Submerged Aquatic Vegetation:
Behavior Change Research and Program Implementation Recommendations
Chesapeake Bay Program

action RESEARCH

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Acknowledgements

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1: Research Goals and Background

The goal of this work was to improve the health of the Chesapeake Bay and its tributaries through helping shoreline property owners protect submerged aquatic vegetation (SAV). To achieve this goal, a steering committee of SAV experts was assembled to provide oversight and expertise. Action Research was then contracted to complete the work, which began with a literature review followed by a survey of Maryland shoreline property owners to understand what challenges and situations they face when considering the SAV in the water alongside their property. This information was gathered to inform the development of strategies and outreach materials that will help shoreline property owners in the Chesapeake Bay watershed better manage their shorelines by motivating them to not interfere with SAV growth and build or extend piers beyond SAV to reduce negative impacts.

Literature Review

The Action Research team began by reviewing the existing literature on SAV. The goal of this literature review was to provide foundational research on the barriers and benefits that property owners may face when engaging in behaviors that protect SAV near their property. SAV includes aquatic grasses, which are rooted, flowering plants in the Chesapeake Bay that provide a wide variety of ecological and economic services. The literature review identified many reasons that property owners either remove SAV or leave SAV in place, including recreational activities, aesthetics, shoreline use, and property value. The literature review also revealed that little has been published on specific behaviors related to SAV issues and that few social science studies have been conducted on this topic. There are many factors that influence SAV health and abundance, given that it grows in shallow water at the interface of terrestrial and aquatic environments where anthropogenic impacts are common and sometimes unavoidable. However, the literature review and consultation with the steering committee determined that reducing direct removal of SAV was a meaningful pathway to increased health and quantity of SAV, particularly as SAV populations are currently increasing in areas where homeowners may be unfamiliar or unaccustomed with its presence. The full review can be found in the *Submerged Aquatic Vegetation Review* memo from May 2020, Appendix A.

Behavior Selection

Our review of the literature identified a set of eight behaviors related to SAV, listed below.

Behavior list

Behaviors to Encourage

- Leave SAV in place
- Leave shoreline unarmored
- Remove bulkheads/riprap if present
- Extend piers beyond where SAV grow

Behaviors to Discourage

- Hand removal of SAV by resident or hired company on residential property
- Mechanical removal of SAV by hired company on residential property
- Hardening of shoreline via riprap or bulkhead
- Installation of additional single-family docks

Through further discussions with the steering committee, it was determined that the most impactful behaviors, with consideration to those that could be feasibly addressed by the committee and not currently part of other active campaigns, were “leave SAV in place” and “extend piers beyond where SAV grows.” These two behaviors were the focus of the next step, a mail survey to Maryland residents.

Shoreline Property Owner Survey

Using the findings from the literature review and expert survey research as a foundation, the next step was to conduct a mail survey to better understand property owners’ current behaviors related to SAV management, their probability of taking the two beneficial SAV-related actions, and their perceived barriers and benefits to engaging in these actions. The methodology and results of the shoreline property owner survey are outlined in the next two sections of this report.

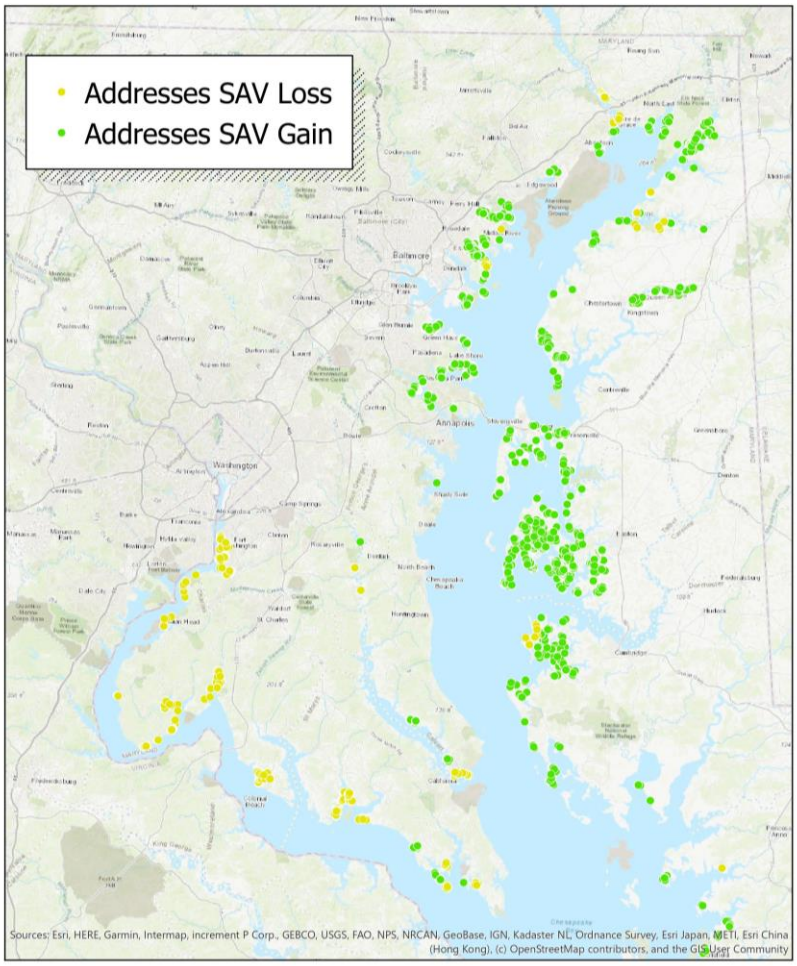
2: Methodology

In September and October of 2020, we administered a mail survey to residents of 600 waterfront properties along both shores of the Chesapeake Bay in Maryland from the northernmost point of the Bay down to the state line at the Potomac River. Several specific communities were selected where SAV is known to be increasing and where removal was reportedly occurring (based on anecdotal reports from the steering committee). The selected communities were near the Susquehanna Flats (Havre de Grace vicinity), Middle River, and near other rivers heading south towards and including the Severn, all in the tidal fresh, oligohaline, and mesohaline salinity zones. An address list of all shoreline properties in the selected communities was created from state-level GIS data and then 600 addresses were randomly selected from this list for inclusion in the survey. This process is described in further detail below.

Address List Generation

After importing all GIS parcel data for Maryland, we removed counties that had no contact with the Chesapeake Bay, coastline, or any river or tributary. We then filtered the addresses to select only residential addresses that were in the targeted regions and mapped where the data indicated with a loss or a gain in SAV. This process resulted in a final list of property addresses, shown in green below.

Figure 1: Map of Addresses in Maryland



Sample Selection

We randomly selected 600 addresses from the complete list with the goal of obtaining survey responses from a minimum of 120 properties (assuming a response rate of at least 20%).

Survey

The survey was administered using the Tailored Design Method (TDM)[1]. In September 2020, selected properties received a prenotification postcard followed a few days later by a hand-addressed survey packet with an addressed and stamped return envelope. In October 2020, non-respondents to the initial mailing received a reminder postcard and a second survey packet. The full survey is attached as Appendix B.

[1] Dillman, Don A., Smyth, Jolene D., Christian, Leah Melani. 2014. Internet, Phone, Mail and Mixed-Mode Surveys: The Tailored Design Method, 4th edition. John Wiley: Hoboken, NJ

3: Results

A total of 600 survey packets were mailed. Of these, 10 were returned as undeliverable. An additional 30 were returned or reported as ineligible (e.g., no shoreline, commercial properties, condominium complexes). This left a sample size of 560 valid addresses in receipt of a survey. From the 560 valid addresses, a total of 198 completed surveys were returned. There were also 14 refusals (blank surveys returned in the pre-stamped envelope). This equates to a response rate of 35.4% which exceeded our expectations. Table 1 lists each category.

Table 1: Responses

	(A) Original Sample	(B) Undeliverable	(C) Ineligibles	(D) Valid Sample *(A – (B+ C))*	(E) Refusals	(F) Completes	(G) Response Rate *(F/D)*
Total	**600**	**10**	**30**	**560**	**14**	**198**	**35.4%**

Demographics

Most respondents were property owners (97%). Length of property ownership was an average of 23 years (Range = 1 – 118 years). Respondents ranged in age from 23 to 92 years (Average = 62). The average household size was 2.2 people (15 % had one person, 62% had two people, and 23% had three or more people). The majority of respondents did not have children under 18 in their household (88%).

Boats and Piers

Most respondents had an existing pier (82.6%) or were planning to build one (4.5%). About a third of respondents' neighborhoods have a community pier (31.6%). Most of the respondents had a boat docked along property (62.2%) or docked elsewhere (11.7%).

Property Characteristics

Respondents were asked to report which shoreline structures they had on their property, checking all responses that applied. Most respondents reported having a bulkhead (69.7%). Some respondents had riprap (20.7%), and a few had a living shoreline (12.6%).

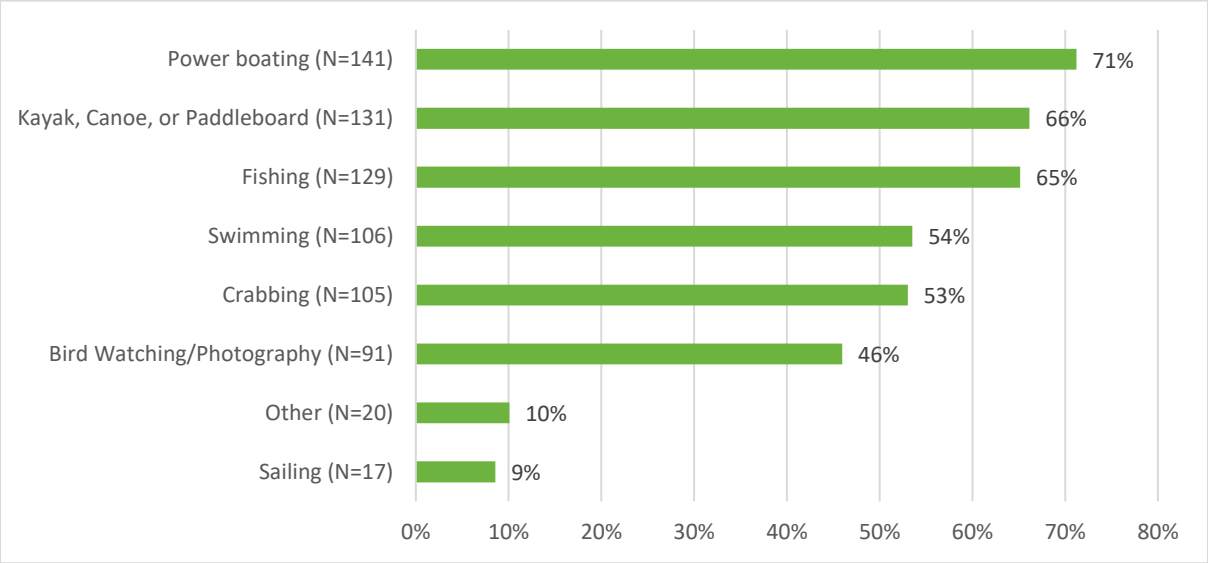
Structures

Respondents were asked to indicate which types of building structures they have on their property, checking all responses that applied. Nearly all had houses (91.9%, N=182). A small number had a vacation or rental home (7.1%, N=14) or other building (12.6%, N=25).

Waterfront Activities

Respondents were asked to report the activities they use their waterfront for, checking as many options as applicable. The most commonly reported activities were *power boating* (71%), *kayak/canoe/paddleboard* (66%), and *fishing* (65%).

Figure 2: Waterfront Activities

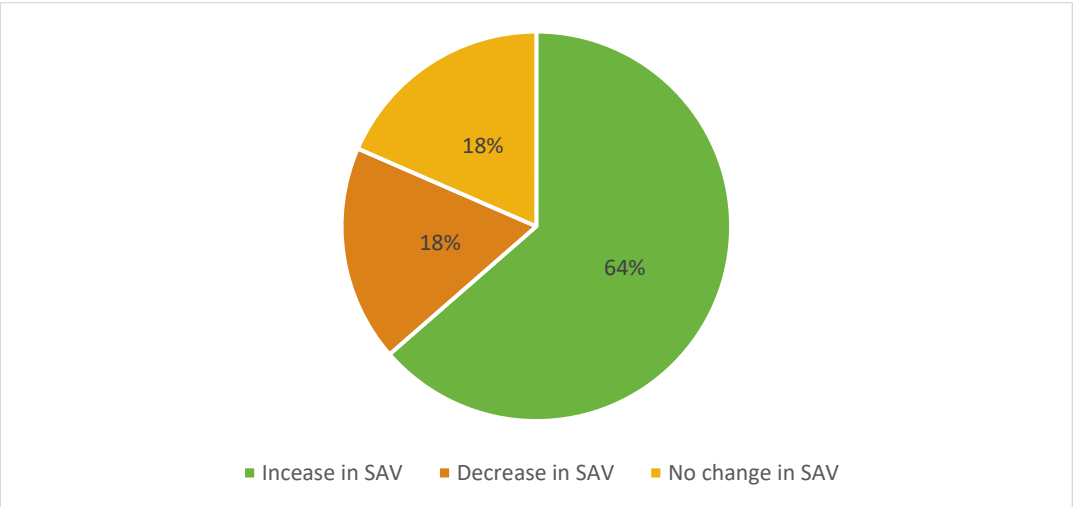


Submerged Aquatic Vegetation (SAV) Context

Change in SAV

Over two-thirds of respondents reported that they have seen an *increase in the amount of SAV* (64%) since living at their property. The remainder of responses were split evenly between seeing a *decrease* (18%) and *no change* (18%).

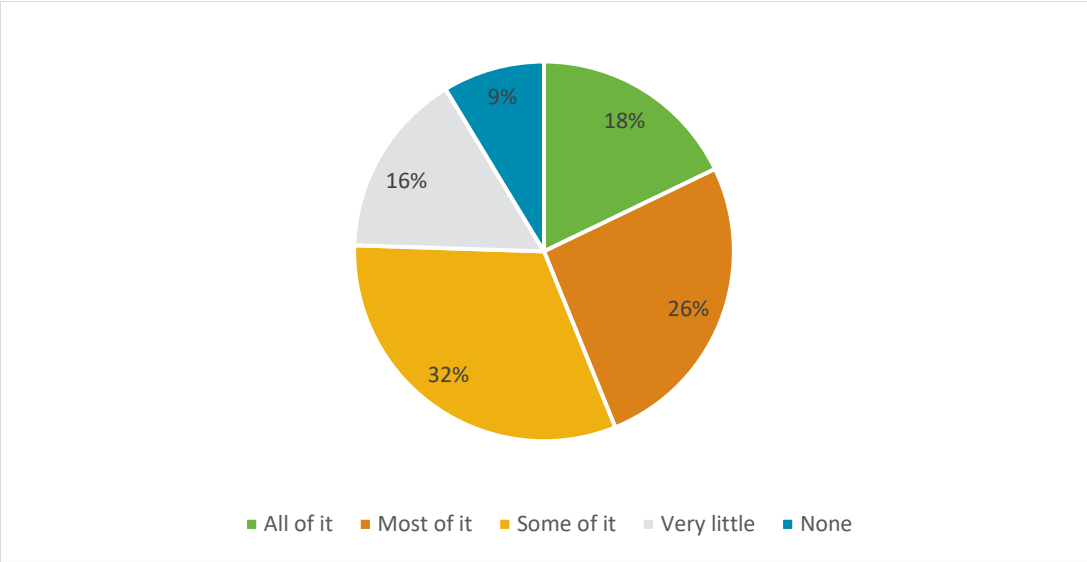
Figure 3: Perceived Change in SAV



Current SAV

About half of respondents reported that either *all* (18%) or *most* (26%) of the water by their shoreline had SAV. Respondents who reported having *none* (N=17) were skipped forward to the attitudes, communication, and demographic questions.

