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Streamside Landowners in the Ashokan Watershed

Findings from a 2023 landowner survey

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EXECUTIVE SUMMARY

The purpose of this study is to improve understanding of beliefs, behaviors, information needs, and information source preferences among streamside landowners in the Ashokan Reservoir watershed. To achieve this end, Cornell Center for Conservation Social Sciences' staff worked with the Ashokan Watershed Stream Management Program (AWSMP) to design a self-administered questionnaire that addressed 4 objectives: (1) clarify streamside landowners' understanding and perceptions of current stream and floodplain topics, (2) identify the outreach topics of greatest interest to streamside landowners; (3) identify streamside landowners' preferences related to outreach sources and methods, and (4) characterize streamside landowners and their property protection and stream management activities.

In cooperation with a AWSMP Contact Team, we developed a self-administered questionnaire to address these research objectives. Staff at AWSMP identified 1,866 owners of property within the watershed that included an order 1-5 stream (Strahler 1957). We implemented a 4-wave survey in January-February 2023. Cover letters included a QR code that recipients could use to complete the questionnaire online instead of completing the paper form. We received 594 questionnaires from a pool of 1,622 deliverable questionnaires (36.7% response).

Key Findings

Landowner Characteristics and Activities

- Mean age of respondents was 45 years old (range 34 – 95 years). The majority (60%) of respondents were male. Most (83%) respondents had no one under 18 living in their household. About 35% of respondents owned a residence in the greater New York City metropolitan area. Over half (58%) of respondents owned a parcel with fulltime residents, about a third (34%) owned a parcel occupied seasonally. The most common purposes for which respondents spent time in and around streams in the watershed was for solitude/peace/quiet (84%), to connect with nature (78%), or for hiking (66%).
- 44% of respondents believed their property had been flooded in the past.
- 73% of respondents had a property with a headwater stream (i.e., stream order 1 – 3); 27% had a middle-sized stream (i.e., stream order 4 – 5).
- The actions taken most often to protect streamside property were cutting and removing in-stream wood (27%) and removing invasive plants (27%). Respondents whose property had flooded were more likely than landowners with no past flooding to have: removed invasive plants (34% vs. 23%), hardened streambanks (24% vs. 10%), or modified stream channels (14% vs. 6%).

Perceptions of Stream- and Flood-Related Topics

- Over 50% of respondents believed declining forest health, more intense storms with heavy rains, and development along streams were major threats to streams in the

watershed. At least 40% believed stream channel erosion, pollutants from septic tanks, warming water, and drought were major threats. Fewer respondents believed bank armoring/stream dredging was a major threat.

- Respondents whose property had flooded in the past were more likely than respondents whose property had not flooded to perceive the following as major threats to stream health: loss of streamside vegetation (46% vs. 30%); turbid (brown/cloudy) water (35% vs. 30%); more intense storms with heavy rain (63% vs. 51%,); and undersized bridges and culverts (36% vs. 21%).
- Landowners expressed broad support for collective actions to protect the health of streams in the watershed. For example, over 80% of respondents believed it was moderately or very important to implement large-scale stream restoration projects, limit future development adjacent to streams, and develop town plans for stream corridor conservation.
- Over 40% of respondents were moderately/very concerned about the possibility of flood damage, and concern about possible flood damage was higher among landowners whose property had flooded than among those whose property had not flooded.

Information Seeking

- 50% of respondents had heard about AWSMP events before they received a landowner questionnaire. They had become aware of AWSMP events primarily through the AWSMP newsletter (66%), word of mouth from a friend or relative (28%), and emails (26%).
- 53% of respondents were somewhat/very likely to attend an informational meeting about stream issues in the watershed; those whose land had flooded in the past were more likely to attend.
- Among landowners who were somewhat or very likely to attend a future meeting, 47% would prefer an online format, 33% would prefer an in-person format, and 20% had no preference on meeting format. They indicated that the best times for them to meet were weekday evenings (60%), weekend mornings (39%), weekend afternoons (36%), weekday afternoons (36%), or weekday mornings (28%).
- 52% of respondents were aware of local stream management plans and 29% had viewed a plan. Respondents whose land had flooded in the past were more likely than those whose land had not flooded to be aware of and have viewed a stream management plan.
- Respondents were most likely to prefer to get information about their streams from printed documents (66%), organization websites (53%), stream-related presentations (37%), and talking with friends and neighbors (37%).

ACKNOWLEDGMENTS

We extend our appreciation to the landowners of the Ashokan watershed for their participation in this study. For their assistance with multiple aspects of the study, we thank Tim Koch, Leslie Zucker, and Adam Doan (Ashokan Watershed Stream Management Program). Alexandra Sholk and Margaret Lachance (Cornell Center for Conservation Social Sciences) assisted with survey implementation and data coding. Domenic Darshan Varma, Abbey Yang, and Emily Xin Ramlochun conducted telephone nonrespondent interviews. Our survey instrument and request to conduct survey research was reviewed and granted approval by the Cornell University Office of Research Integrity and Assurance (Institutional Review Board for Human Participants Protocol ID# 1004001374). This work was funded by the Ashokan Watershed Stream Management Program.

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INTRODUCTION

This research was sponsored by the Ashokan Watershed Stream Management Program (AWSMP). The aims and activities of AWSMP are summarized below:

> *"AWSMP works in partnership with communities to protect and restore stream corridor stability and ecosystem integrity in the Ashokan Watershed.*
>
> *The Ashokan Watershed Stream Management Program (AWSMP) is a joint effort between Cornell Cooperative Extension of Ulster County, the Ulster County Soil and Water Conservation District, and the New York City Department of Environmental Protection. The three agencies work collaboratively to maintain the health of streams in the Ashokan Reservoir Watershed.*
>
> *The program aims to improve stream stability and reduce erosion threats to water quality and infrastructure, mitigate potential damage from flooding, and enhance aquatic and riparian habitat. AWSMP works to educate and inform the community about stream stewardship best management practices and coordinates stream management activities in the watershed. Stream management plans — comprehensive evaluations of stream characteristics with recommendations and strategies for improvement — provide the basis for the program's activities."*
>
> (Source: https://ulster.cce.cornell.edu/environment/ashokan-watershed-stream-management-program)

A better understanding of the activities, interests, and concerns of streamside landowners can help AWSMP staff develop and deliver programs that are useful in educating and informing community members about best management practices for streamside properties.

Study Objectives

The purpose of this study is to improve understanding of beliefs, behaviors, information needs, and information source or channel preferences among streamside landowners in the Ashokan Reservoir watershed. To achieve this end, Cornell staff worked with the Ashokan Watershed Stream Management Program (AWSMP) to design a self-administered questionnaire that addressed 4 objectives:

1. Clarify streamside landowners' understanding and perceptions of current stream and floodplain topics.
2. Identify the outreach topics, sources, and methods of greatest interest to streamside landowners.
3. Identify streamside landowners' preferences related to outreach sources and methods.
4. Characterize streamside landowners' and their property protection and stream management activities.

METHODS

Study Area

The study area was the Ashokan watershed (Figure 1). The drainage basin of the Ashokan reservoir encompasses an estimated 255 square miles, mainly in the New York State townships of Olive, Shandaken, Woodstock, Hurley, Lexington and Hunter. It spans portions of Ulster and Greene counties and most of the watershed is within the Catskill State Park. More than half of the land in the watershed is in public ownership; an estimated 11% is owned by New York City DEP. The watershed contains several hamlets, including Boiceville, Mount Tremper, Phoenicia, Shandaken, Big Indian, and Pine Hill (https://ashokanstreams.org/exploring-the-watershed/).

