through a Hudson River Estuary Program of the New York State Department of Environmental Conservation (DEC) (contract #303671)