Figure 4: Amount of SAV on the Shoreline



Inferential Statistics

Respondents who reported that either *all* or *most* of the water by their shoreline had SAV were significantly more likely ($p<.05$)[2] to report that they had seen an increase in SAV since they had owned their property. Conversely, respondents who reported *very little* SAV were more likely ($p<.05$) to report that they had seen a decrease in SAV.

[2] A p-value of less than .05 indicates there is a less than 5% chance that the results are due to random chance, and the observed difference is statistically significant.

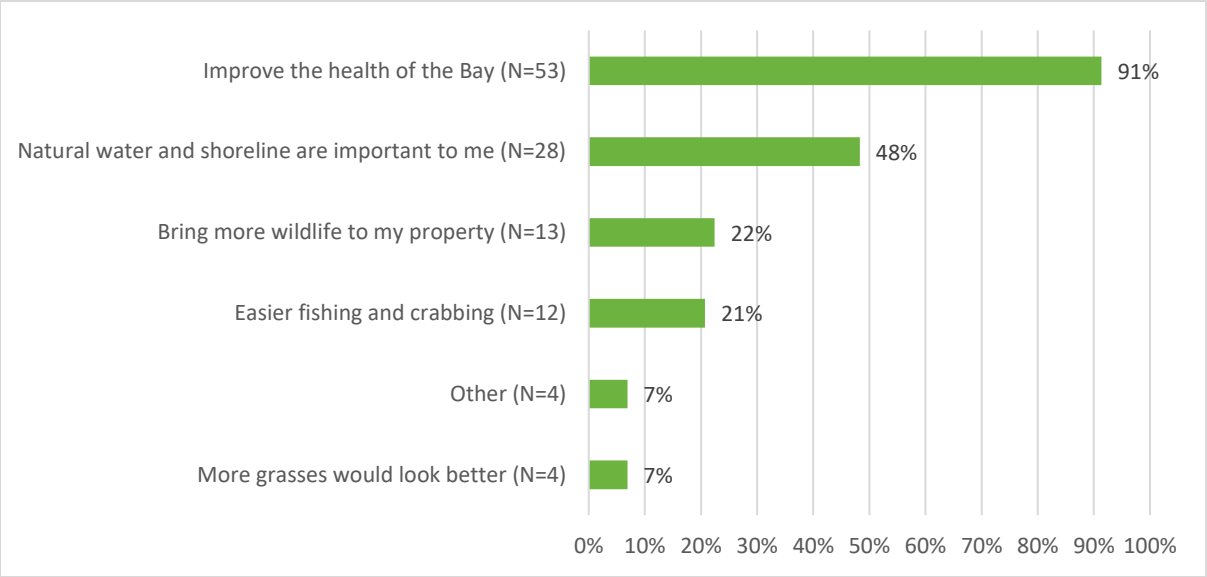
SAV Actions

Restoration or Protection

Two-thirds of respondents (67.8%) reported that they had not considered restoring or protecting the SAV along their shoreline. There was no statistical difference in responses between those who had observed an increase and those who had reported a decrease in SAV.

Respondents (32.2%) that had considered restoring or protecting SAV were asked to identify their primary reason for considering the action. Nearly all respondents who had considered restoring or protecting SAV reported doing so to *improve the health of the Chesapeake Bay* (91%), followed by *natural water and shoreline are important to me* (41%); see Figure 5. While the question was intended to be a singular response, most respondents checked multiple boxes. Therefore, the responses do not add to 100%.

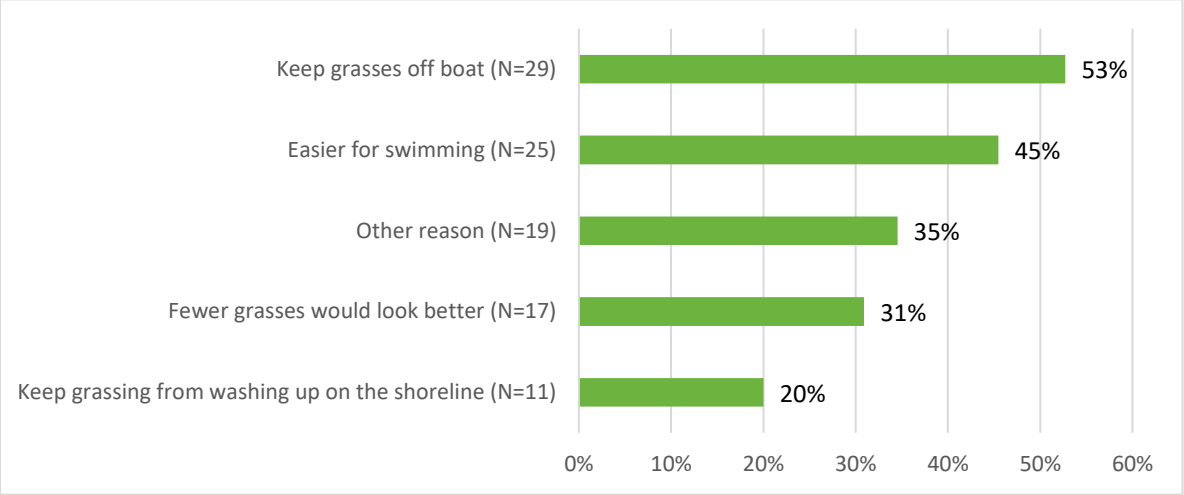
Figure 5: Reasons for Considering Protecting or Restoring SAV



Removal

Two-thirds of respondents (63.8%) reported that they had not considered removing the SAV along their shoreline. Respondents who had seen an increase in SAV were more likely to report that they had considered removing SAV ($p<.05$). The respondents (28.1%) that considered removing SAV were asked to identify the primary reason they considered the action. About half of the respondents who had considered removing SAV would do so to *keep grasses off boat* (53%) and to make their water *easier for swimming* (45%); see Figure 6. While the question was intended to be a singular response, most respondents checked multiple boxes. Therefore, the responses will not add to 100%.

Figure 6: Reasons for Considering Removal of SAV



The written in reasons listed under *Other* were varied, but primarily focused on water activities (jet skis, boats, swimming) and stopping trash from collecting in the SAV.

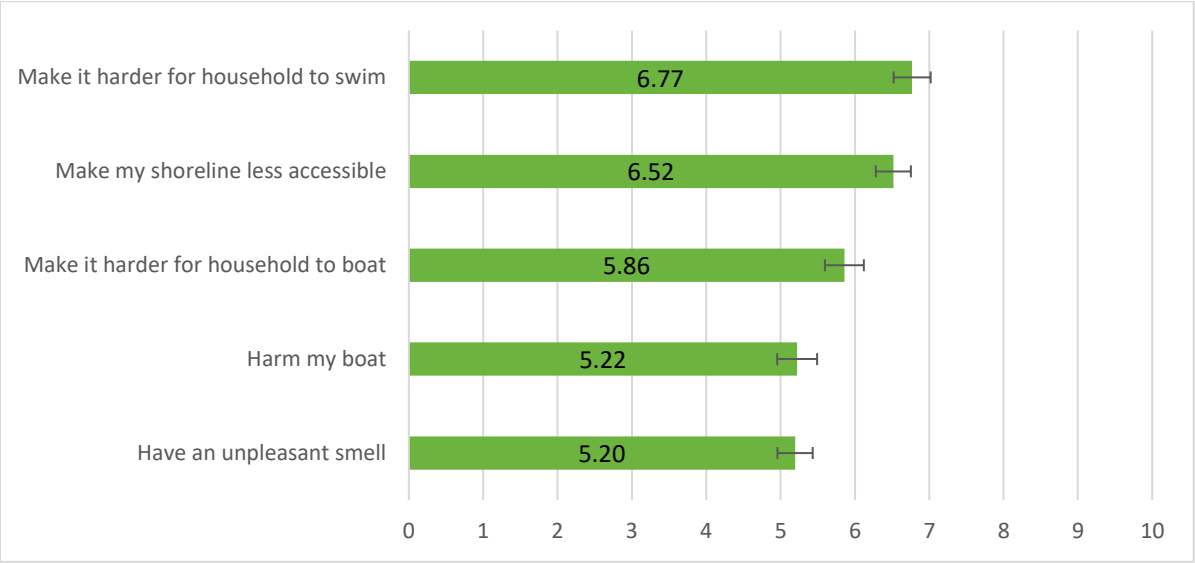
Community Actions

Very few respondents (13.8%) reported anyone in their community restoring or protecting SAV, while about a third (33.5%) reported that someone in their community removed SAV.

Leaving SAV Alone

Respondents were asked to rate a list of statements about the barriers of leaving SAV to grow undisturbed using a scale from *0 (strongly disagree)* to *10 (strongly agree)*. The highest ranked barriers to letting SAV grow undisturbed were making it *harder for their household to swim* and making their *shoreline less accessible.*

Figure 7: Barriers to Leaving SAV Alone



Inferential Statistics

Making it harder for their household to swim had a negative correlation ($r = -.165$, $p<.05$) with years of property ownership, indicating that the concerns about this barrier decreased the longer respondents had owned their property.

Benefits

Respondents were asked to rate a list of statements about the benefits of leaving SAV to grow undisturbed using a scale from *0 (strongly disagree)* to *10 (strongly agree)*. The highest valued benefit to letting SAV grow undisturbed was that it was *healthy for the Chesapeake Bay*, followed by *bring(ing) more wildlife to my property* and *protect shoreline from erosion*. Respondents generally disagreed that leaving SAV in the water would *look attractive* or *increase property value*, indicating that these are not seen as benefits.

Figure 8: Benefits to Leaving SAV Alone

Inferential Statistics

Looking attractive and *increasing property value* were positively correlated (r = .210 and r = .211, $p<.05$) with years of ownership, indicating that these perceived benefits increased higher the longer respondents had owned their property.

Permits

Half of respondents were aware that permits were needed for SAV removal, either reporting that *yes,* they were required (27.1%) and *in some situations* (22.9%), while half reported that *no*, they are not required (50.0%). Those who had either seen an increase or decrease in the SAV by their property were more likely ($p<.05$) to report that they did not need a permit than those who reported no change.

SAV-Friendly Piers

The majority of respondents reported having a pier (82.6%, N=147) or were planning on building one (4.5%, N=8). The remainder (12.9%, N=23) were skipped ahead to the next section, Attitudes, as they did not have a pier or an intent to build one.

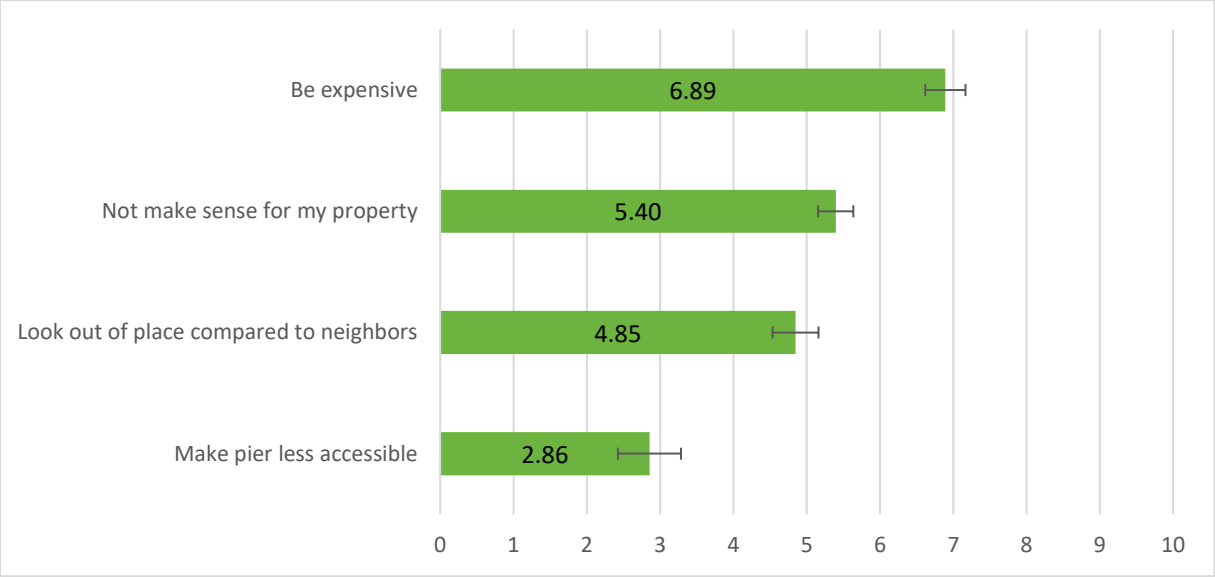
Likelihood

About a quarter (21.7%, N=43) of respondents reported that their pier already extended beyond where SAV grows. To assess the likelihood of extending piers beyond where SAV grows, respondents who reported having a pier that does not already extend beyond SAV (N=93) were asked to rate the likelihood of taking action using a scale from *0 (not at all likely)* to *10 (extremely likely)*. The average likelihood rating was a 4.86, indicating they leaned toward not acting.