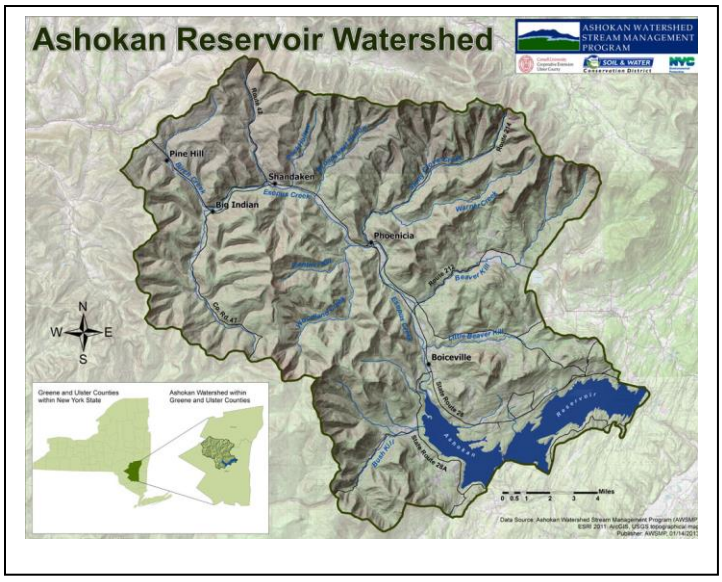

Figure 1. Map displaying the study area (i.e., the Ashokan Reservoir watershed). Dark line delineates the watershed and study area perimeter (map source: Ashokan Watershed Stream Management Program).

Survey Instrument

In cooperation with a AWSMP Contact Team, we developed a self-administered questionnaire (Appendix A) to address our research objectives. The questionnaire contained 105 questions that assessed:

- awareness of stream management plans,

- perceived impacts of stream processes and importance of management practices to mitigate those impacts,
- level of concern about flooding,
- property protection actions taken,
- stream related topics and flood mitigation actions about which landowners would like more information,
- outreach and educational program outlet preferences,
- preferred method for receiving information specifically from AWSMP,
- who they would contact for more information about managing streams on their property,
- frequency with which respondent uses social media,
- landownership characteristics,
- landowner sociodemographic characteristics.

Some questions were adapted from a previous, related survey of streamside landowners in the Esopus Creek watershed (Brown 2006). The Cornell University Office of Research Integrity and Assurance (Institutional Review Board for Human Participants, Protocol ID#1004001374) approved the questionnaire for use with human subjects.

Survey Implementation

Staff at AWSMP consulted real property assessment rolls to identify owners of private property within the Ashokan watershed that included a headwater (stream order 1-3) or middle-sized (stream order 4-5) stream. We implemented the survey with the 1,866 unique landowners identified by AWSMP. Seventy-five percent of the sample members owned property classified as residential (e.g., single family year-round or seasonal residences). The remaining quarter of the sample owned land classified as: residential or rural vacant land, commercial (e.g., apartment buildings, hotels, camps, restaurants, motor vehicle services), manufacturing and processing facilities, community services (e.g., religious organizations, fire protection, cemetery), or private hunting and fishing clubs. The sample did not include parcels held in public ownership (e.g., land held by NYSDEC).

In the first week of January, 2023 AWSMP sent all members of the sample a pre-notification postcard letting them know that they would soon receive a survey to learn more about landowners' interests, concerns, and land management activities in the Ashokan watershed. Cornell staff completed survey mailings between January 11, 2023 and February 2, 2023. All members of the sample received an original mailing that contained a cover letter and questionnaire, which could be returned by mail with postage prepaid. Nonrespondents received up to three reminder mailings, and the second reminder included a replacement questionnaire. Cover letters included a QR code that recipients could use to access a secure website where they could complete the questionnaire online instead of completing the paper form.

We conducted a telephone interview of survey nonrespondents about three weeks after the last survey mailing. We set a target of 50 completed nonrespondent interviews. We were able to identify telephone numbers for 778 (out of 1,028) nonrespondents. We attempted to call all working telephone numbers for nonrespondents up to 4 times. Interviews started on March 4 and ended on March 22, 2023. Interviews contained 11 key questions from the mail survey and took less than 5 minutes to complete.

We were unable to contact 431 of the nonrespondents for whom we thought we had a working telephone number (i.e., telephone numbers for those individuals were not in service/not a working number, were the wrong number or were a business number, or the person listed was deceased). We were able to contact 81 of the 347 nonrespondents for which we had valid contact information: 40 completed an interview, 26 hung up the telephone, and 15 asked the interviewer to call back later (and did not respond when recalled). We were not able to reach the remaining 266 nonrespondents for whom we had contact information.

Analysis

We completed all analyses using IBM SPSS Statistics for Windows, Version 27. We calculated descriptive statistics (frequencies, means) to present results for each variable. We used chi square tests and Student's t-tests to identify respondent-nonrespondent differences and differences between subgroups of respondents. We used results on flooding history to place respondents into two subgroups for comparison: those who believed their property had been flooded in the past and those who believed their property had never been flooded. We used information from the sample database on stream order to place landowners into two stream owner subgroups: those who owned property with a headwater stream (stream order 1-3) and those who owned a middle-sized stream (stream order 4-5).

RESULTS

We received 594 questionnaires from a pool of 1,622 deliverable questionnaires, yielding an overall response rate of 36.7%. Seventeen respondents indicated that they owned no parcels of land within the watershed, so we excluded those respondents from our analysis.

The Ashokan reservoir watershed is comprised of 12 subbasins (sub-watersheds). The proportion of returned questionnaires by subbasin was very similar to the proportion of all streamside landowners who lived in each subbasin (Table 1). This increases confidence that survey results provide a representative depiction of streamside landowners living in the Ashokan reservoir watershed.

Respondent–Nonrespondent Comparisons

A comprehensive set of respondent-nonrespondent comparisons is provided in Appendix B. Respondents were similar to nonrespondents on the following traits:

- Number of streamside parcels owned.
- Percentage who owned a parcel that had no residents.
- Percentage who were aware of AWSMP events or programs.

But there were multiple respondent-nonrespondent differences. Respondents were younger than nonrespondents (respondents mean age 45.0 years old [SD=11.84, n=532]; nonrespondents mean age 65.7 years old [SD=13.48, n=40]; t=964.27, p<0.001). Respondents were less likely than nonrespondents to be aware that management plans existed for many streams in the watershed (respondents 52% vs. nonrespondents 80%). Respondents were more likely than nonrespondents to believe that their streamside property had flooded in the past (respondents 44% vs. nonrespondents 30%) and be moderately or very concerned about flood damage to those properties (respondents 43% vs. nonrespondents 25%). Respondents also appeared to be more aware of or concerned than nonrespondents about health of stream ecosystems in the Ashokan watershed. We compared the groups on three particular threats. Respondents were more likely than nonrespondents to believe the following were a major threat:

- development along streams (respondents 53% vs. nonrespondents 28%).
- stream channel erosion (respondents 45% vs. nonrespondents 32%).
- pollutants from septic systems (respondents 53% vs. nonrespondents 28%).

In this study, we decided not to weight the data based on observed differences between respondents and nonrespondents. Weighting data involves tradeoffs. Weighting data based on a small number of nonrespondent interviews dramatically increases the standard errors of estimates and leads to a loss of precision of results.

Landowner Characteristics and Activities

The mean age of streamside landowners was 45 years old and ranged from 34 to 95 years. The majority (60%) of respondents were male. Most (83%) respondents had no one under 18 living in their household. Approximately one-third of respondents had an annual household income of less than $80,000 in 2022; another third had an annual household income between $80,000 and $160,000; the remaining third had an annual household income above $160,000. About 35% of respondents owned a residence in the greater New York City metropolitan area. Over

half (58%) of respondents owned a parcel with fulltime residents, about a third (34%) owned a parcel occupied seasonally, and about a quarter (24%) owned vacant or undeveloped land. Owners of multiple parcels were more likely than those with a single parcel to own vacant/undeveloped land (61% vs. 12%, chi square=138.15, df=1, p<0.001) (Table 2).

Average parcel size was 13 acres (range <1 – 593 acres). Half (50%) of all respondents owned parcels of 3 acres or less; 75% owned parcels <10 acres in size. The most common purposes for which respondents spent time in and around streams in the watershed was for solitude/peace/quiet, to connect with nature, or for hiking (Table 3).