Barriers

Respondents were asked to rate a list of statements about the barriers of extending their pier beyond where SAV grows using a scale from *0 (strongly disagree)* to *10 (strongly agree)*. Among respondents, the most significant barrier to extending the pier was that it would *be expensive*. Respondents were moderately concerned about the barriers that it would *not make sense for (their) property* and would *look out of place.* Respondents were not very concerned that it would *make (their) pier less accessible.*

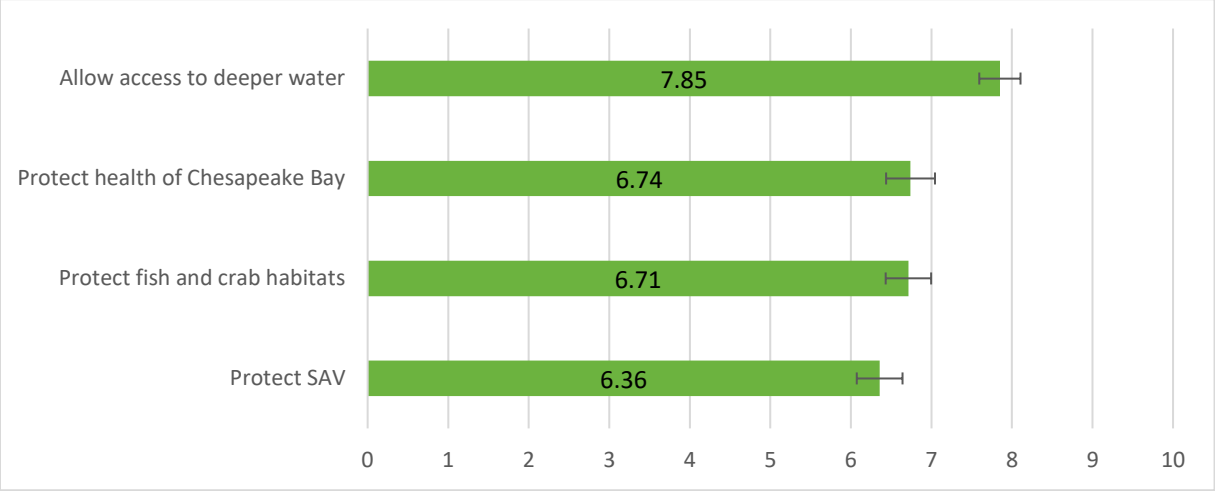
Figure 9: Barriers to Extending Pier



Benefits

Respondents were asked to rate a list of statements about the benefits of extending their pier beyond where SAV grows using a scale from *0 (strongly disagree)* to *10 (strongly agree)*.

Figure 10: Benefits to Extending Pier

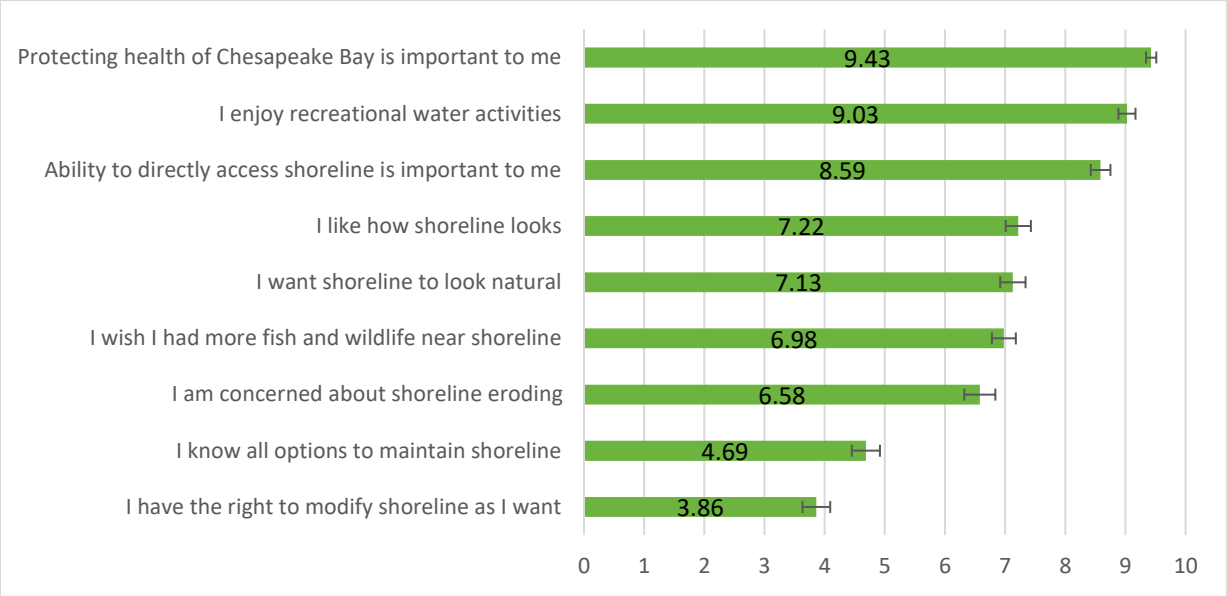


Among respondents, the primary perceived benefit was *allowing access to deeper water.* Respondents rated the benefit for *protecting the health of the Chesapeake Bay, protecting fish and crab habitats*, and *protecting SAV* about equally.

Attitudes

Respondents were asked to rate a list of statements about their attitudes toward their shoreline using a scale from *0 (strongly disagree)* to *10 (strongly agree).* Respondents reported very strong agreement with *protecting the health of the Chesapeake Bay*. Respondents also reported high agreement for *enjoying recreational water activities* and *ability to access the shoreline.* Respondents reported both *liking how their shoreline looks currently* and *wanting their shoreline to look natural*. Respondents did not agree that they *have the right to modify shoreline as they want* or *know all options to maintain shoreline*.

Figure 11: Shoreline-Related Attitudes



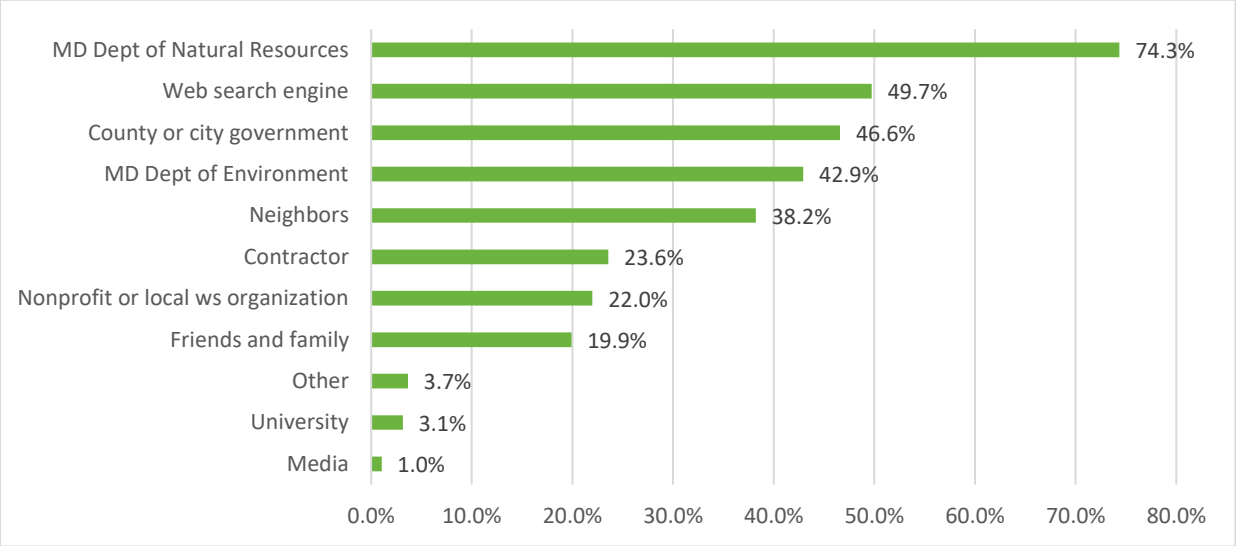
Inferential Statistics

I am concerned about shoreline eroding and *I know all options to maintain shoreline* were correlated (r= .162 and r = .202, $p<.05$) with years of ownership, indicating that these attitudes increased the longer respondents had owned their property.

Communication

Respondents were asked to indicate which sources of information they would use when they have questions about managing their shoreline and could check all that applied. The majority of respondents identified Maryland Department of Natural Resources as a preferred source of information (74.3%). About half of respondents use a web search engine (49.7%), county or city government (46.6%), or MD Department of Environment (42.9%). About two-thirds of respondents speak to their neighbors (38.2%).

Figure 12: Information Sources for Shoreline Management



Exploratory Analysis

Three sets of exploratory analyses were conducted on the perceived barriers and benefits to leaving SAV alone as well as attitudes on this topic. First, we compared respondents who have and have not considered removing SAV. Next, we compared respondents who reported an increase, decrease, or no change in SAV. Finally, we compared respondents based on whether they have the following: boats, piers, and armor.

Analyses were conducted for the questions related to the barriers and benefits around piers, but no meaningful statistical differences were found.

Considering Removal of SAV

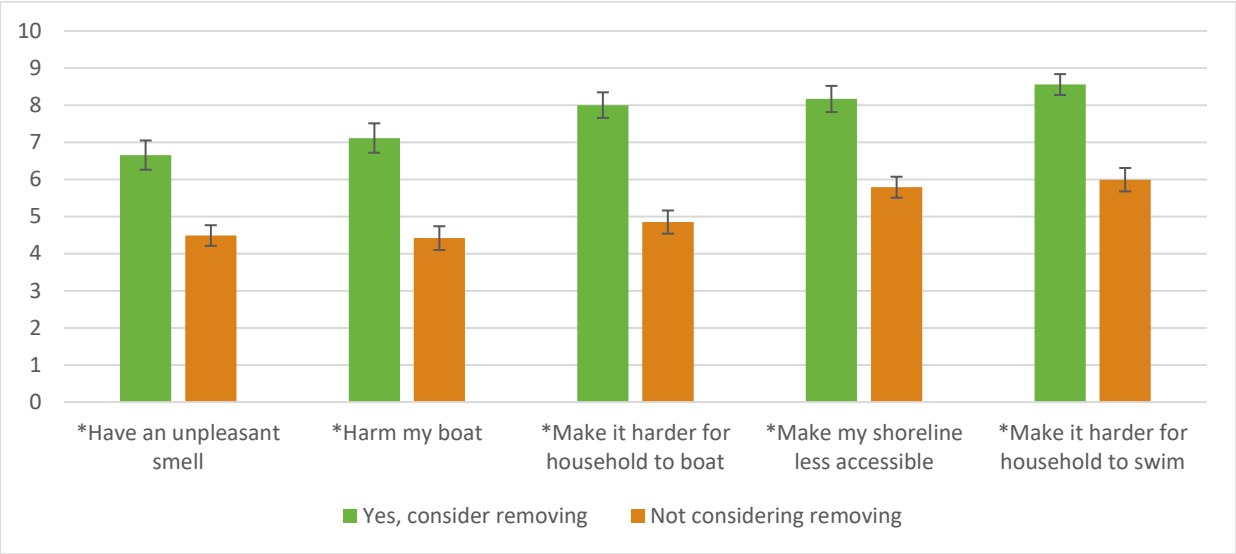
Two-thirds of respondents (63.8%) reported that they had not considered removing the SAV along their shoreline, while one-third of respondents (28.1%) had. Each section below outlines the differences in barrier and benefit ratings for each group.

Barriers to Leaving SAV Alone

Barriers to letting SAV grow were rated by respondents on a scale from *0 (strongly disagree)* to *10 (strongly agree)* and differences between groups (those that have and have not considered removing SAV) were analyzed. Respondents who had considered removing SAV perceived all barriers to be significantly higher than participants who had not considered removing SAV. Compared to the barrier rankings for the whole sample size, the barriers for those who have considered removing SAV were ranked the same, but even the lowest ranked barrier, *have an unpleasant smell*, had a mean rating score

of 6.65 for those who have considered removing. The average rating for the full sample size for this barrier was 5.20. See Figure 13.

Figure 13: Barriers for Leaving SAV Alone by Considering Removing

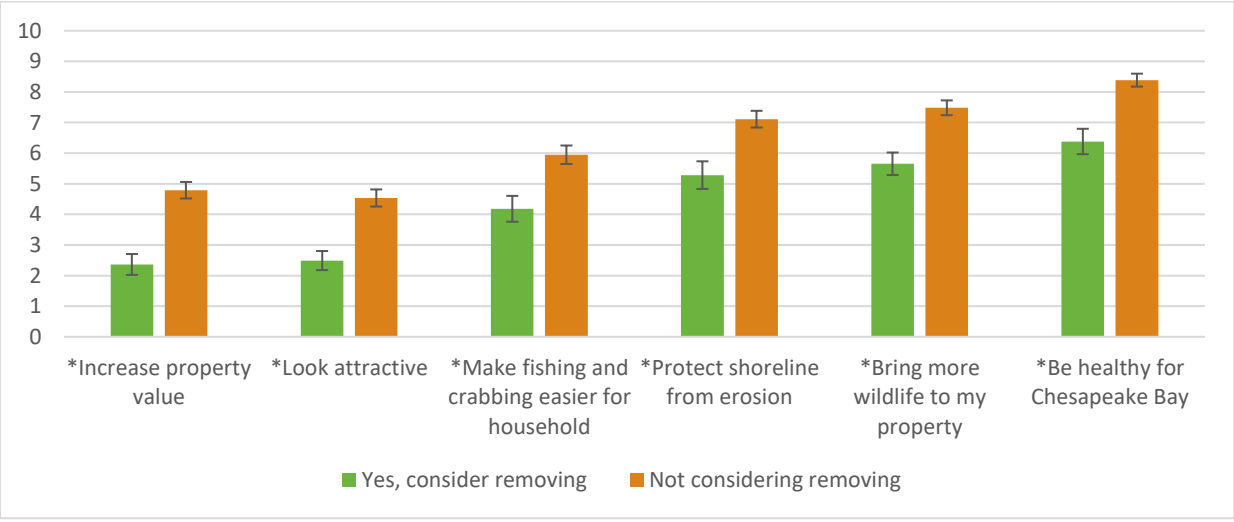


Statements with a statistically significant difference by respondents who have and have not considered removing SAV are noted using a "*".

Benefits to Leaving SAV Alone

Benefits of letting SAV grow were rated by respondents on a scale from *0 (strongly disagree)* to *10 (strongly agree)* and differences between groups were analyzed. Respondents who had considered removing SAV perceived all benefits to be significantly lower than participants who had not considered removing SAV. The benefits for those who have considered removing were generally in the same order as the whole sample size, with *be healthy for Chesapeake Bay, bring more wildlife to my property,* and *protect shoreline from erosion* at the top. See Figure 14.

Figure 14: Benefits for Leaving SAV Alone by Considering Removing

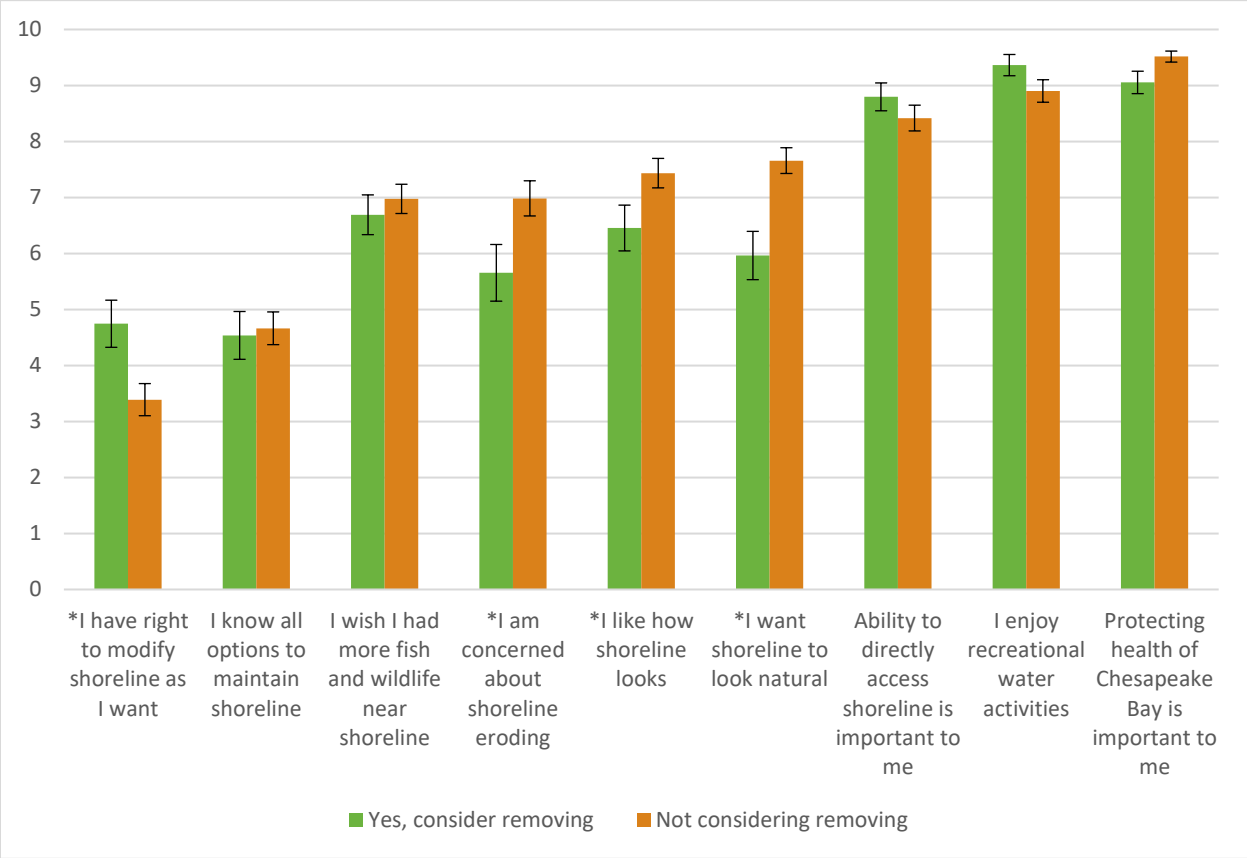


Statements with a statistically significant difference by respondents who have and have not considered removing SAV are noted using a "*".

Attitudes

Attitudes about respondents' shorelines were rated on a scale from *0 (strongly disagree)* to *10 (strongly agree)* and differences between groups were analyzed. About half of the listed attitudes were significantly different for respondents who were and were not considering removing SAV. The largest differences were in the following attitude statements: *I want my shoreline to look natural, I am concerned about shoreline eroding*, and *I have right to modify shoreline as I want.* See Figure 15.

Figure 15: Attitudes Toward Shorelines by Consider Removing



Statements with a statistically significant difference by respondents who had and had not considered removing SAV are noted using an "*".

Change in SAV

We compared respondents who reported an increase, decrease, or no change in SAV. The only meaningful statistically significant ($p<.05$) difference was that respondents who reported an increase in SAV were more concerned SAV would *make it harder for household to boat*, with a mean rating of 6.58 as compared to 4.55 for those who reported a decrease and 4.88 for those reporting no change.

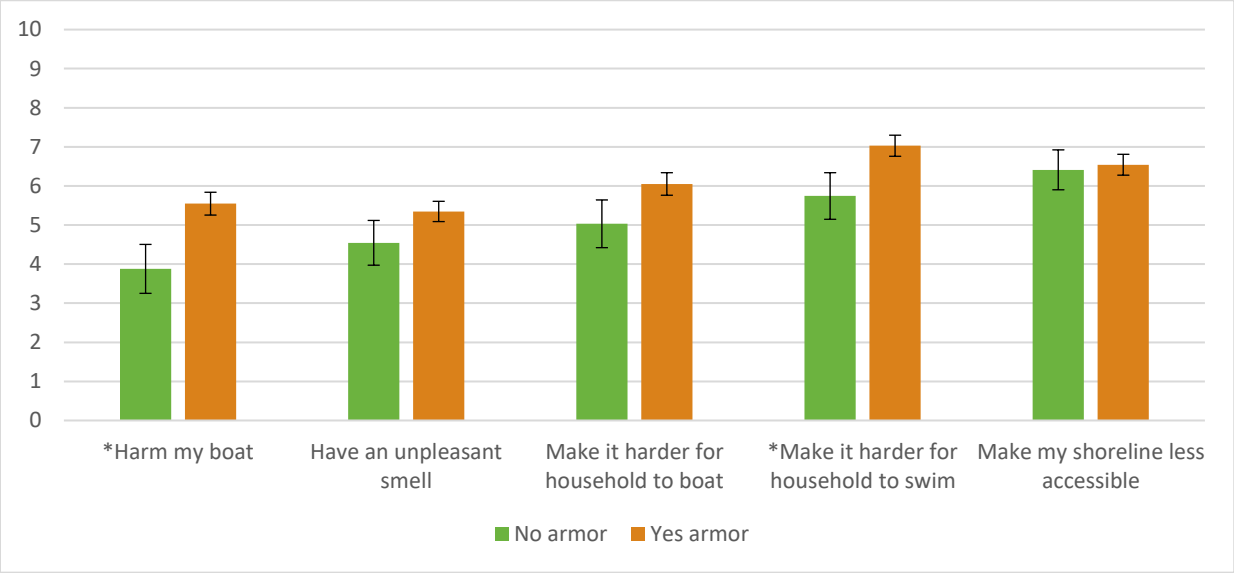
Armor

The majority of respondents reported having armor (80.3%). Each section below outlines the differences in barrier and benefit ratings for each group (armor versus no armor).

Barriers

Barriers to letting SAV grow were rated by respondents on a scale from *0 (strongly disagree)* to *10 (strongly agree)* and differences between groups (those that have and do not have armor) were analyzed. Respondents who had armor perceived that the barriers to leaving SAV alone, where it would *make it harder for household to swim* and *harm my boat* to be significantly higher than participants who did not have armor. See Figure 16.

Figure 16: Barriers to Leaving SAV Alone by Armor

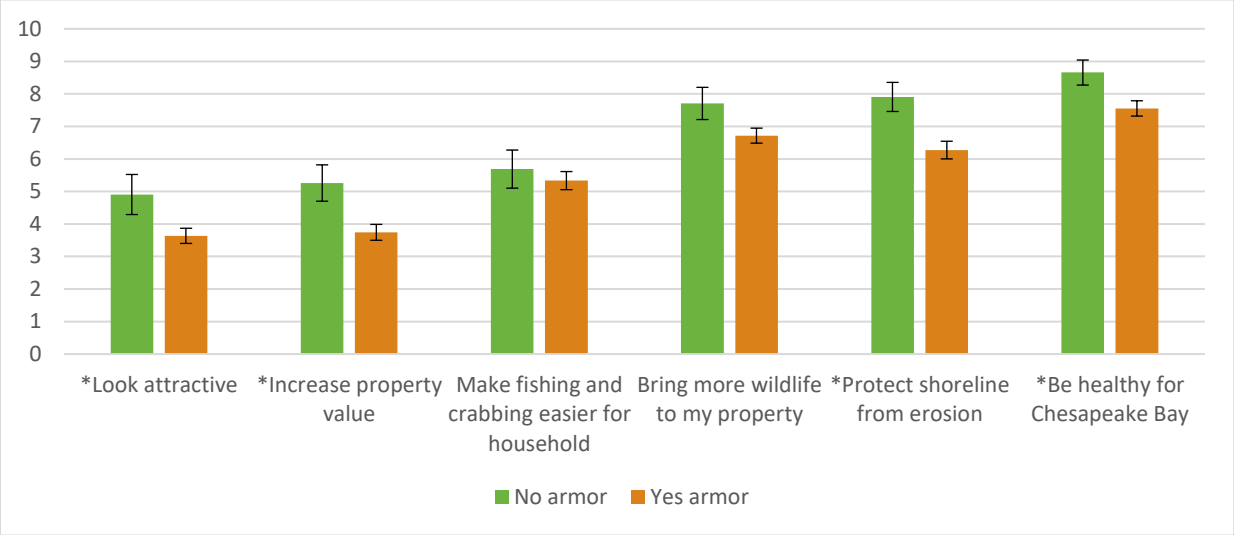


Statements with a statistically significant difference by respondents who do and do not have armor are noted with an "*."

Benefits

Benefits of letting SAV grow were rated by respondents on a scale from *0 (strongly disagree)* to *10 (strongly agree)* and differences between groups were analyzed. Respondents who had armor perceived several benefits to be significantly higher, including *be healthy for Chesapeake Bay, protect shoreline from erosion, increase property value,* and *look attractive.* See Figure 17.

Figure 17: Benefits to Leaving SAV Alone by Armor

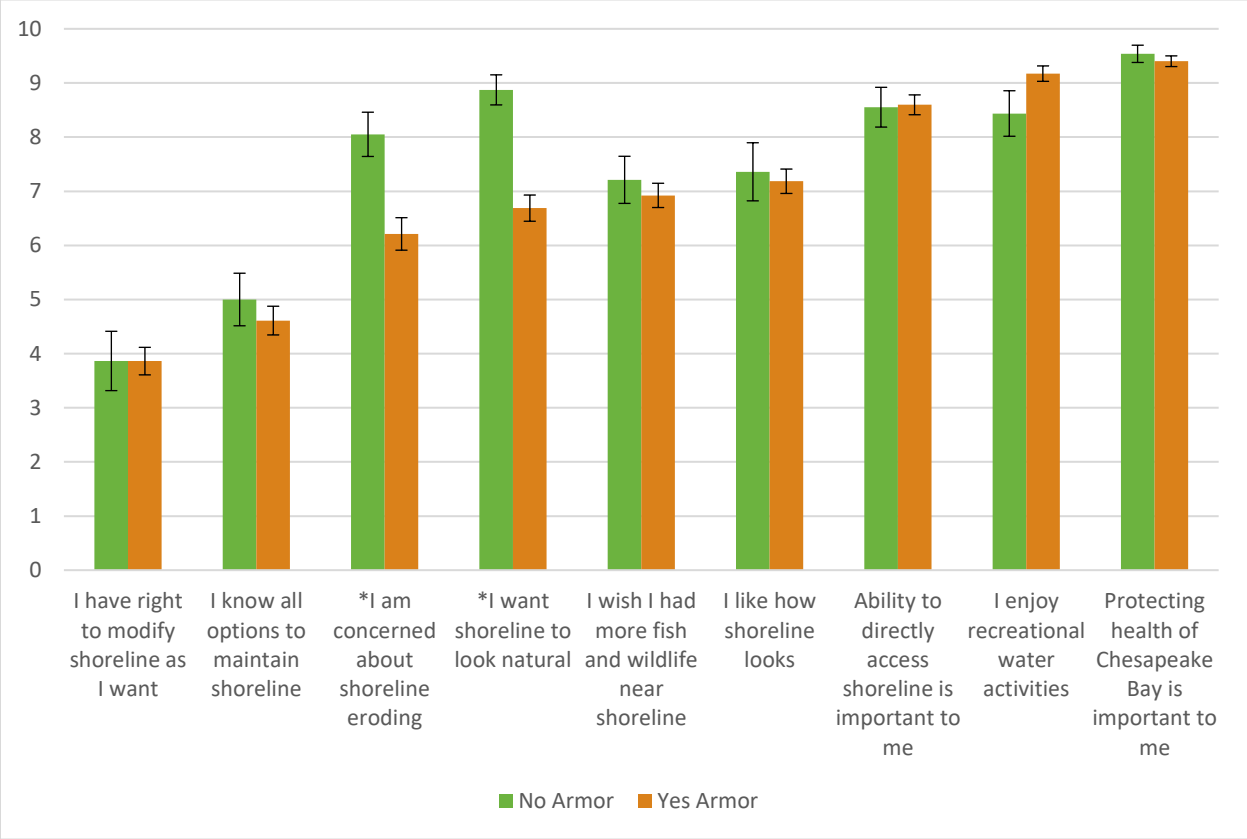


Statements with a statistically significant difference by respondents who do and do not have armor are noted using a "*".

Attitudes

Attitudes about respondents' shorelines were rated on a scale from *0 (strongly disagree)* to *10 (strongly agree)* and differences between groups were analyzed. Two statements were rated significantly higher by those without armor - *I am concerned about shoreline eroding* and *I want shoreline to look natural.* See Figure 18.

Figure 18: Shoreline Attitudes by Armor



Statements with a statistically significant difference by respondents who do and do not have armor are noted using a "*".

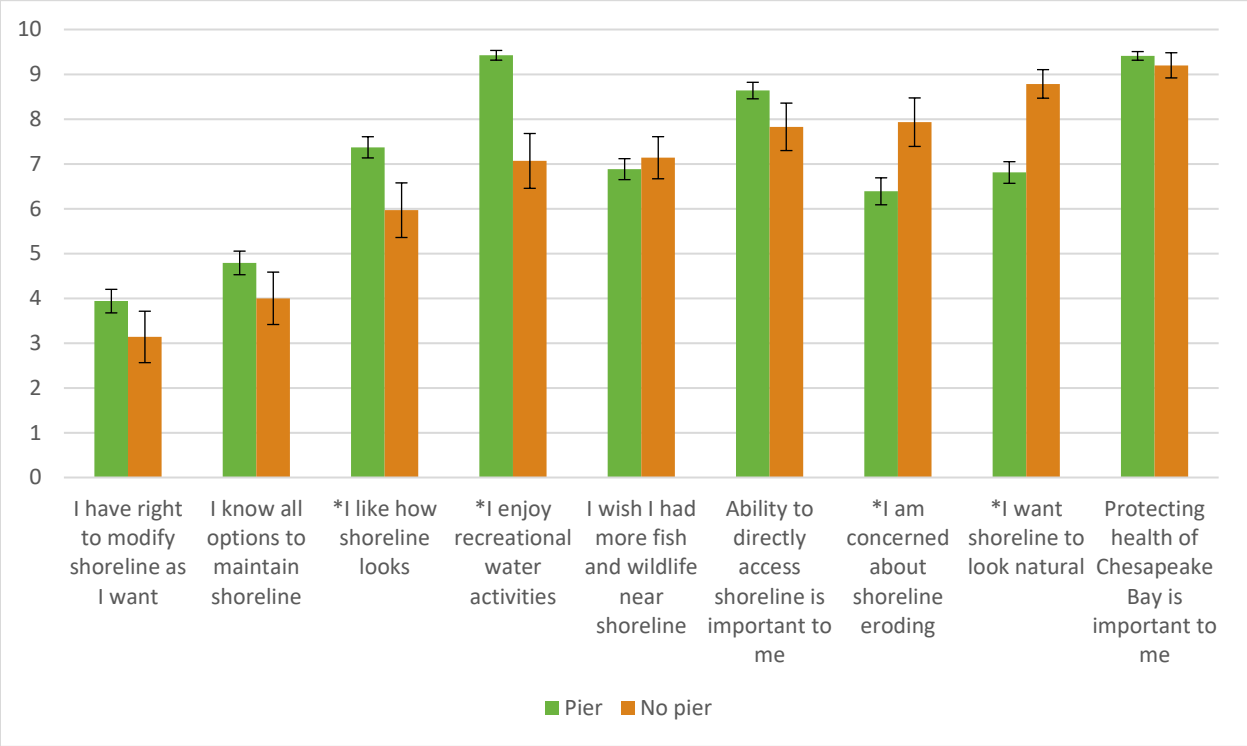
Piers

The majority of respondents reported having a pier (82.6%). Analyses were run on all questions comparing those who did and did not have piers, but significant differences were only found on the attitude questions.