Approximately 44% of respondents believed their property had been flooded in the past, 42% believed their property had never been flooded, and the remaining 14% were not sure about the flooding history of their property. Seventy-three percent of respondents had a property with a headwater stream (i.e., stream order 1, 2, or 3). The remaining 27% of respondents had a middle-sized stream (i.e., stream order 4 or 5).

We asked landowners whether they had taken any of 8 actions to protect their streamside properties. Sixty-three percent of respondents (n=361) had taken at least one of the eight actions. Among the 361 respondents who had taken an action, most (85%) had taken 1-3 of the 8 listed actions. The actions taken most often were cutting and removing in-stream wood (27%) and removing invasive plants (27%). The actions taken least often were enlarging a private bridge or culvert and elevating, relocating, or flood-proofing structures. Respondents whose property had flooded in the past were more likely than landowners whose property had not flooded to have: removed invasive plants (34% vs. 23%, chi square=7.63, df=1, p=0.005); hardened their streambanks (24% vs. 10%, chi square=15.30, df=1, p<0.001); modified their stream channels (14% vs. 6%, chi square=7.15, df=1, p=0.007), or flood-proofed structures (9% vs. 4%, chi square=6.48, df=1, p=0.011) (Table 4).

Respondents with headwater streams were more likely than those with middle-sized streams to have cut and removed invasive plants (29% vs. 21%, chi square=4.07, df=1, p=0.043). Respondents with middle-sized streams were more likely than those with headwater streams to have hardened their streambanks (27% vs. 12%, chi square=19.17, df=1, p<0.001).

Perceptions of Stream- and Flood-Related Topics

We asked landowners to report their views on the degree to which 13 different processes or human actions threatened the health of ecosystems in the Ashokan watershed. A majority of respondents believed that declining forest health, more intense storms with heavy rains, and development along streams were major threats. At least 40% of respondents believed that stream channel erosion, pollutants from septic tanks, warming water, and drought were major

threats. Twenty percent of respondents believed that bank armoring or stream dredging or straightening posed no threat to streams, and another 35% were unsure whether bank armoring or stream dredging posed a threat (Table 5).

We found no differences on perceived threats to streams when we compared respondents with different stream types. However, respondents whose property had flooded in the past were more likely than those whose property had not flooded to perceive the following as a major threat to the health of stream ecosystems: loss of streamside vegetation (46% vs.30%, chi square=14.47, df=3, p=0.002); turbid (brown/cloudy) water (35% vs. 30%, chi square=8.66, df=3, p=0.034); more intense storms with heavy rain (63% vs. 51%, chi square=9.27, df=3, p=0.026); and undersized bridges and culverts (36% vs. 21%, chi square=11.19, df=3, p=0.011).

We asked respondents how important they believed 8 different practices were for ensuring the continued health of streams in the Ashokan watershed. A majority of respondents believed that 6 of the 8 practices were very important for ensuring stream health. More than 70% of respondents thought all 8 practices were moderately or very important. Respondents placed the most importance on having a strong scientific basis for stream management decisions; they placed the least importance on the practices of dredging and berming streambanks and improving stream access to floodplains (Table 6). There were no differences in importance level based on number of parcels owned, but there was one difference between landowners with headwater and landowners with middle-sized streams. Respondents who owned middle-sized streams were more likely than those with headwater streams to believe that dredging and berming were very important (chi square=8.60, df=3, p=0.035).

Over 40% of respondents were moderately or very concerned about the possibility of flood damage on their property. Level of concern about possible flood damage was higher among landowners whose land had flooded than among those whose land had not flooded (chi square=123.91, df=3, p<0.001), higher among landowners with middle-sized than with headwater streams (chi square=29.17, df=3, p<0.001), and higher among landowners with multiple parcels than among those with a single parcel (chi square=7.94, df=3, p=0.047) (Table 7).

Stream-Related Information Needs

We asked landowners how much information they needed on 11 stream-related topics. Respondents were most likely to need much more information about how a stream management plan can help them, legal topics involving streams, stream regulations and permits, strategies to repair streambanks, and how erosion processes affect their property (Table 8). Owners of middle-sized streams were more likely than owners of headwater streams

to need much more information on 7 stream-related topics (Table 9). Owners whose property had flooded were more likely than owners whose property had not flooded to need more information on 10 stream-related topics (Table 10). Owners whose property had flooded were more likely than owners whose property had not flooded to be interested in learning about stream projects to reduce flood risk, flood-proofing structures, buyout of their property, and elevating utilities or the first floor of a structure (Table 11).

Information Seeking

Awareness of and Interest in AWSMP Programs

Half (50%) of respondents had heard about AWSMP events before they received a streamside landowner questionnaire. Landowners had become aware of AWSMP events primarily through the AWSMP newsletter (66%), word of mouth from a friend or relative (28%), emails (26%), newspapers (13%), or posters/flyers in the community (12%). Fewer landowners learned of AWSMP events from Facebook (8%), Instagram (2%), or Twitter (<1%).

About half (53%) (n=276) of respondents were somewhat or very likely to attend an informational meeting about stream issues in the Ashokan watershed. Likelihood of attending an informational meeting about stream-related issues was higher among respondents whose property had flooded than among those whose property had never flooded (Table 12).

Among landowners who were somewhat or very likely to attend a future meeting, 47% would prefer an online format, 33% would prefer an in-person format, and 20% had no preference on meeting format. They indicated that the best times for them to meet were weekday evenings (60%), weekend mornings (39%), weekend afternoons (36%), weekday afternoons (36%), or weekday mornings (28%).

About half (52%) of respondents were aware that management plans were available for many streams in the Ashokan watershed. Landowners with property that had flooded were more likely than those whose property had not flooded to be aware of stream management plans (67% vs. 44%, df=1, $p<0.001$). Twenty-nine percent of respondents who were aware of stream management plans had reviewed a stream management plan for streams near their property. Those who had reviewed a stream management plan said they preferred to access those plans by browsing an interactive website (38%), obtaining a hard copy (33%), or downloading a digital copy (30%). Landowners whose property had flooded were more likely than those whose property had not flooded to have reviewed a stream management plan (35% vs. 24%, df=1, $p=0.048$).

Preferred Sources for Stream-related Information

Landowners were most likely to prefer to get information about their streams from printed documents (66%), organization websites (53%), stream-related presentations (37%), and talking with friends and neighbors (37%). About 23% of respondents preferred to use social media to get information about streams on their property. Over a third (36%) of respondents never used social media, about 20% used social media no more than a few times a week, but 44% of respondents used social media at least once a day. Few landowners preferred to get information about their streams from local radio or television programs. Information source preferences were similar for landowners whether or not their property had been flooded in the past (Table 13).

DISCUSSION

The purpose of this study was to improve understanding of streamside landowners in the Ashokan watershed. Our 2023 survey results provide a snapshot of landowner beliefs, behaviors, and information needs related to protecting stream quality and preventing or mitigating flood damage.

Quality of stream ecosystems is threatened by a range of events (e.g., intense storms) and processes (e.g., stream channel erosion). Survey results suggest that many streamside landowners recognize that events and processes such as declining forest health, intense rainfall events, streamside development, and stream channel erosion are major threats to stream ecosystems. Survey results suggest that many streamside landowners see the importance of collective actions to protect the health of streams in the watershed. For example, over 80% of respondents believed it was moderately or very important to implement large-scale stream restoration projects, limit future development adjacent to streams, and develop town plans for stream corridor conservation.

Although most respondents supported collective action to protect stream health, not all respondents took individual actions to protect, maintain, or repair streambanks. Several factors help explain why only minorities of respondents had participated in specific streamside management activities mentioned in the survey. Some actions are not applicable for every owner (e.g., not all owners have a private bridge or culvert or structures on their property, an owner who never mowed near their stream can't logically respond that they stopped mowing near their stream). A portion of landowners own land with small, headwater streams on which the owner may see no need for streambank management. Some landowners may be unaware that they have a stream on their property (e.g., an order 1 headwater stream with intermittent flow may not look like a stream to the landowner during summer months or during a drought year). Owners with small streams, buildings located outside a flood plain, or no buildings on

their on their property may perceive little risk of flood damage on their property and thus little incentive to take actions such as removing in-stream wood, planting trees/shrubs on streambanks, or hardening streambank.