Attitudes

Attitudes about respondents' shorelines were rated on a scale from *0 (strongly disagree)* to *10 (strongly agree)* and differences between groups (those with and without a pier) were analyzed. About half of the listed attitudes were significantly different for respondents who do and do not have a pier. The largest differences were in *I want my shoreline to look natural* and *I am concerned about shoreline eroding* where respondents without a pier rated these attitudes higher than those with a pier. Significant differences in ratings were also found for *I enjoy recreational water activities* and *I like how shoreline looks* where those with a pier rated these attitudes higher than those without. See Figure 19.

Figure 19: Shoreline Attitudes by Pier



Statements with a statistically significant difference by respondents who do and do not have a pier are noted using a "*".

Open-ended Responses

Several questions in the survey included an "other" option; these responses are listed in in Appendix C. Finally, the last question of the survey asked for additional comments. Many of these responses included stories about the respondent's property, from the broken boats and jet skis to concerns about very dense SAV. Many requested more information on making decisions or assisting with issues, and left contact information that was removed for the purpose of this report. These are included in Appendix C.

4: Conclusions and Recommendations

This research was conducted to better understand how shoreline property owners perceive and make decisions about the SAV on their shoreline. The results of this research will assist organizations in the Chesapeake Bay region to successfully motivate property owners to leave their SAV alone and build piers that protect SAV. In this section, we provide a strategy table with a summary of key findings and associated recommendations for motivating property owners to leave their SAV alone. At the end of the section there is an *Outreach Approach* subsection which details the outreach materials created for the program and recommendations for their use. One key finding to note across both behaviors is that the channel respondents reported using for information (above all others) was Maryland DNR (74%). About half reported using web searches, local government, and Maryland Department of the Environment.

Leave SAV Alone

Overall, respondents perceive low to moderate benefits to leaving SAV alone but face significant barriers. The health of the Bay, encouraging more wildlife, and preventing erosion were all meaningful benefits to the full group, and protecting the health of the Bay was by far the top reason respondents had considered for protecting or restoring SAV.

Habitats

Linking the value of encouraging wildlife to the role and value of SAV is important. There is evidence that waterfowl populations have rebounded as the colonizing of SAV such as Hydrilla have expanded. A focus on fisheries, especially nurseries, could be a positive value to highlight to property owners tied to values of encouraging wildlife. Images of the beauty of underwater fishes and other species swimming among SAV in outreach materials would provide the connections.

Boating and Jet Skis

Those who considered removing SAV rated all benefits lower, suggesting the need to enhance benefits across the board. The most important barriers were that SAV is perceived to create challenges with boating and swimming, especially for those who had considered removing SAV. Best practices for boating include raising a boat's motor to avoid cutting SAV and not mooring a boat where it would settle on the bottom during low tides. SAV have a baffling effect on wakes even in low energy or sheltered settings. It could be pointed out that jet skis are a big contributor to wakes, and SAV in these areas could result in less opposition to jet ski use.

Aesthetics

Those who considered removing SAV also ranked aesthetic barriers highly including concerns about smell, disagreement that SAV looked attractive, and increased property value. The most negative comments about SAV were from property owners who had canopy formers such as Hydrilla or Milfoil along their shoreline. Public education could include information on the value of different SAV species. For example, how and why they grow where they do. The SAV types considered less attractive at the water surface are the best at reducing wave energy along the shoreline.

Several respondents included comments on their survey about algae growing on the surface of their SAV canopy. It could be pointed out that algae are not a characteristic of SAV but of excess nutrients from runoff. The presence of algae may be a good thing as they are sequestering and storing nutrients which otherwise might produce toxic phytoplankton blooms.

Respondents who had considered removing SAV rated a natural shoreline, concern about erosion, and liking how their shoreline looks significantly lower (less agreement). Respondents who had considered removing SAV had moderate agreement to the right to modify shoreline.

Other Considerations

Overall, all respondents highly valued protecting the health of the Chesapeake Bay, recreational water activities, and shoreline access. Several other important findings should be noted regarding outreach for motivating property owners to leave SAV alone:

- Longer-term property owners were less concerned about SAV and swimming and perceived more benefit from SAV in terms of looking attractive and increasing property value. Longer-term property owners were more likely to report they were concerned about shoreline erosion and know all options to maintain their shoreline. Overall, longer-term residents have lower barriers (easier to motivate), but also may be less likely to seek information as they feel they know the options to maintain their shoreline.
- Respondents who do more activities on their shoreline were more likely to report they enjoy recreational water activities and like how their shoreline looks, and less likely to report they want their shoreline to look natural. As the top barriers to leaving SAV alone are water activity based, those who do more activities have more barriers (harder to motivate).
- About half of respondents were unaware they would need any kind of permit for SAV removal.
- Ownership of the waterway bottom below mean low tide does not appear to be well understood by some property owners. The bottom area does not belong to the shoreline property owner, but to the state, so they are not allowed to do anything to this area without community. This could be promoted in a positive manner by pointing out that it means neighbors cannot do anything which might be detrimental to their shoreline.
- For residents who object to certain SAV, it could be pointed out that they are not invasive, but colonizers and that research has shown they will evolve over time to a more diverse community.

Target Audience

Based on the results, we recommend the strategies initially focus on targeting longer-term residents, as they reported fewer barriers and more benefits to leaving SAV alone. We also recommend focusing on areas that have higher levels of SAV, either increasing or already established, as they were more likely to consider removing SAV.

Leave SAV Alone Strategy Table

In the strategy table below, we list relevant research findings, link those findings to social science and marketing tools, and suggest pathways for operationalization.

Research Outcome	Tools	Strategy Options/Operationalization
SAV negatively impacts shoreline usage	Education/ Communication	• Outreach will include best practices for boating, swimming, and other waterfront activities with SAV around – both for how to accommodate SAV but also for the activity. This could highlight extending piers beyond SAV, the other behavior that barrier and benefit data was collected on for this work – see next section, *Build Piers that Extend Beyond SAV.* Boats can also trim their motors in shallow water to avoid getting SAV caught in the motor and damaging the boat. • If there are situations that should be exceptions, note those specifically (e.g., if there is a specific density of SAV where it should be cut) • Since SAV, especially when visible at the water surface, is particularly helpful against erosion caused by boat and jet ski wakes, this can be linked to benefits of SAV for waterfront activities.
Low motivation to protect SAV	Normative feedback	• Communicate that most shoreline property owners leave their SAV alone, and highly value the Bay. • Show simple metrics of how the local region is improving due to the actions of most property owners. • Highlight well-known and well-respected residents in the area that already leave SAV alone through water-facing shoreline signage (social diffusion). • This can be linked to the Bay Protector ambassadors referenced in the *Bay Protectors for Shoreline Management: Implementation Plan* as another social diffusion message that identified ambassadors can distribute through their social channels. The results suggest that those without armor, which is part of the criteria to be a Bay Protector ambassador, may be more likely to leave their SAV alone, given lower barriers and higher benefits.
Lack of knowledge about permitting	Education/ Communication	• Include simple information on when the removal of SAV requires a permit. • Consider providing simple information on where state owned land starts.
Protecting the health of the Bay; Wildlife	Education/ Communication/ Cognitive Dissonance	• Show beautiful images of SAV and underwater species to evoke a positive emotional response and connection to the Bay where they live and recreate. • Provide credible, vivid information about how more SAV protects the Bay and brings wildlife to their property. Given that the highest barriers to leaving SAV alone were linked to usage of the shoreline and waterfront activities, messages could link between the health of the Bay, SAV, and ability to continue to engage in their favorite waterfront activities.

		• Respondents reported valuing the health of Bay as a general attitude. However, when asked if the health of the Bay was a benefit of SAV, it was not valued as highly. Outreach should connect leaving SAV alone to protect the Bay, such as the increase in fish and wildlife and the sequestering of excess nutrients (which may lead to even more growth of algae on their shoreline). • Cognitive dissonance can motivate actions that are consistent with individual's values by reminding them of their values (protecting the Bay is very important) and speaking to what behaviors are consistent with those values (leaving SAV alone).

Build Piers that Extend Beyond SAV

Respondents reported both moderate benefits and moderate barriers to building piers that extend beyond SAV. The primary barrier respondents reported was that extending the pier would be *expensive*, with moderate agreement to it *would not make sense for their property* or *look out of place*. The highest benefit of a longer pier was *allowing access to deeper water,* followed by other benefits related to the Bay, wildlife, and SAV. About a quarter of respondents reported they already had a pier that extended beyond the SAV, and for those who did not, they reported moderate likelihood to engaging in the action.

Target Audience

As above, we recommend focusing on longer-term property owners in areas that have increasing or already established SAV. We recommend focusing on owners who already have a pier that does not extend beyond SAV to avoid incentivizing additional piers and to leverage the primary benefit of access to deeper water to protect their boat and increase the ease of engaging in water activities. If possible, we also recommend initially focusing on property owners with the financial resources to extend their pier without additional grants.

Build Piers that Extend Beyond SAV Strategy Table

In the strategy table below, we list relevant research findings, link those findings to social science and marketing tools, and suggest pathways for operationalization.

Research Outcome	Tools	Strategy Options/Operationalization
Expensive	Incentive	• Either correct misperceptions about expense, provide grants for pier extension, or focus on property owners with the financial means to extend piers.
Not make sense/look out of place – difficult to motivate	Convenience/ Communication	• Create a website or other information source that provides information quickly and easily for residents to build longer piers. This could include contact information for companies who do this kind of work, rebates/grants for pier extensions, and other important information needed to complete the work. • Consider vivid info, either through photos of piers in their area or via virtual reality, to demonstrate what a longer pier might look like on their property.
Look out of place/	Social Norms	• Highlight that other shoreline owners highly value the health of the Bay.

Moderate likelihood		• Create testimonials that communicate how other shoreline owners have overcome barriers and realized benefits of extending piers beyond SAV (e.g., ease of boating and swimming when the water beyond SAV is more accessible). This is linked to the messaging in the *Leave SAV Alone Strategy Table.* • Highlight well-known and well-respected residents in the area that already leave SAV alone through water-facing "lawn" signage (social diffusion). • This can be linked to the Bay Protector ambassadors referenced in the *Bay Protectors for Shoreline Management: Implementation Plan* as another social diffusion message that identified ambassadors can distribute through their social channels. The results suggest that those without armor, which is part of the criteria to be a Bay Protector ambassador, may be more likely to leave their SAV alone, given lower barriers and higher benefits. • Alternatively, this program can conduct work with local groups to identify members of the target audience (longer-term property owners in areas with SAV) that have already extended their pier, and approach them about their willingness to distribute the materials through their social channels.
Allow access to deeper water	Education/ Communication	• Communicate the benefits of having access to deeper water for the resident's use of their property and waterfront
Protecting the health of the Bay; Wildlife	Education/ Communication/ Cognitive Dissonance	• Use cognitive dissonance to motivate actions that are consistent with individual's values by reminding them of their values (protecting the Bay is very important) and speaking to what behaviors are consistent with those values (leaving SAV alone). • Respondents reported valuing the health of Bay as a general attitude. However, when asked if the health of the Bay was a benefit of SAV, it was not valued as highly. Outreach should connect extending a pier beyond SAV as a way to protect the Bay. • Provide credible, vivid information about how more SAV protects the Bay and brings wildlife to their property.

Outreach Approach

There are a variety of communication channels that are appropriate for this outreach, especially door-to-door (as possible with local COVID-19 restrictions). Based on results of other shoreline management work with the Chesapeake Bay Program, *Bay Protectors for Shoreline Management: Implementation Plan,* we recommend leveraging social networks when possible, such as visual signage that faces the water. A subsequent discussion of the survey results and strategy recommendations with Rachel Felver and Brooke Landry from the Chesapeake Bay Program resulted in the approach and next steps summarized below.

Audience

The survey results indicated that **long-term property owners would be the most likely to adopt behaviors that protect SAV** and therefore will be targeted first, if possible. Property owners who have existing piers that can be extended can be engaged once there is feedback and lessons learned from this initial program outreach phase.

Messengers

The key messenger for this program is the Chesapeake Bay Program; however, the Maryland Department of Natural Resources and the Virginia Institute of Marine Science can be promoted on additional outreach materials and through presentations, as appropriate.

Materials

This table displays the outreach materials developed for the program, along with their associated messages, channel, and use of social science tools.

Table 2: Materials Developed for the Outreach Program

Material	Message	Channel	Social Science Tools
Flyer-Poster	Leave SAV alone; Protect SAV to protect the Bay; and Protect SAV to protect wildlife.	Public places, community gatherings places, trailheads, park kiosks, events	Imagery to evoke emotion to protect; Education Social norms
Shoreline sign	Commit to leave SAV alone	Provided to property owners in-person by ambassadors.	Commitment Social diffusion Self-perception
Door Hanger Rip Card	Leave SAV alone; Correct misconceptions; Stated function of SAV; Active involvement in monitoring SAV; and Protect SAV to protect the Bay	Direct drop off at the doorstep of property owners by ambassadors.	Commitment Education Social norms
Commitment Card	Leave SAV alone	In-person by Ambassadors	Commitment Social norms

Messages by Material

Flyer-Poster

Two designs:

1: When Bay Grasses are Greener our Bay is Cleaner: Help Protect and Restore the Bay's Underwater Grasses

2: When Bay Grasses are Green, our Bay is Clean: Help Protect and Restore the Bay's Underwater Grasses

Shoreline Sign

Two designs and one message.