Results suggest that many landowners are interested in obtaining more information on a range of topics related to streamside management, such as stream regulations and permits, how to repair streambanks, how to manage streamside plants, how in-stream wood and sediment affects streams, and how to reduce flooding risk. Interest in such topics opens opportunities for education and outreach from AWSMP. Many landowners already contact AWSMP for stream-related information and prefer to obtain information about streams on their property from printed documents, organization websites, and stream-related presentations. These information source preferences confirm opportunities for AWSMP to reach area landowners through established means of communication.

Study Limitations

Survey response rate is a concern in any study. Low response raises concerns about the potential for nonresponse bias. In the Ashokan watershed, average acreage was about the same for the population of streamside landowners and respondents (population 14 acres; respondents 13 acres). In both the population and respondent groups, 75% of streamside landowners owned <10 acres. These findings provide assurance that respondents were representative of the landowner population on some characteristics. But nonrespondent interviews suggested that respondents represent a portion of the landowner population who are more likely to have property that has flooded in the past. We also found some evidence that respondents were more aware of or concerned about threats to health of stream ecosystems in the watershed. Their concern about threats to stream health could be because they experience problems with their streams or it could be because they're more aware of threats to stream health or more concerned about environmental protection in general. Taken together, these findings suggest that respondents over-represent landowners for whom stream health, stream protection, and flood mitigation are more salient topics. The percentage of landowners who were concerned about flooding and expressed interest in obtaining more information on stream-related topics would likely be lower if all members of the sample had responded to the survey.

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Table 1. Proportion of respondents from each subbasin within the Askokan watershed basin.

Subbasin name	Proportion of unique streamside landowners from each subbasin (n=1,866)	Proportion of returned useable questionnaires from each subbasin (n=577)
	%	%
Ashokan Reservoir	15.8	15.3
Beaverkill	12.9	12.0
Birch Creek	6.2	5.9
Broadstreet Hollow	2.4	3.1
Bushkill	6.6	7.5
Bushnellsville Creek	3.0	1.6
Esopus Creek	18.5	15.7
Esopus headwaters	5.0	5.4
Little Beaverkill	10.5	12.5
Peck Hollow	0.3	0.2
Stoney Clove	13.9	14.8
Woodland Valley	4.9	5.9

Table 2. Residential use of streamside parcels owned by landowners with a single parcel compared to those who own multiple parcels in the Ashokan watershed.

	All respondents (n=558)	Own 1 parcel (n=426)	Own >1 parcel (n=132)
	%	%	%
Own parcels with fulltime residents	58.1	57.3	60.6
Own parcels with seasonal residents	34.1	31.9	40.9
Own parcels that are vacant/undeveloped with no residents	23.5	11.7	61.4

Table 3. Purposes for which streamside landowners spent time in and around streams in the Ashokan watershed.

Activity	Percent participating	Activity	Percent participating
Solitude	84.4	Fishing	33.0
Connect with nature	77.6	Rail biking	16.2
Hiking	65.8	Camping	14.9
Swimming/wading	51.3	Kayaking/canoeing	13.4
Photography/art	36.9	Tubing	8.5

Table 4. Actions respondents had taken to protect their streamside properties.

	All	Property flooding history		Stream order	
		Never flooded	Has flooded	Headwater stream	Medium stream
	(n=577)	(n=225)	(n=233)	(n=421)	(n=154)
	%	%	%	%	%
Cut and removed in-stream wood	27.0	24.4	30.5	29.2	20.8
Removed invasive plants	26.5	22.7	34.3	25.7	29.2
Planted trees or shrubs on my streambanks	16.6	14.7	21.0	15.0	21.4
Stopped mowing near streams	16.6	14.7	20.2	17.1	14.9
Hardened streambank with rock, sheet piling	15.8	10.2	24.0	11.6	26.6
Modified stream channel (changed shape, course)	9.7	6.2	13.7	8.6	13.0
Enlarged a private bridge or culvert	8.8	8.0	12.0	10.0	5.2
Elevated, relocated, or flood-proofed structures	5.9	3.6	9.4	5.2	7.8
Other	12.1	14.7	10.3	13.3	9.1

Table 5. Landowner perceptions of degree to which various factors threaten the health of stream ecosystems in the Ashokan watershed.

	n	Mean[a] (SD)	No threat	Moderate threat	Major threat	Unsure
Declining forest health	509	1.54 (0.62)	5.9	27.9	52.8	13.4
More intense storms with heavy rain	520	1.53 (0.64)	7.1	28.3	54.6	10.0
Development along streams	510	1.49 (0.66)	9.0	27.5	53.1	10.4
Stream channel erosion	508	1.46 (0.63)	6.1	32.9	44.5	16.5
Pollutants from septic systems	511	1.41 (0.67)	8.4	31.7	42.5	17.4
Roadway runoff	511	1.35 (0.62)	6.7	40.7	35.4	17.2
Warming water as a result of climate change	508	1.32 (0.75)	14.0	26.2	40.4	19.5
Drought	507	1.32 (0.70)	11.8	34.3	40.0	13.8
Loss of vegetation adjacent to streams	495	1.32 (0.67)	9.3	38.8	35.8	16.2
Ground water depletion	507	1.26 (0.75)	13.4	26.6	32.3	27.6
Undersized bridges and culverts	500	1.26 (0.66)	8.8	35.4	27.0	28.8
Turbid (brown/cloudy) water	505	1.23 (0.70)	11.9	35.2	29.7	23.2
Bank armoring, stream dredging or straightening	506	0.99 (0.77)	19.6	26.5	18.8	35.2

[a]Mean score based on a 3-point Likert-type scale where 0 = no threat, 1 = moderate threat, 2 = major threat. “Unsure” responses were not used in calculation of mean score.

Table 6. Landowner perceptions of the importance of various practices for ensuring the continued health of streams throughout the Ashokan watershed.

	n	Mean[a] (SD)	Level of importance			
			Not at all	Slightly	Moderately	Very
Having a strong scientific basis for stream management decisions	516	3.67 (0.64)	1.9	3.3	20.3	74.4
Planting or allowing trees and shrubs to grow along streams	515	3.37 (0.78)	3.1	9.3	34.6	53.0
Implementing large scale stream restoration projects to improve degraded sections of streams	508	3.33 (0.81)	3.0	12.4	33.4	51.4
Limiting future development immediately adjacent to streams	510	3.32 (0.87)	4.3	13.7	28.0	53.9
Protecting and managing cold water supply to streams	490	3.30 (0.83)	3.5	13.7	32.4	50.4
Developing town plans for stream corridor conservation or use	511	3.28 (0.90)	5.5	14.1	27.6	52.8
Controlling stream erosion and flooding by dredging and/or building berms	493	3.06 (0.96)	8.1	18.3	32.7	41.0
Improving stream access and connectivity to floodplains	485	2.96 (0.92)	7.4	22.1	37.1	33.4

[a]Mean score based on a 4-point Likert-type scale where 1 = not at all important, 2 = slightly important, 3 = moderately important, 4 = very important.

Table 7. Level of concern about flood damage to streamside properties.

		Flooding history[a]		Stream order[b]		Number of parcels[c]	
	All	Property never flooded	Property has flooded	Headwater stream	Medium stream	1	>1
	(n=537)	(n=224)	(n=233)	(n=390)	(n=145)	(n=394)	(n=126)
	%	%	%	%	%	%	%
Not concerned	25.5	46.4	8.2	29.7	14.5	27.2	20.6
Slightly concerned	32.0	35.3	27.9	34.9	24.8	33.2	27.0
Moderately concerned	22.2	11.6	29.6	18.7	30.3	20.1	31.0
Very concerned	20.3	6.7	34.3	16.7	30.3	19.5	21.4

[a]Concern level higher among landowners with a history of flooding (chi square=123.91, df=3, p<0.001).

[b]Concern level higher among landowners with medium-sized streams (chi square=29.17, df=3, p<0.001).

[c]Concern level higher among landowners with multiple parcels (chi square=7.94, df=3, p=0.047).

Table 8. Amount of additional information Ashokan landowners said they needed on a range of stream-related topics.

	n	Mean[a] (SD)	Have enough information	Need Slightly more	Need much more information	Not applicable
How a stream management plan can help me	503	2.48 (0.68)	9.5	26.6	52.3	11.5
Legal topics involving streams	499	2.48 (0.66)	7.2	27.5	45.9	19.4
Stream regulations and permits	500	2.45 (0.67)	8.6	28.8	45.8	16.8
Strategies to repair my streambanks	491	2.37 (0.75)	13.4	23.6	43.4	19.6
How to manage streamside plants	502	2.35 (0.71)	11.4	31.7	40.8	16.1
How in-stream wood affects my property	503	2.32 (0.75)	14.5	28.2	41.7	15.5
How erosion processes affect my property	494	2.29 (0.78)	17.8	26.7	42.3	13.2
How to protect my property from flooding	501	2.26 (0.82)	19.0	21.8	39.7	19.6
How amount of stream sediment affects my property	495	2.26 (0.77)	15.6	26.7	36.4	21.4
Culvert or bridge maintenance and repair	492	2.25 (0.79)	13.6	20.5	29.5	36.4
How to manage fish and wildlife on my property	492	2.19 (0.80)	18.5	24.6	33.1	23.8

[a]Mean score based on a 3-point Likert-type scale where 1 = have enough information, 2 = need slightly more information, 3 = need much more information. “Not interested/not applicable” responses were not used in calculation of mean score.

Table 9. Amount of additional information needed on a range of stream-related topics among respondents with headwater (order 1-3) streams or middle-sized (order 4-5) streams.

	Stream	n	Amount of information needed[a]				Chi square	P value
			Have enough	Slightly more	Much more	NA		
			%	%	%	%		
Strategies to repair my streambanks	Headwater	358	14.0	24.6	38.5	22.9	15.27	0.002
	Middle	131	12.2	20.6	56.5	10.7		
How to protect my property from flooding	Headwater	365	19.7	21.4	35.6	23.3	15.75	0.001
	Middle	134	17.2	21.6	51.5	9.7		
How erosion processes affect my property	Headwater	355	19.2	27.6	38.3	14.9	10.89	0.012
	Middle	136	14.0	24.3	53.7	8.1		
How a stream mgt. plan can help me	Headwater	362	10.8	27.6	48.3	13.3	10.74	0.013
	Middle	139	15.8	23.7	63.3	7.2		
Legal topics involving streams	Headwater	362	7.2	29.0	43.4	20.4	3.71	0.295
	Middle	135	7.4	23.7	52.6	16.3		
Stream regulations and permits	Headwater	362	9.1	31.2	42.3	17.4	6.97	0.073
	Middle	136	6.6	22.8	55.1	15.4		
How amount of stream sediment affects prop.	Headwater	359	15.9	28.1	32.6	23.4	9.57	0.023
	Middle	134	14.9	22.4	47.0	15.7		
How in-stream wood affects property	Headwater	365	15.6	30.1	37.5	16.7	10.65	0.014
	Middle	136	11.8	22.8	53.7	11.8		
How to manage streamside plants	Headwater	362	11.0	35.9	35.9	17.1	16.72	0.001
	Middle	138	11.6	20.3	54.3	13.8		
Culvert/bridge repair or maintenance	Headwater	355	13.0	21.1	28.5	37.5	1.49	0.684
	Middle	135	15.6	19.3	31.9	33.3		

[a]Response categories: have enough information, need slightly more information, need much more information, not interested/not applicable.

Table 10. Amount of additional information needed on a range of stream-related topics among respondents who believed their property had or had not flooded in the past.

	Previous flooding	n	Amount of information needed[a]				Chi square	P value
			Have enough	Slightly more	Much more	NA		
			%	%	%	%		
Strategies to repair my streambanks	No	202	14.4	29.2	29.2	27.2	28.49	<0.001
	Yes	217	15.7	19.4	52.1	12.9		
How to protect my property from flooding	No	205	23.4	23.9	19.5	33.2	68.50	<0.001
	Yes	218	18.8	18.8	54.1	8.3		
How erosion processes affect my property	No	206	20.9	32.5	27.7	18.9	28.09	<0.001
	Yes	211	18.5	20.9	51.7	9.0		
How a stream mgt. plan can help me	No	205	10.7	31.2	42.4	15.6	10.91	0.012
	Yes	222	10.8	23.9	56.8	8.6		
Legal topics involving streams	No	207	8.2	33.3	33.3	25.1	22.92	<0.001
	Yes	220	5.9	21.8	56.4	15.9		
Stream regulations and permits	No	206	11.2	32.5	34.5	21.8	18.27	<0.001
	Yes	221	7.7	24.4	54.8	13.1		
How amount of stream sediment affects prop.	No	204	18.1	28.9	24.0	28.9	20.97	<0.001
	Yes	213	16.0	23.5	44.1	16.4		
How in-stream wood affects property	No	207	15.9	32.9	31.9	19.3	9.75	0.021
	Yes	222	14.9	26.1	45.9	13.1		
How to manage streamside plants	No	210	13.3	37.1	29.5	20.0	13.20	0.004
	Yes	219	11.9	28.8	46.1	13.2		
Culvert/bridge repair or maintenance	No	206	12.1	24.3	22.3	41.3	13.03	0.005
	Yes	215	16.3	16.7	35.3	31.6		

[a]Response categories: have enough information, need slightly more information, need much more information, not interested/not applicable.

Table 11. Flood mitigation actions that streamside landowners wanted to learn more about.

		Property flooding history	
	All (n=552)	Never flooded (n=217)	Has flooded (n=233)
	%	%	%
Projects in my stream to reduce flooding risk	54.2	36.9	69.5
Flood-proofing structures	15.4	7.6	19.3
Buyout of my property	6.0	2.7	8.2
Anchoring fuel tanks	5.8	3.6	5.2
Elevating utilities of first floor of a structure	4.5	1.3	7.3
Relocating flood-prone structures on my land	2.2	.04	3.0
None of the these	39.2	56.0	21.9

Table 12. Likelihood of attending an informational meeting about stream management in the Ashokan watershed sometime within the next year.

		Flooding history[a]		Stream order[b]	
	All (n=526)	Never flooded (n=206)	Has Flooded (n=217)	Headwater stream (n=380)	Medium stream (n=144)
	%	%	%	%	%
Very/somewhat unlikely	32.5	35.9	29.0	32.1	34.0
Neither likely nor unlikely	15.0	19.4	12.0	16.8	10.4
Very/somewhat likely	52.5	44.7	59.0	51.1	55.6

[a]Likelihood of attending a meeting higher among landowners with a history of flooding (chi square=9.46, df=2, p=0.009).

[b]Likelihood of attending a meeting was not different for owners of headwater or medium streams.

Table 13. Means that landowners prefer to use to obtain information about streams on their property in the Ashokan watershed.

		Property flooding history	
	All (n=525)	Never flooded (n=218)	Has flooded (n=230)
	%	%	%
Printed documents (e.g., fact sheets)	65.9	62.1	71.3
Visiting websites of organizations	53.3	52.5	52.2
Attending stream-related presentations	37.2	32.1	42.2
Talking with friends and neighbors	30.7	28.4	30.4
Informational videos (e.g., YouTube)	29.1	25.6	26.1
Social media	22.5	24.3	21.3
Local radio programs	5.3	6.0	4.3
Local television programs	4.2	4.1	4.8

APPENDIX A: SURVEY INSTRUMENT

Ashokan Watershed:

Interests and Concerns of Streamside Landowners

This survey was developed by the Ashokan Watershed Stream Management Program (AWSMP) working with Cornell University's Center for Conservation Social Sciences, which is administering the survey. The AWSMP is a joint effort between Cornell Cooperative Extension of Ulster County, the Ulster County Soil and Water Conservation District, and the New York City Department of Environmental Protection (the project sponsor).