Chesapeake Bay: I Protect Bay Grass Beds

Door Hanger Rip Card

Side 1: When Bay Grasses are Green, our Bay is Clean

Chesapeake Bay is my home. I protect bay grasses because they:

- Provide food and habitat for wildlife;
- Absorb nutrient pollution and trap sediment;
- Help reduce erosion and protect shorelines; and
- Improve water clarity and increase oxygen.

Help protect Bay grasses and get involved with your community. Join your local watershed group's efforts to help monitor Bay grasses. Go to chesapeakebay.net for more information.

Side 2: THE CHESAPEAKE BAY IS PART OF MY COMMUNITY.

Bay grasses are a critical part of the Chesapeake Bay ecosystem. These grasses provide food and habitat for countless species and help keep the water clean. Your efforts today ensure a cleaner, greener, healthier Chesapeake Bay for years to come.

Ways to Help Restore and Preserve Bay Grasses:

- Let Bay grasses grow along your shoreline;
- Fertilize your lawn less, or use a Bay-friendly fertilizer;
- Follow posted speed limits and trim your boat's motor in shallow water; and
- Keep your shoreline as natural as possible.

Commitment Card

Two postcard style back designs:

1: When Bay Grasses are Greener our Bay is Cleaner: Help Protect and Restore the Bay's Underwater Grasses

2: When Bay Grasses are Green, our Bay is Clean: Help Protect and Restore the Bay's Underwater Grasses

One message on the back for the commitment:

Chesapeake Bay is my Community

I commit:

- To not removing my Bay grasses;
- To trim my motors in shallow waters;
- To fertilizing my lawn less or using Bay-friendly fertilizers; and
- To follow posted speed limits while boating.

Ambassadors

Ambassadors are community group members aligned with non-profit groups and shoreline property owners who commit to protecting SAV. Their role is to:

- Distribute door hangers;
- Distribute posters to appropriate community locations;
- Distribute shoreline property signs; and
- Gain commitments from shoreline property owners and post them in a public location.

Ambassador Script

A script for conducting outreach in-person to shoreline property owners can be found in Appendix D.

CBT Role

- Recruit community and non-profit groups to become ambassadors who deliver messages and materials, gain commitments; and
- Identify places to post the posters and commitments from shoreline property owners.

Considerations for Implementation

Roll Out

When deciding to roll out the program consider the different audiences throughout the Bay. Below are a few questions to discuss to guide a widespread roll out:

- Are there different areas that have lower penetration of the behaviors than other areas?
- How much staff time do your partners have to dedicate to the roll out?
- How much funding do you and your partners have to dedicate to the roll out?

Control Groups

Control groups are an important evaluation component. To test the program, if possible, use a control group to help you demonstrate that the program is having the desired effect. Below are a few questions to discuss about the need for control groups:

- Do you need to demonstrate that the program is working? (to management, grant funding sources, etc.)
- How are the populations of interest different? (i.e., income level, long-term residents versus newcomers). Make sure the control groups are representative of the target population.
- Can you do a phased roll out? You can use a small portion of the population as a control group, then after evaluation, roll out to that group.

Delivery Methods

In-person communication channels are the preferred method for this program; however, in-person could be at the property owner's doorstep or at a public even. Below are a few questions to discuss when deciding which method is appropriate for the area:

- Are there certain areas that need the program more than others? If so, focus resources on the in-person doorstep channel for those areas.

- Are there gated communities that would rather not be visited at the door? How can you reach these communities?
- Are the people delivering the materials representative of the neighborhoods they are visiting?

Publicity

Publicizing the program could potentially help notify residents of the ambassadors' presence in defined neighborhoods. Below are a few questions to discuss when considering publicizing the program:

- How would you publicize it?
- What would you tell residents to expect?
- If a resident wants materials, where would they get them?
- Would publicizing the program justify the staff resources required?

Evaluation

Evaluating your program allows you to make any necessary program adjustments. Ongoing evaluation can be measured using direct observation and interviews with shoreline property owners. Below are a few questions to discuss when determining how to evaluate the program:

- Are there ongoing monitoring surveys that can include questions about the program?
- Can property owners be included in the shoreline monitoring? They could be sent a periodic mailer that includes a stamped return postcard with a few key questions about the state of their SAV. They are providing ongoing data and increasing their self-perception of a person who protects the Bay.
- Are there ongoing community events that can include questions about the program? Like above, these questions would not be tied to participants but would gauge overall program awareness.

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Appendix A: *Submerged Aquatic Vegetation Review* Memo

Submerged Aquatic Vegetation Review

Purpose and Definition

The goal of this brief literature review is to lay the foundation for research on the barriers and benefits that individuals face to engaging in behaviors that protect submerged aquatic vegetation (SAV). SAV includes aquatic grasses and other flowering plants that root into the sediment of the Chesapeake Bay (Bay).[3] SAV is highly valuable habitat since it provides numerous important ecological functions that are difficult to replace, including shelter, food, and reproductive space for animals.[4] SAV also binds sediment together, adds oxygen to the water, absorbs nutrient pollution, and reduces erosion.[5] Approximately 20 SAV species exist in the Chesapeake Bay, based on the major salinity zones, and have different tolerances to light and sediment quality.[6] As part of the Chesapeake Bay Watershed Agreement, the Chesapeake Bay Program partners have committed to the goal of achieving and sustaining 185,000 acres of SAV in the Bay, with a target of 130,000 acres by 2025. In 2018, there were an estimated 91,559 acres of SAV in the Bay.[7]

Background

There are many ecosystem factors that affect the abundance of SAV in the Bay. Three of the most influential factors are: changes in watershed land use and increased shoreline development; climate change; and decreased water quality (nitrogen, phosphorus, sediment).[8] These factors will have long-term impacts on SAV in the Bay, from decreasing populations of SAV species that are less resilient to changes in temperature, storm frequency, and salinity, to declining viable areas for growth due to poor

[3] Chesapeake Environmental Communications. (2017). Submerged Aquatic Vegetation. *Retrieved from* http://www.chesapeakedata.com/changingchesapeake/

[4] NOAA Southeast Regional Office (2018) Why Is Submerged Aquatic Vegetation Designated As Essential Fish Habitat? *NOAA. Retrieved from www.fisheries.noaa.gov/content/why-submerged-aquatic-vegetation-designated-essential-fish-habitat*

[5] Chesapeake Bay Program. (2020) Underwater Grasses. Retrieved from: https://www.chesapeakebay.net/issues/bay_grasses

[6] NCCOS. (2016) Hardened Shorelines Associated with Seagrass Decline in Southern Chesapeake Bay. NOAA. *Retrieved from* https://coastalscience.noaa.gov/news/researchers-associate-hardened-shorelines-declines-seagrasses-southern-chesapeake-bay/; Dennison, W.C. ; Orth, R.J; Moore, K.A.; Stevenson, J.C.; Carter, V.; Kollar, S.; Bergstrom, P.W.; & Batiuk, R.A (1993). Assessing Water Quality with Submersed Aquatic Vegetation. *BioScience, 43*:2.pp. 86-94.

[7] Chesapeake Bay Program. (2020) Underwater Grasses. Retrieved from: https://www.chesapeakebay.net/issues/bay_grasses

[8] Chesapeake Environmental Communications. (2017). Submerged Aquatic Vegetation. *Retrieved from* http://www.chesapeakedata.com/changingchesapeake/

water quality and habitat reductions. These factors affect different SAV species in the Bay to varying degrees, with the previously mentioned effects related to human activities generally having the most significant impact.[9] However, while all three are critical factors to consider for achieving the goal of increased SAV quality and quantity, these factors are generally beyond the current scope of this project. This work seeks to change behavior that has a direct physical effect on SAV populations, as opposed to a secondary effect via improved water quality or reduced climate change impacts. There are numerous research efforts focused on behaviors that impact water quality and climate change. However, there is limited existing work exploring direct human effects on SAV. This work acknowledges that water quality, development, and climate change are critical factors of concern for SAV's future prosperity. However, the primary focus of this work is to prioritize and understand direct human impacts on SAV quality and quantity. The review does also look at some indirect effects on SAV through shoreline modification.

Direct Human Impacts on SAV

As human populations have grown in the Chesapeake Bay region, they have had an increasing negative impact on the shoreline and associated SAV populations. There are also two primary audiences who can have a direct negative impact on SAV populations – boaters and shoreline property owners.

Recreational and Commercial Boaters

When individuals and organizations operate boats in the Chesapeake Bay, the boats can cause significant damage to SAV. When commercial and recreational boats run aground while docking, scrape their boat along the bank, fail to follow speed limits and no-wake laws, or move carelessly through shallow waterways (such as by revving their motor), they can damage and even kill SAV.[10] For example, shellfish dredges and boat propellers can pull underwater grasses up from the bottom of rivers, streams, and the Bay, leaving visible marks across grass beds in shallow waters.[11] SAV can also get wrapped around propellers and cause damage to boats, leading to negative attitudes about SAV. Boaters present a challenge as it is difficult to enforce regulations on such a diverse and large population, and passing regulations may lack public support.[12] While recreational and commercial boaters are meaningful audiences that influence the health of SAV, there are already significant efforts to directly target these audiences. These efforts include state regulations and behavior change outreach from organizations such as the Ocean Foundation and ShoreRivers, with funding from the Chesapeake Bay Trust. Consequently, this project will focus on the ways that shoreline property owners affect SAV populations.

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[9] Patrick, C.J., Weller, D.E., Orth, R.J., Wilcox, D.J., & Hannam, M.P. (2017) Land Use and Salinity Drive Changes in SAV Abundance and Community Composition. *Estuaries and Coasts, 40:*2.

[10] Murphy, R., Valauri-Orton, A., & Hildt, A. (2018) Changing Boater Behavior: A Case Study in Using a Social Marketing Toolkit to Prevent SAV Damage. ShoreRivers and Ocean Foundation for Chesapeake Bay Trust. Retrieved from https://www.chesapeakebay.net/channel_files/27574/tof_shorerivers_cbt_workshop_presentation.pdf

[11] Chesapeake Bay Program. (2020) Underwater Grasses. Retrieved from: https://www.chesapeakebay.net/issues/bay_grasses

[12] Chesapeake Bay Program (U.S.). Living Resources Subcommittee. Submerged Aquatic Vegetation Workgroup. (1995). Guidance for Protecting Submerged Aquatic Vegetation in Chesapeake Bay from Physical Disruption.

The effectiveness of these efforts has not been evaluated within the scope of this work, but this project seeks to prioritize audiences and behaviors that have not already been addressed.

Shoreline Property Owners

Shoreline property owners across the Chesapeake Bay can have significant direct and indirect effects on SAV populations, including through hardening of shoreline, dock construction, and direct removal.

Shoreline Hardening

A common concern reported by many shoreline property owners in the Bay is reduced property size and harm to infrastructure resulting from shoreline erosion. There are several actions that a property owner can take to reduce shoreline erosion each having a unique impact on SAV populations. A common activity for reducing shoreline erosion is to construct armor to harden the shoreline. Shoreline hardening stabilizes coastal land and protects infrastructure through the construction of bulkheads, riprap, or other similar structures.[13] When shorelines are hardened, the SAV environment may be disrupted or destroyed due to changes in natural wave energies and sediment transport.[14] Comparisons of SAV beds show reduced coverage, diversity, species richness, and evenness in the distribution of SAV species in beds adjacent to hardened shorelines compared to natural shorelines.[15] SAV beds adjacent to hardened shorelines also have inhibited recovery times after storms.[16] As climate change leads to sea level rise and increased weather events, shoreline owners may increasingly seek to harden their property, potentially leading to further reductions in SAV populations.[17]

Removing Current Armoring. For properties with current armoring, they may be able to remove the current armoring, even if no further work is done. While armoring a few small sections of shoreline may have only small-scale adverse impacts, armoring larger areas of shoreline causes changes to occur to the coastal ecosystem and services they provided.[18] For example, installing bulkheads usually increases nearshore erosion, and can increase erosion on adjoining properties (Nutrient Subcommittee Sediment Workgroup's Tidal Sediment Task Force, 2005). Therefore, landowners can improve the health of the Bay by removing their property's armoring, if their property has low to moderate erosion potential. Property owners may be unnecessarily hardening their shoreline as they do not realize their shoreline does not need that level of erosion protection or believe their shoreline has unique characteristics that requires armor. In addition, they may need financial incentives to overcome the cost of removal.

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[13] NCCOS. (2016) Hardened Shorelines Associated with Seagrass Decline in Southern Chesapeake Bay. NOAA. https://coastalscience.noaa.gov/news/researchers-associate-hardened-shorelines-declines-seagrasses-southern-chesapeake-bay/

[14] Koch, E.W. (2001) Beyond light: physical, geological and geochemical parameters as possible submersed aquatic vegetation habitat requirements. Estuaries 24: 1–17.

[15] Landry, J.B. & Golden, R.R. (2018) In Situ Effects of Shoreline Type and Watershed Land Use on Submerged Aquatic Vegetation Habitat Quality in the Chesapeake and Mid-Atlantic Coastal Bays. *Estuaries and Coasts 41:*S101-S113.

[16] Ibid.

[17] Orth, R.J. et al, (2017). Submersed Aquatic Vegetation in Chesapeake Bay: Sentinel Species in a Changing World. *BioScience, 67*:8, Pg 698–712, https://doi.org/10.1093/biosci/bix058

[18] NOAA. (2015) Guidance for Considering the Use of Living Shorelines. Living Shorelines Workgroup. Retrieved from https://www.habitatblueprint.noaa.gov/wp-content/uploads/2018/01/NOAA-Guidance-for-Considering-the-Use-of-Living-Shorelines_2015.pdf

Shoreline property owners have reported that they have a desire to learn customized information about their shorelines, learn from other shoreline property owners, tend to make decisions about shoreline management after an erosion event, and want to do the right thing.[19]

Dock Construction

Single family docks increase water access for shoreline property owners. The increase of these docks is linked to increased development of the shoreline, a strong economy, the associated increase in discretionary spending, increased boat sales, and limited mooring and public docking facilities.[20] However, the presence of single-family docks off shoreline property has a significant negative impact on the availability of light for nearshore aquatic life, such as SAV.[21] The negative impacts of docks are numerous, ranging from habitat loss to water pollution to altered water flow, but the most critical impact for SAV is shading stress.[22] While the best action to protect SAV is to not install a dock, there are also a number of ways to design single family docks that help protect SAV health more than a traditional dock. This includes placing docks away from SAV beds, using grated decking, avoiding floating or covered docks, extending the dock to deeper water, minimizing the dock width, maximizing the dock height, and orienting the dock in a manner that decreases the area and time the space under the dock is shaded during the day (e.g., as close as possible to North-South). [23]

Laws Covering Dock Construction

In Maryland and Virginia, permits for single-family docks require submission of information such as what land changes must occur, materials used, and other relevant information. The Maryland Department of Environment cannot issue a license for piers, decks, walkways, or related structures if it would adversely affect SAV or if the structure would be located over SAV.[24] Similarly Virginia requires SAV be considered

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[19] Colehour + Cohen, Applied Research Northwest, Social Marketing Services, Futurewise and Coastal Geologic Services (2014) Shore Friendly Final Report. WA Department of Fish and Wildlife and WA State Department of Natural Resources

[20] Kelty, R. & Bliven, S. (2003) *Environmental and Aesthetic Impacts of Small Docks and Piers: Workshop Report: Developing a Science-Based Decision Support Tool for Small Dock Management, Phase 1: Status of the Science.* NOAA Coastal Ocean Program, Decision Analysis Series Number 22. NOAA Coastal Ocean Program, 1305 East-West Highway, Silver Spring, MD, 20910. Copies of the report may be downloaded from http://coastalscience.noaa.gov/documents/dockpier.pdf

[21] Beal, J.L., & Schmit, B.S. (2000) The effects of dock height on light irradiance (PAR) and seagrass (Halodule wrightii and Syringodium filliforme) cover, pp. 49-63. In: *S.A. Bortone (ed) Seagrasses: Monitoring, Ecology, Physiology, and Management*. Boca Raton, Florida. CRC Press.

[22] Kelty, R. & Bliven, S. (2003) *Environmental and Aesthetic Impacts of Small Docks and Piers: Workshop Report: Developing a Science-Based Decision Support Tool for Small Dock Management, Phase 1: Status of the Science.* NOAA Coastal Ocean Program, Decision Analysis Series Number 22. NOAA Coastal Ocean Program, 1305 East-West Highway, Silver Spring, MD, 20910. Copies of the report may be downloaded from http://coastalscience.noaa.gov/documents/dockpier.pdf

[23] Fresh, K.L., Wyllie-Echeverria, T., Wyllie-Echeverria, S. & Williams, B.W. (2006) Using light permeable grating to mitigate impacts of residential floats on eelgrass *Zostera marina* L. in Puget Sound, Washington. *Ecological Engineering 28*:354-362.; Landry, J.B., Kenworthy, W. J., & Di Carlo, G. (2008) The Effects of Docks on Seagrasses, With Particular Emphasis on the Threatened Seagrass, *Halophila johnsonii.* Center for Coastal Fisheries and Habitat Research, *Protected Resources Division, NMFS*

[24] Chesapeake Legal Alliance (2019). Existing Chesapeake Bay Watershed Statutes and Regulations Affecting Submerged Aquatic Vegetation. https://www.chesapeakelegal.org/wp-

as a factor for project approval.[25] While there are ways around both of these laws, the current permit system seeks to protect SAV from dock construction.

Direct Removal of SAV

Shoreline property owners may also have direct and specific concerns about SAV itself, and ultimately seek to remove it. Property owners cite multiple reasons for seeking to remove SAV from shoreline property including: navigational pathways for boats; swimming (either for perceived entanglement risk or for discomfort with plants touching skin); hydrodynamics (impaired water flow); fishing; property value; and aesthetic preferences.[26] SAV is more likely to be considered a nuisance if it has a high growth rate, tall height, high coverage, high biomass, and/or is a monoculture, with height and coverage most highly related to a negative perception. [27] Other cited reasons for a negative attitude toward SAV included perceived health risks and unpleasant odors.[28] However, the presence of SAV is positively linked to many types of recreational activities, such as fishing, hunting, and bird watching, as it provides food, shelter, and habitat for species. [29]

Types of Direct Removal

There are two common methods property owners may use to remove SAV: (1) by hand or (2) with larger equipment/machinery. Anecdotal evidence from members of the SAV goal implementation team also suggests that herbicides, which are widely available for use in removing SAV in lakes or ponds, may also be used in some capacity in the Bay.

Hand Removal. Hand removal involves removing the entire plant by hand or with hand tools such as by pulling, cutting, or raking. These methods are labor-intensive and would typically be employed in a smaller context. Property owners may use this method on their own, or by hiring a company. A company may utilize powered- or non-powered hand tools specifically designed to remove SAV. [30]

Equipment/Machine Removal. Mechanical harvesters, weed rollers, and rotovators are equipment designed to remove aquatic plants at a much larger scale. They can cut out wide sections of SAV and cause significant disturbance to sediments, as well as to the animals that live in SAV. These activities would typically be taken on a residential property by a professional company, not by the property owner themselves. Similarly, ground-mowing equipment is available to mow wetland and shoreline vegetation,

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content/uploads/2019/07/Existing-Chesapeake-Bay-Watershed-Statutes-and-Regulations-Affecting-SAV-1.pdf

[25] Ibid; K. Moore, personal communication, May 1 2020.

[26] Verhofstad, M.J.J.M., & Bakker, E.S. (2019) Classifying nuisance submerged vegetation depending on ecosystem services. Limnology 20:55–68.

[27] Verhofstad, M.J.J.M., & Bakker, E.S. (2019) Classifying nuisance submerged vegetation depending on ecosystem services. Limnology 20:55–68.

[28] Dodds WK, Bouska WW, Eitzmann JL, Pilger TJ, Pitts KL, Riley AJ, Schloesser JT, Thornbrugh DJ (2009) Eutrophication of US freshwaters: analysis of potential economic damages. *EnvironSci Technol 43*:12–19

[29] Verhofstad, M.J.J.M., & Bakker, E.S. (2019) Classifying nuisance submerged vegetation depending on ecosystem services. Limnology 20:55–68.

[30] Aquatic Ecosystem Restoration Foundation (2003). Best Management Practices Handbook for Aquatic Plant Management in Support of Fish and Wildlife Habitat

which does not remove the plant but does significantly damage the habitat. Mowing or harvesting would also typically be conducted by a professional company.[31]

Laws Covering Physical Removal of SAV

In Maryland, the Department of Natural Resources (DNR) requires an individual who wishes to remove SAV on their property to submit a permit application describing why the removal is necessary, the proposed method of removal, a site plan, and the amount of SAV to be removed. The statute excludes individuals harvesting fish, shellfish, or crabs. It also excludes individuals, organizations, and government agencies involved in the construction, operation, or maintenance of agricultural drainage channels. Furthermore, the statute permits individuals to remove a 60-foot strip of SAV for navigation/boating access purposes without prior DNR approval. Virginia and Washington, D.C. mandate obtaining a permit for SAV removal with similar policies and have policies about removal for navigable waters. Virginia has more specifics on the historical, environmental, and scientific context that allow for more policy guidance.[32] For our foundational research, it is important to keep in mind that the questionable legality of some SAV removal behaviors may influence survey respondents.

Conclusions

This project will explore the reasons that property owners remove SAV and what may motivate them to leave SAV in place, including recreational activities, aesthetics, shoreline use, and property value. There are many factors that influence SAV health and abundance, given that it exists within a complex ecosystem. However, reducing direct removal of SAV is a meaningful pathway to increased health and quantity of SAV, particularly as populations increase in areas where homeowners may be unfamiliar with it. Given the information in this literature review, we recommend that our foundational research focus on the following behaviors:

Behavior List

Behaviors to Encourage

- Leave SAV in place
- Leave shoreline unarmored
- Remove bulkheads/riprap
- Use SAV friendly dock design

[31] Aquatic Ecosystem Restoration Foundation (2003). Best Management Practices Handbook for Aquatic Plant Management in Support of Fish and Wildlife Habitat

[32] Chesapeake Legal Alliance (2019). Existing Chesapeake Bay Watershed Statutes and Regulations Affecting Submerged Aquatic Vegetation. https://www.chesapeakelegal.org/wp-content/uploads/2019/07/Existing-Chesapeake-Bay-Watershed-Statutes-and-Regulations-Affecting-SAV-1.pdf

Behaviors to Discourage

- Physically hand remove SAV from residential property
- Hire a company to hand remove SAV from residential property
- Hire a company to use equipment to remove SAV from residential property
- Harden shoreline with riprap or bulkhead
- Install additional single-family docks

An additional behavior of interest may be the use of herbicides to remove SAV – however, it is unclear at this time how frequent this behavior is, as there is no real data on this behavior. In addition, the questionable legality of such behaviors may present a challenge for research. Given advisement from the steering committee, this action will be included in a limited fashion as possible.

Next Steps

Based on the information collected in this document, the next step of this project will be to conduct research with shoreline property owners on the barriers and benefits they face to increasing the behaviors we seek to encourage and decreasing the behaviors we seek to discourage. We will also assess the current penetration (e.g., how many shoreline property owners are taking these actions) and probability (e.g., how willing are property owners to take these actions?) of those behaviors. Finally, we will collect information on the relevant attitudes and knowledge property owners have about SAV, as well as their communication preferences.

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Appendix B: Barrier and Benefit Survey

Dear Resident,

This survey was sent to you from the Chesapeake Bay Program and the Chesapeake Bay Trust. The information we collect will assist us in developing outreach materials to help residents protect their property's shoreline and the water alongside it for years to come. We would appreciate it if you would complete this short survey. It should take no more than 10 minutes.

Your household is one of only a select number of Maryland households being asked to complete this important survey, so your participation is very important to us.

Please return your completed survey by using the postage-paid envelope provided. If for some reason you prefer not to respond, kindly return the blank survey and we will remove you from future mailings regarding this survey.

If you have any questions, please contact Brooke Landry at brooke.landry@maryland.gov. Thank you for your time.

Sincerely,

Brooke Landry
Chair, Chesapeake Bay Program's SAV Workgroup

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Section A. This survey is about the shoreline and property where this survey was received. The shoreline is the area where your land meets the water. **If your property does not have a shoreline, please check this box and return the survey. ☐ No Shoreline**

1. Do you own or rent your shoreline property? ☐ Own, for _____ years ☐ Rent, for _____ years

2. What structures do you have on the property where this survey was received? Please check all that apply.

☐ House (primary residence) ☐ House (vacation/rental property) ☐ Other type of building

3. Do you use your waterfront for any of the following? Please check all that apply.

☐ Swimming
☐ Launching kayak/canoe/paddle board
☐ Fishing
☐ Power boating
☐ Crabbing
☐ Sailing
☐ Bird watching/photography
☐ Other, please specify: _____

Section B. This section is about underwater grasses, also known as seagrasses or submerged aquatic vegetation (SAV). In the Bay, there are many species of underwater grasses, including ones that look similar to field grass, with long, tape-like stems, ones that look more like herbs with short leaves growing right from the stem, and even those that grow in a clumping, bushy manner resembling shrubbery. They grow under the water, sometimes reaching the water's surface, and are many shades of green.
For this survey, think of the underwater grasses that may or may not be growing along your property's shoreline.

4. Since you have lived at your waterfront property, have you seen:

- ☐ An increase in underwater grasses
- ☐ A decrease in underwater grasses
- ☐ No change in underwater grasses

5. When you look at the water along your shoreline, how much of the water has underwater grasses, also known as submerged aquatic vegetation or SAV?

- ☐ All of it
- ☐ Most of it
- ☐ Some of it
- ☐ Very little
- ☐ None **[SKIP to Question 15 on the back]**

6. Have you ever:

a. Considered restoring or protecting the underwater grasses along your shoreline?

- ☐ Yes, please answer Question **6b**. → →
- ☐ No, please go to Question **7a**. ↓ ↓

6b. If yes, what is the top reason you have considered restoring or protecting your underwater grasses? Please choose one.

- ☐ Easier fishing and crabbing
- ☐ More grasses would look better
- ☐ Bring more wildlife to my property
- ☐ Improve the health of the Chesapeake Bay
- ☐ Natural shorelines and water are important to me
- ☐ Other:

7. Have you ever:

a. Considered removing any of the underwater grasses along your shoreline?

- ☐ Yes, please answer Question **7b**. → →
- ☐ No, please go to Question **8** on the next page

7b. If yes, what is the top reason you have considered removing your underwater grasses? Please choose one.

- ☐ Easier for swimming.
- ☐ Keep grasses from washing up on my shoreline.
- ☐ Keep grasses off my boat.
- ☐ Fewer grasses would look better.
- ☐ Other:

8. Have you ever heard of anyone in your community restoring or protecting their underwater grasses?

☐ Yes ☐ No

9. Have you ever heard of anyone in your community removing their underwater grasses?

☐ Yes ☐ No

10. Using a scale from 0 (*strongly disagree*) to 10 (*strongly agree*) please rate your agreement with the following statements.

Letting underwater grasses along my shoreline grow undisturbed would…	Strongly Disagree										Strongly Agree
a. Increase my property value.	0	1	2	3	4	5	6	7	8	9	10

b.	Be healthy for the Chesapeake Bay.	0	1	2	3	4	5	6	7	8	9	10
c.	Bring more wildlife to my property.	0	1	2	3	4	5	6	7	8	9	10
d.	Make my shoreline less accessible.	0	1	2	3	4	5	6	7	8	9	10
e.	Harm my boat.	0	1	2	3	4	5	6	7	8	9	10
f.	Make it harder for my household to swim.	0	1	2	3	4	5	6	7	8	9	10
g.	Make fishing and crabbing easier for my household.	0	1	2	3	4	5	6	7	8	9	10
h.	Protect my shoreline from erosion.	0	1	2	3	4	5	6	7	8	9	10
i.	Make it hard for my household to boat.	0	1	2	3	4	5	6	7	8	9	10
j.	Have an unpleasant smell.	0	1	2	3	4	5	6	7	8	9	10
k.	Look attractive.	0	1	2	3	4	5	6	7	8	9	10
l.	Other, please specify:											

11. To your knowledge, is a permit required for the removal of underwater grasses along your shoreline?

☐ Yes ☐ In some situations ☐ No

Section C. This section is about overwater structures, such as fixed or floating piers, wharfs, docks, walkways, or other similar water-dependent structures constructed on or over tidal wetlands for the purpose of gaining access to the navigable waters.
For this survey, we will refer to all "overwater structures" as "piers."

12. Does your property have a pier?

☐ Yes ☐ No, but we are planning on building one ☐ No, and we are not planning to build one **[Skip to Question 15, over]**

13. Using a scale from 0 (*not at all likely*) to 10 (*extremely likely*), when planning a new pier or renovating an existing pier, how likely are you to use a design that places or extends the end of the pier beyond where underwater grasses grow?

Not at all likely — Extremely likely

0 1 2 3 4 5 6 7 8 9 10

☐ My pier already extends beyond grasses

14. Using a scale from 0 (*strongly disagree*) to 10 (*strongly agree*), please rate your agreement with the following statements.