The purpose of the survey is to learn more about streamside landowners, including their interests, concerns, and land management activities in the Ashokan watershed. Your response will help AWSMP deliver education and outreach programs that are useful to landowners like yourself.

Please take a few minutes to complete this questionnaire. Your identity will be kept confidential and the information you give us will never be associated with your name.

To return this questionnaire, simply seal it with the white reusable seal (postage has already been provided) and drop it in the nearest mailbox. Or if you would prefer to complete the questionnaire electronically, scan the QR code in the cover letter.

THANK YOU FOR YOUR HELP!

PART I: YOUR STREAMSIDE PROPERTY(S)

*All questions refer to the streamside parcel(s) of land you own in the Ashokan Reservoir Watershed, hereafter referred to as the "**Ashokan watershed**"

1. **How many streamside parcels of land do you own in the Ashokan watershed?**

   # of parcels = ____

2. **Do you own streamside property(s) in the Ashokan watershed that are occupied by residents, or vacant parcels that are unoccupied?** *(Check one box per line.)*

Yes	No	I own one or more parcels…
☐	☐	with a fulltime resident(s)
☐	☐	with a seasonal resident(s)
☐	☐	that are vacant/undeveloped and have no residents

PART II: ACTIONS ON YOUR STREAMSIDE PROPERTY

3. **Which of the following actions have you taken to protect your streamside property(s) in the Ashokan watershed?** *(Check <u>all</u> that apply.)*

- ☐ Modified stream channel (changed the shape or course of the channel, removed instream sediment)
- ☐ Hardened streambank with rock or sheet piling
- ☐ Cut and removed in-stream wood
- ☐ Planted trees or shrubs on my streambanks
- ☐ Removed invasive plants
- ☐ Stopped mowing near streams
- ☐ Elevated, relocated, or flood-proofed structures
- ☐ Enlarged a private bridge or culvert
- ☐ Other (describe):

PART III: YOUR VIEWS ON WATERSHED ISSUES

4. In your view, how much do each of the following threaten the health of stream ecosystems in the Ashokan watershed? (*Check one box per row.)*

	No threat	Moderate threat	Major threat	Unsure
Loss of vegetation adjacent to streams	☐	☐	☐	☐
Development along streams	☐	☐	☐	☐
Warming water as a result of climate change	☐	☐	☐	☐
Bank armoring, stream dredging or straightening	☐	☐	☐	☐
Drought	☐	☐	☐	☐
Turbid (brown/cloudy) water	☐	☐	☐	☐
Declining forest health	☐	☐	☐	☐
More intense storms with heavy rain	☐	☐	☐	☐
Stream channel erosion	☐	☐	☐	☐
Ground water depletion	☐	☐	☐	☐
Undersized bridges and culverts	☐	☐	☐	☐
Roadway runoff	☐	☐	☐	☐
Pollutants from septic systems	☐	☐	☐	☐

5. In your view, how important are the following <u>practices</u> for ensuring the continued health of streams throughout the Ashokan watershed? (*Check one box per row.)*

	Not at all important	Slightly important	Moderately important	Very important
Limiting future development immediately adjacent to streams	☐	☐	☐	☐
Having a strong scientific basis for stream management decisions	☐	☐	☐	☐
Implementing large scale stream restoration projects to improve degraded sections of streams	☐	☐	☐	☐
Protecting and managing cold water supply to streams	☐	☐	☐	☐
Planting or allowing trees and shrubs to grow along streams	☐	☐	☐	☐
Developing town plans for stream corridor conservation or use	☐	☐	☐	☐
Controlling stream erosion and flooding by dredging and/or building berms	☐	☐	☐	☐
Improving stream access and connectivity to floodplains	☐	☐	☐	☐

PART IV: ASHOKAN WATERSHED EVENTS/PROGRAMS

6. **How likely are you to attend an informational meeting about stream management in the Ashokan watershed sometime in the next year?** *(Check one box.)*

- ☐ Very unlikely
- ☐ Somewhat unlikely
- ☐ Neither unlikely or likely
- ☐ Somewhat likely
- ☐ Very likely

7. **How would you prefer to attend an informational meeting about stream issues in the Ashokan watershed?** *(Check one box.)*

- ☐ In person
- ☐ Online
- ☐ No preference
- ☐ N/A (not likely to attend an informational meeting)

8. **What would be good times for you to participate in stream- related events or programs?** (*Check <u>all</u> that apply.)*

- ☐ Weekday mornings
- ☐ Weekday afternoons
- ☐ Weekday evenings
- ☐ Weekend mornings
- ☐ Weekend afternoons

9. How have you become aware of AWSMP events or programs? (*Check <u>all</u> that apply.)*

- ☐ AWSMP newsletter
- ☐ Email
- ☐ Poster or flyer hung in the community
- ☐ Instagram
- ☐ Facebook
- ☐ Twitter
- ☐ Newspaper
- ☐ Word of mouth from a friend or relative
- ☐ I have never heard about AWSMP events

10. Before getting this survey, did you know there are management plans for many streams in the Ashokan watershed?

- ☐ Yes → → CONTINUE TO NEXT QUESTION
- ☐ No → → SKIP TO QUESTION 13

11. Have you ever reviewed a management plan for streams near your property?

- ☐ Yes
- ☐ No

12. What is your preferred way to access stream management plans? *(Check one box.)*

- ☐ Get a hard copy
- ☐ Download a digital (pdf) copy
- ☐ Browse on an interactive website
- ☐ Not interested in stream management plans

PART V: YOUR INFORMATION NEEDS AND SOURCES

Questions in this section will help us understand your preferred sources and types of information of greatest interest to you.

13. **Who would you contact for more information about managing streams in the Ashokan watershed?** (*Check <u>all</u> that apply.)*

- ☐ Professional contractors
- ☐ Town highway department
- ☐ Cornell Cooperative Extension
- ☐ Soil and Water Conservation District
- ☐ NY State Dept. of Environmental Conservation
- ☐ NY City Dept. of Environmental Protection
- ☐ Neighbor with experience
- ☐ Ashokan Watershed Stream Management Program

14. **How much information do you personally need on the following topics?** (*Circle one box per row.)*

Amount of information needed on…	Have enough information	Need slightly more information	Need much more information	Not interested/ Not applicable
Strategies to repair my streambanks	☐	☐	☐	☐
How to protect my property from flooding	☐	☐	☐	☐
How erosion processes affect my property	☐	☐	☐	☐
How amount of stream sediment affects my property	☐	☐	☐	☐
How a stream management plan can help me	☐	☐	☐	☐
How in-stream wood affects my property	☐	☐	☐	☐
How to manage fish and wildlife on my property	☐	☐	☐	☐
How to manage streamside plants	☐	☐	☐	☐
Culvert or bridge maintenance and repair	☐	☐	☐	☐
Legal topics involving streams	☐	☐	☐	☐
Stream regulations and permits	☐	☐	☐	☐

15. About how often do you use social media? (*Check one box.*)

Rarely use social media	A few times a month	A few times a week	At least once a day	More than once a day
☐	☐	☐	☐	☐

16. What are your preferred <u>means</u> for getting information about streams on your Ashokan watershed property(s)? (*Check <u>all</u> that apply.)*

- ☐ Printed documents (e.g., fact sheets)
- ☐ Informational videos (e.g., YouTube)
- ☐ Local radio programs
- ☐ Local television programs
- ☐ Social media
- ☐ Visiting websites of organizations
- ☐ Talking with friends and neighbors
- ☐ Attending stream-related presentations

PART VI: FLOODING ON YOUR PROPERTY

17. Which category best describes the flooding history on your Ashokan watershed property(s)? *(Check one box.)*

- ☐ My property(s) have never been flooded
- ☐ My property(s) have flooded at least once
- ☐ My property(s) have flooded multiple times
- ☐ I don't know if my property(s) have ever flooded or not

18. How would you describe your level of concern about the possibility of flood damage on your property(s) in the Ashokan watershed? (*Check one box.*)

Not at all concerned	Slightly concerned	Moderately concerned	Very concerned
☐	☐	☐	☐

19. Which flood mitigation actions are you interested in learning more about for your property(s)? (*Check <u>all</u> that apply.)*

- ☐ Relocating flood-prone structures on my land
- ☐ Buyout of my property
- ☐ Elevating utilities or first floor of a structure
- ☐ Anchoring fuel tanks
- ☐ Flood-proofing structure(s)
- ☐ Projects in my stream to reduce flooding risk
- ☐ None of the above

PART VII: BACKGROUND ABOUT YOU

20. What year (using four digits, e.g., 1984) were you born?

Year of birth: __ __ __ __

21. What is your gender? _____

22. How many of the people residing in your home are under the age of 18?

_____ # of children

23. Which category best describes your 2022 annual household income before taxes? (*Check one box.*)

- ☐ $0 – $39,999
- ☐ $40,000 – $79,999
- ☐ $80,000 – $119,999
- ☐ $120,000 – $159,999
- ☐ $160,000 – $199,999
- ☐ $200,000 or more

24. **For which of the following purposes have you spent time in or around streams in the Ashokan watershed in the past 12 months?** *(Check all that apply.)*

- ☐ Fishing/Angling (including fly fishing)
- ☐ Swimming/wading
- ☐ Kayaking/canoeing
- ☐ Tubing
- ☐ Hiking
- ☐ Camping
- ☐ For solitude/quiet/peace
- ☐ To connect with nature
- ☐ Photography/art
- ☐ Rail biking (e.g., “Rail Explorers” program)

25. Do you have a residence in the greater New York City metropolitan area? (*Check one.)*

- ☐ Yes
- ☐ No

THANK YOU FOR YOUR INPUT!

(Please use the space below to offer any comments.)

APPENDIX B: RESPONDENT-NONRESPONDENT COMPARISONS

Table B1. Number of streamside parcels owned in the Ashokan watershed.

	Respondents (n=575) %	Nonrespondents[a] (n=41) (%)
0 parcels	2.9	2.4
1 parcel	71.7	68.3
2 parcels	17.5	19.5
3 or more parcels	4.8	9.8
Total	100.0	100.0

[a]chi square=2.01, df=3 , p= 0.570 (NS)

Table B2. Comparison of respondents to nonrespondents on whether they own a streamside parcel in the watershed that is occupied by fulltime residents.

	Respondents (n=450) %	Nonrespondents[a] (n=40) %
Yes	74.9	55.0
No	25.1	45.0
Total	100.0	100.0

[a]chi square=7.41, df=1 , p=0.006

Table B3. Comparison of respondents to nonrespondents on whether they own a streamside parcel in the watershed that is vacant or undeveloped and has no residents.

	Respondents (n316) %	Nonrespondents[a] (n=40) %
Yes	52.9	40.0
No	47.1	60.0
Total	100.0	100.0

[a]chi square=2.39, df=1, p=0.122

Table B4. Comparison of respondents to nonrespondents on how much they believe development along streams threatens ecosystems in the Ashokan watershed.

	Respondents (n=510) %	Nonrespondents[a] (n=40) (%)
No threat	9.0	17.5
Moderate threat	27.5	37.5
Major threat	53.1	27.5
Unsure	10.4	17.5
Total	100.0	100.0

[a]chi square=11.67, df=3 , p=0.008

Table B5. Comparison of respondents to nonrespondents on how much they believe stream channel erosion threatens ecosystems in the Ashokan watershed.

	Respondents (n=508) %	Nonrespondents[a] (n=40) (%)
No threat	6.1	17.5
Moderate threat	32.9	27.5
Major threat	44.5	32.2
Unsure	16.5	22.5
Total	100.0	100.0

[a]chi square=9.28, df=3, p=0.023

Table B6. Comparison of respondents to nonrespondents on how much they believe pollutants from septic systems threatens ecosystems in the Ashokan watershed.

	Respondents (n=511) %	Nonrespondents[a] (n=40) (%)
No threat	8.4	20.0
Moderate threat	31.7	32.5
Major threat	42.5	22.5
Unsure	17.4	25.0
Total	100.0	100.0

[a]chi square=10.18, df=3 , p=0.017

Table B7. Comparison of respondents to nonrespondents on awareness of AWSMP programs before receiving the Ashokan survey.

	Respondents (n=555) %	Nonrespondents[a] (n=40) %
Yes	50.3	45.0
No or unsure	49.7	55.0
Total	100.0	100.0

[a]chi square=0.41, df=1 , p=0.51

Table B8. Comparison of respondents to nonrespondents on awareness of management plans for streams in the Ashokan watershed.

	Respondents (n=562) %	Nonrespondents[a] (n=41) %
Yes	52.1	80.0
No	47.9	20.0
Total	100.0	100.0

[a]chi square=11.67, df=1 , p<0.001

Table B9. Comparison of respondents to nonrespondents on history of flooding on property in the Ashokan watershed.

	Respondents (n=534) %	Nonrespondents[a] (n=40) %
Yes	40.3	30.0
No	42.1	67.5
Don't know if property has ever flooded	14.2	2.5
Total	100.0	100.0

[a]chi square=10.89, df=1 , p=0.004

Table B10. Comparison of respondents to nonrespondents on level of concern about flood damage on properties they own in the Ashokan watershed.

	Respondents (n=537) %	Nonrespondents[a] (n=40) (%)
Not at all concerned	25.5	50.0
Slightly concerned	32.0	25.0
Moderately concerned	22.2	10.0
Very concerned	20.3	15.0
Total	100.0	100.0

[a]chi square=11.89, df=3 , p=0.007

APPENDIX C: UNSOLICITED COMMENTS

Flooding:

Our home is very close to the stream. The property has flooded but never the home. Potential erosion of the streambank is an ongoing concern.

I was in [Hurricane] Irene and now in a flood zone.

Our organization owns one undeveloped 15 acre parcel on Esopus Creek. We have needs to protect our structures on an adjacent parcel not on the Esopus, but within the "floodway". We suffered flooding in the mid 2000's (2005?), plus Hurricane Irene (2011).

My property is in the Jackie Brook running through the back part. No structures near stream, only wooded land. Even if it floods its banks there's no impact to my parcel.

My house flooded several times. The culvert that goes under the road is too small. During heavy rain, the water does not go through fast enough. Last big storm I had 6 inches of water in my entire house.

My property has 3 small creeks that form one larger one when leaving the property. It's all vacant with 2 sheds that are nowhere near the creeks.

We have two homes, both stream adjacent, both with a culvert. Historically there has been very little flooding that has affected us directly. We do maintain a small stone embankment as there was signs of a possible wash out of a driveway 30+ years ago.

We have flooding from beaver dams, brush, etc. Culvert flooding and pond sediment, lily pad and geese issues.

Our flooding issues are related to "runoff" from a Town of Olive road above our property. In previous communications with the Town, the Town was not interested in alleviating the problem.

I am a scientist by profession. I respect the research motivating this questionnaire. However, I have owned property on both Stony Clove creek and Hollow Tree Brook in Lanesville for some 47 years. I have lived through the March flood of either 1980-1981 (forget which year) where a stalled thunder cell dumped over 10 inches of rain in 24 hours which knocked out 80% of the bridges across Stony Clove Creek, left me a new embankment of naked river stone 70 meters long, 4 meters wide and over a meter deep on my property and the more recent Hurricane Irene flood which removed a Hollow Tree Brook embankment on my property totaling over 35

meters long by 10 meters width and over 3 meters high, with a total mass of (probably) between 500,000 kg and 1000,000 kg of stone and soil never to be seen again (except in the slowly filling reservoir) and which dropped the creek bed by well over a meter. I find the terms "stream management" and "flood control" somewhat arrogant in the face of what mother nature has to offer. I have left the thousands of feet of "my" (at least temporarily in this world) creek frontage untouched, and leave mother nature to take or leave what she pleases, which I believe she will do with or without "Stream Management" or "flood control", at least in the upper reaches of Stony Clove Creek and Hollow Tree Brook.

Environmental concerns:

I am concerned about the tributaries into the Esopus. In particular a junk car yard on the banks of the Little Beaver Kill right before the mouth of the stream. An ecological disaster waiting to happen. Cars/trucks with gas/oil left over 5 years—should not be allowed that close to the Esopus and Ashokan. Also, I think the Esopus is being maintained at a too low level to maintain a healthy stream environment.

It would be nice to see trash from flooding picked up from banks.

Keeping all streams healthy is in everyone's best interest.

My biggest concerns are flood protection, invasive species—the knotweed is atrocious and spreading fast since Hurricane Irene. Some neighbors have been using Roundup.

Concerns about heavy stream flows:

I have owned my property for over 30 years. Streams are impacted negatively by heavy flows. …[heavy flows] change the direction of streams, sometimes negatively.

Concerns about public trespassing on private property:

With new Air B&Bs in my area I have more stream trespassing on my land on Stony Clove. Do we need signage? Air B&B owners and Catskill Outfitters are giving incorrect access info. Not all areas are public swimming holes.

I would like more information on rules/laws/regulations pertaining to stream/watershed process/trespass laws and property owner's rights. Specifically the ability to post and restrict access to trespassers/swimmers/weekenders!

Needs for information or assistance:

Would like assistance with invasive species management.

It feels like NO help exists with bank reinforcement.

I look forward to learning more about how to restore the health of the stream on our property.

After numerous questionnaires, studies, and management plans, I have yet to see any significant actions other than addressing turbidity issues from open clay banks. Following Hurricane Irene, I had to invest $10K of personal funds to restore my stream bank as much as I could not find any county, state, or AWSMP help.

I have a big interest in how to treat hemlocks that are infested with wooly adelgid.

I am interested in a management plan that addresses existing flooding issues as well as a long-term solution to recreational access and education programs for area schools.

What is the name of our beautiful little stream, where does it start and are there any trout in it still!

I need much more information about how to protect the stream and embankment in my backyard. I'm willing to learn and take action.

We would like large retaining wall stones.

Rules and Permits:

Having to work with two different agencies to understand the rules of what we can do as homeowners is unreasonable.

Is there any way you can get the DEP to permit clearing logs/trees, etc.?

Have been trying for 2 years to obtain DEC permits to restore stream to pre-2019 flooding to Stoney Clove Creek.

Eager for the ban on small-parcel sales to be lifted. Want to sell!

Bridges:

I have a bridge over the stream and it has washed out twice. My property is elevated so no problem there. I cannot afford a higher bridge.

Suggested actions:

Alter Esopus Creek as needed to reduce flood destruction of bridges and roads! Other than that, leave things as they are.

A balance between development and conservation is important as development (>taxes) will support conservation efforts.

There has to be more hands-on common sense work done in streams to prevent people losing their property like mine. A lot of my property and my neighbors has gone away and you don't get a break in land taxes when it is gone.

We need to let the natural processes work as they have for thousands of years that created the watershed we have that is both economically and recreationally viable.

Pave Route 28A! And clean up road trash.

Much more needs to be done to eradicate invasives such as mugwort and knotweed. Also eliminating the leaving of trash at access sites.

The creek needs to be maintained more frequently in order to control flooding, i.e., cleaned out and dredged on a regular basis.

Please leave the streams alone. At least on my property.

If the state could dig it out and plant noninvasive species it would help [to control invasive species like knotweed].

Trees and branches fall into the stream and there is no clean-up program on Stony Clove Creek.

Positive comments:

Thank you for your efforts here.

Thank you so much!

The AWSMP has done wonderful things in our community!!!

Cannot thank you enough for caring about our stream and property.

Thank you to Bobby Taylor and his team for all their assistance!

We are very interested in stream management and are glad to share our experiences.

The State of New York:

The State of New York has allowed the City of N.Y. to dump tons of mud into the Esopus Creek thru the Shandaken Portal. FOR 30 YEARS!

NYSDEP/City of New York:

Prior to DEP assuming lead agency status, DEC ran a successful gravel skimming program adimistered through their fisheries department, utilizing minimal manpower and benefitting local landowners, contractors, and municipalities. Since its demise, the stream channel has become clogged and unaccessible.

NYC has spent a lot of money in the watershed. I hope the projects are working.

I, like many others I know and speak with, don't like the attitude of the DEP concerning any and all water flowing or standing in the watershed. Also [DEP attitude toward] people's concerns about the DEP's aggressive land acquisition in the watershed.

I own over 1000 feet of the Esopus Creek in the town of Shandaken. I've fished for trout, trapped beavers and mink, and enjoyed the creek for over 65 years. I believe the Esopus Creek is the lifeblood of the Catskill Mountains. I have/would do anything to make the stream healthier. However, politicians in Ulster County have allowed the Esopus Creek to become a mudhole from the Shandaken Portal all the way to the Hudson River. For over 30 years the City of New York has dumped tons of mud into the Esopus Creek turning this once great fishery into a chocolate milk colored eyesore. Years ago the DEC gave the City of New York a permit to pollute the stream and the practice has continued for 30 years. I have asked Senator Schumer why he doesn't use the Clean Waters Act to stop the pollution more times than I can count. I never receive an answer. Our County Legislator, [name] has refused to condemn the pollution, she won't even admit there is a problem. Our local newspaper, Kingston Freeman has never written a story on the pollution problem. They refuse to print any of my letters to the editor. Our former County Executive, [name], now a member of Congress, totally ignored any questions concerning the creek. You see [name of Cornell researcher], we live in a blue state and the City of New York is all powerful. Not one politician has the courage to condemn the City. I have pictures of the clean water above the Portal where it mixes with the dark brown water puking from the Portal. It should make the politicians sick but they just turn a blind eye, a cost of doing business. Years ago we had stream management projects but not anymore. If gravel builds up under a bridge, we don't dig some of the gravel out, we build a higher bridge. If the stream moves toward a roadway we don't guide the water away from the roadway, we do nothing until the stream causes the roadway to collapse.

Town of Shandaken:

About 6 years ago part of the retaining wall along [road name unclear] (Town of Shandaken road) fell into the stream forcing the stream over on my side. It eventually washed out my wall (I got a temporary repair) and the town has still not done nother, even after many requests.

Town of Woodstock:

The Woodstock Town Highway Superintendent decided to divert the stream to flow through my yard, instead of flowing along the side of the road. I personally told [name of Town Highway Superintendent] the water would destroy my property. The erosion finally washed my bulldozer, wood-fired boiler, snow plows and many other items away, including my yard!! The water is now about 40 feet from my house, and getting closer every day. Milk Hollow Road washed out every major storm since the 1970s. Nothing ever happened to my yard. I never lost a blade of grass. Now my yard is gone! The highway department taking matters into their own hands, by changing the path of the waterway. I've owned the property for 50 years. I never had a problem until [name of Town Highway Superintendent] came along. Something should be done to hold the people who make stupid decisions, that totally change people's lives, responsible.

Not sure if my property has a stream:

The definition of "stream" has not been offered. Is it like the Esopus Creek or is it the forest rivulet that has visibly moving water for at least half the year? What about the broad sheet of ground water running down the hillside behind me—up to an inch deep and a hundred yards wide after sever rain or spring thaw?

Our property is across the road from the stream and rises sharply up the mountain. The ravines feed the stream.

I am not sure if my properties are within the AWSMP.

Perhaps I'm being too literal because in fact my property doesn't exactly border the stream that runs from Yankeetown Pond in Bearsville to the lake in Wilson State Park. I'm guessing my property is fifty or so yards from the stream.

Other Comments:

I don't live there [own a vacant land parcel in the watershed] but if you think this is important I'll fill this out as honestly as I can.

We moved here fulltime during the pandemic. We bought our place before the pandemic.

I have 218 acres of forest land bordering Traver Hollow Stream. I live in [state name] and spend about 3 months most years on the property. I don't recall ever seeing Traver Hollow Stream being muddy even during high water flows.

I have found that the people who are sent to discuss anything to do with streams are book smart but have very little common sense.

I'm sure you are trying to do the right thing, but I can only wonder how knowing my yearly income helps the stream in any way. If you ever feel the need to visit this area I would be more than happy to show you around.