Placing the end of the pier beyond where the underwater grasses grow would…	Strongly Disagree										Strongly Agree
a. Make my pier less accessible.	0	1	2	3	4	5	6	7	8	9	10
b. Be expensive.	0	1	2	3	4	5	6	7	8	9	10
c. Protect underwater grasses.	0	1	2	3	4	5	6	7	8	9	10
d. Protect fish and crab habitats.	0	1	2	3	4	5	6	7	8	9	10
e. Allow me to access deeper water.	0	1	2	3	4	5	6	7	8	9	10
f. Not make sense for my property.	0	1	2	3	4	5	6	7	8	9	10
g. Look out-of-place compared to neighbors' piers.	0	1	2	3	4	5	6	7	8	9	10
h. Protect the health of the Chesapeake Bay.	0	1	2	3	4	5	6	7	8	9	10
i. Other, please specify:											

Section D. These next statements are about attitudes and opinions you have about your waterfront property.

15. Using a scale from 0 (*strongly disagree*) to 10 (*strongly agree*) please rate your agreement with each of the following statements.

	Strongly Disagree										Strongly Agree
a. I am concerned about my shoreline eroding.	0	1	2	3	4	5	6	7	8	9	10
b. My ability to directly access my shoreline is important to me.	0	1	2	3	4	5	6	7	8	9	10

c. I want my shoreline to look natural.	0	1	2	3	4	5	6	7	8	9	10
d. I know all the options to maintain my shoreline.	0	1	2	3	4	5	6	7	8	9	10
e. I enjoy recreational water activities (boating, kayaking, fishing, etc.).	0	1	2	3	4	5	6	7	8	9	10
f. Protecting the health of the Chesapeake Bay is important to me.	0	1	2	3	4	5	6	7	8	9	10
g. I like how my shoreline looks.	0	1	2	3	4	5	6	7	8	9	10
h. I have the right to modify my shoreline as I want.	0	1	2	3	4	5	6	7	8	9	10
i. I wish I had more fish and wildlife near my shoreline.	0	1	2	3	4	5	6	7	8	9	10

Section E. The next question is about your communication preferences.

16. When you have questions about managing your shoreline, where do you look for information? Please check all that apply.

- ☐ Contractor
- ☐ Friends and family
- ☐ Neighbors
- ☐ University
- ☐ Non-profit or local watershed organization
- ☐ County or city government
- ☐ Maryland Department of Natural Resources
- ☐ Maryland Department of the Environment
- ☐ Media (newspapers, etc.)
- ☐ Web Search Engine (Google, etc.)
- ☐ Other, please specify: _____

Section F. Other Household Information. These questions are used for classification purposes only.

17. Does your community have a community pier, such as one managed by a HOA?

☐ Yes ☐ No ☐ I do not know

18. Do you have a boat?

☐ Yes, docked in the water along my property ☐ Yes, docked somewhere other than the water along to my property ☐ No

19. Does your waterfront property have any of the following shoreline structures? Please check all that apply.

☐ Bulkhead ☐ Riprap ☐ Living shoreline ☐ Other shoreline structure: _____

20. In what year were you born? _____

21. Including yourself, how many people live in your household? _____ How many are children under 18? _____

22. If you have any other comments about underwater grasses, please write them below.

Thank you for your participation!

Appendix C: Survey Comments

Q3: Do you use your waterfront for any of the following? Other, please specify:
Butterfly garden
Commercial crabbing for 36 years
Community beach, launching (if annual fee paid)
Dog-walking
Ice skating
Invasive hydrylla ruined the water. Used to have boats, jet skis, kayaks.
Jet skiing
Jet skis.
Kayaking.
Oyster gardening
Paddle boarding, relaxing, enjoying view.
Relaxing on the beach.
Scenery
Sitting next to the water
To enjoy the views
Unable to access shoreline directly due to invasive vegetation and steep drop off.
Wacky, fun stuff.
Water skiing
We installed a "living shoreline" to enjoy SAV.

Q6b: If yes, what is the top reason you have considered restoring or protecting your underwater grasses? Other, please specify.
It's a vital nursery to many different species.
To prevent shoreline erosion.

Q7b: If yes, what is the top reason you have considered removing your underwater grasses? Other, please specify.
Allow trash to not collect at low tide.
Can't get boat out.
Clogs up jet ski.
Density of grasses are excessive. I won't step in the water along the shoreline because of how thick the grasses are.
Fishing
Grasses get into jet ski pumps.
Harbor snake head fish - not good!
In 2016 there was an abundance of grass. I pulled out some for swimming but it appeared to be Milfoil.
Invasive algae blooms.
It gets in the prop of our power boat.
Jet ski clogs up.
Keep grasses out of boad motor and jet skis.
Less algae blooms, easier fishing
Reduce algae bloom and smell.
So dense it completely covers surface of the water.
They smell.
Trash collects in it.
Trash gets stuck in the grasses. Over-run with some grasses, some are beautiful.

Q10: Letting underwater grasses along my shoreline grow undisturbed would… (Other)
Bad for prop and jet skis.
Encourage underwater life
Make the water clearer
More seaweed results in clearer water. In 2016 you could see to the bottom and see fish swimming.

My jet ski sucked grass and is now broken.

Reduce the number of mosquitoes

The algae floats on top of grasses and is very unsightly.

The debris that it collects is disgusting and an eyesore.

The Milfoil is so thick and ends ups giving us fish kills with low oxygen.

Water clarity is desirable. SAV's improve water clarity immensely.

Q14: Placing the end of the pier beyond where the underwater grasses grow would… (Other)

Allow better use of boat lifts at low tide.

Grasses collect algae on top.

Improve my boating.

It is narrow, don't think I would be allowed to extend.

Our entire cove is shallow and grassed in; therefore, there is no possibility of building a pier beyond the grasses.

The grass will grow around the pier and rocks. It's the re-growth grass. As long as the Bay is healthy it will grow.

Q22: If you have any other comments about underwater grasses, please write them below.

1997 there was no grass, 2020 everywhere you look is grass.

A much anticipated dredging project was slated for Bird River. Included in the project were many spurs. Bird River is extremely silted due to sand and gravel strip mining which has been on-going for a very long time. The project has been delayed and all the spurs have been eliminated due to a new requirement that SAV's destroyed in spurs must be mitigated at a 4 to 1 ratio. This is not at all fair to all those who need spurs and made decisions based on getting spurs. Why dredge if you can't get to the channel? SAV's will be destroyed by folks prop dredging to the channel! *(contact information removed)*

Agree they indicate a healthy bay, but this year are totally out of control and interfere with swimming, kayaking, jet skiing, and like I said, the collection of debris from storms is unacceptable.

Can I use something to remove a portion of the grass? It is choking out everything. If yes, what? *(contact information removed)*

Concerned over invasive underwater grasses choking Bird River. Also, underwater grasses making it impossible to swim at Maxwell Point.

Garbage gets trapped. It smells, it burned up my jet ski motor. Friends with boats can no longer come by water. Fish get trapped in it and die. Get rid of it! PLEASE!

Grass in Middle River was extremely thick 3 or 4 years ago. Last year there was very little, and not much this year (not even milfoil). The water is no longer clear and very few migratory ducks stopped here this year. Ten years ago we had large flocks of many different ducks. However, oddly enough, there are more fish, and in the past couple weeks, crabs!

Grasses came back a few years ago then disappeared. In 1950's much grass with minnows, crab, fish. Now water dead, too many people pouring chemicals on lawns, taking trees down. Water clear in winter, cloudy in summer - too many boats going too fast.

Have all seaweed - it effects my boating!

How do we get grasses? We do have clams. How can we help cleanup the Bay?

Hydrilla gets really bad July/August where we often can't use or safely get our jet skis out. We have a boat we can't use because of low tide. We were promised dredging a year ago and the low water lever exacerbates the hydrilla. We can fix the issue with hydrilla by dredging!!

I acknowledge that grasses place restrictions on use of waterways but I appreciate how much they help with water quality of the bay, how they improve the overall habitat and in turn draw more wildlife to the area.

I am very pro education about environmental issues, however, I am strongly against any more legislation that will limit and/or penalize homeowners when they try to use the water front property they pay such a great price to own. I personally think the grasses that took over our pond last summer were unsightly, but I appreciate the good they do for the health of the environment.

I believe the grass is good for the water. Only concern is that it grows to top of water and collects algae. If you trim it below water it seems to do a lot better. It doesn't choke out the area and fish love it.

I don't know if the grass is good or bad for environment/water. It did ruin my jet ski and wrapped around boat propeller. I would like some grass removed. It also smells bad.

I don't see a lot of underwater grasses. I wonder about vegetation that would help at the end of my property where water goes over the bulkhead.

I have always thought there are good and bad grasses. Not sure which is which or if this is true.

I live on the main part of Middle River. In 2016 a pontoon boat came several times and cut all the seaweed from the beach out at my neighbor's home. Living right next door I can promise you that these grasses were not affecting my neighbor's boating. He has many guests all summer and does not want them to have to swim in seaweed. My understanding was that companies like "Seaweed Solutions" could only remove grasses from the end of your pier out to an area where grasses would not impede boating. I guarantee you they are breaking the law and should be investigated. I've seen so many barges of seaweed being carried to Chesapeake Marine to haul away.

I never had grasses until the last couple of years. This year it is so bad, I can't even get my boat in and out without issues. Is there a way to keep the seaweed from getting so dense?

I sold both of my jet skis due to grasses. Never had a problem until 3-4 years ago. However, the grasses make the water clearer.

I support growth of underwater grasses, much of what is there now though are invasive species (hydrilla) so plans on how to support more natural species growth would be beneficial.

I want to support the bay and would like to know how to promote "good" grass.

I would like more info on introducing natural grass to my shoreline.

I would like to restore and replant the grasses at my home! We had dense beds of sea grasses four years ago and they are mostly gone now. Please contact me with info about how I can replant. *(Contact information removed)*

I would like to understand the connection between the SAVs and the algae that forms on the top - it only forms where there are some grasses and not in deeper channel area - very unsightly and smelly and a pain to get rid of when it dies back as big [?] on the shoreline in the fall.

I'd like to know more about the grasses, if they are native or invasive and what to look for.

If MDNR would dredge our creek it would be deeper. The foot of sludge or muck would wash into the dredged area and more grasses would grow, but every year less and less crabs, and grasses grow.

In the early 70's when we purchased this property there were grasses growing along out shoreline. Several years later they began to vanish - now there are none.

Invasive grasses are no good!

Invasive Milfoil has been getting worse every year. I realize SAV's are important but not when we have one overtaking and outcompeting other species. When they die and use up all the oxygen, they die off along with the fish and you can smell it from a far distance. Milfoil is lowering our SAV diversity.

I've lived on the Bush River and have seen considerable improvement in SAV's in the river, in particular the past few years. I am planning on riprapping a 100' section in front of my house that continues to erode into the Bush River. However, regulations, permits, etc. are time consuming, complicated, bureaucratically a mess, and expensive so I'm not sure when I will address.

MDE would not permit a bulkhead the full length of my property and now my shoreline is eroding. Grasses between mine and neighboring piers have increased dramatically over the past few years.

My neighbor's waterfront has never had any bulkhead or riprap securing their property/shoreline. Is there any law or agency that would require them to do so?

My waterfront is very shallow and is overrun with underwater grass. The grass extends approximately 190 ft. from the shoreline.

Not very pleasant to swim or stand in.

Only that I was under the assumption that when the underwater grass get out of control it is due to fertilizer runoff from surrounding communities.

Q16: Didn't know these [MD DNR, MD Dept of the Environment] existed.

Sadly, we know very little about the grasses. Perhaps an educational program should be considered.

Since there are both good and bad grasses, I'm not sure which the survey refers to. Good, of course, is healthy for all.

Thank you! If looking at our property for survey/research, please contact us: *(Contact information removed)*

Thanks for sending this out to us!

The county has given too many building permits over the years. Building and nature do not agree. We've lived here since 1966, had a lot of seagrasses - all gone!

The grass was extreme this year. Never seen it like that before. Don't know if good or bad.

The proliferation of the invasive hydrilla grasses is destroying the shoreline along my property. Swimming is not an option anymore, fishing and crabbing are difficult and getting by boat from my pier to deeper water is a problem. Please refer to the attached correspondence with Baltimore County government for a full explanation or contact me at *(Contact information removed)* if you wish to discuss.

The underwater grasses in our cove seem to retain algae. This is what is visible from our house and unsightly and degfinitely reduces our property value.

There had been an increase in SAV in the past 5 years, however this year there is very little.

There has been an enormous growth of new underwater grasses this year in my cove. I have never seen this much growth before.

They allow unwanted trash to collect at lower tides and clog boaters thru-hulls.

They have been coming back!

They should never allow people to remove grass at all from slips around pier, etc. I told my neighbor if in the spring you want to remove the grass or limit growth throw cracked corn in the slip. Carp will feed on the cracked corn and in the process, root up the grass naturally. The grass came back in 2015, 2016, 2017, and 2018 like I remember in the early 1960's. I thought I would never see tht again in my lifetime, but I did. Sincerely, *(Contact information removed)*

They vary year to year - some years none, some it's so thick it stalls a small boat.

Underwater grass was very common and thick in 2014. Over the last 6 years it has become less dense, and is more useable to fish and crab population to the extent that 100' out from shoreline, completely acceptable in its present state of density.

Underwater grasses are bad in the cove I live in as it makes boating and swimming very unpleasant and damages engines on boats and smells. The runoff on Baltimore County rightaways in our tiny cove is very bad and filling in our cove where our channel has become more shallow over the years and killed the grasses. Dredging our cove was omitted when they dredged Middle River several years ago. No attempt is being made by Baltimore County to top the runoff on the two rightaways on our cove and we residents are the ones putting up with this, not only for shallow water but also polluting the rivers and bay. Concerned citizen

We are happy with the grasses. However, in August when they start to die they smell and can get in the boat motor. We had a lift installed so that should not be an issue.

We are very concerned about wave erosion and damage to bulkhead and boat from motor boats going in and out of Middle River.

We don't mind the grasses, what we really don't like are the algae. When we had a lot of grass, toward the end of the season we would see algae. We don't know where the grass went this year.

We have always had the tall, beautiful grasses but now we have the invasive underwater grasses that are taking over. You can't even see the water anymore near our bulkhead. Feel free to call me or stop by to see how bad it has gotten. *(Contact information removed)*

We have definitely noticed an increase this year, especially along the eddy near our creek mouth. We have been contemplating asking about returning the creek to its natural state for the Bay conservation as we sit on 11 acres with 1000 ft. of waterfront.

We have seen more turtles and eagles this year than in previous years. In 25 years, we have seen the osprey population increase dramatically, as well as snakes, lizards, frogs, and other birds (seagulls, blue jays, cardinals).

We just replaced our bulkhead and stone revetment with a living shoreline.

We live in a condo. The grass grows in June and takes over the shoreline from the bulkhead to about 20-30 feet out. While this doesn't affect me personally, I see boats have trouble with seaweed. The owners of the marina are planning to dredge next to our building.

We live on a small creek just off Middle River. We have seen many changes in the amount of SAV over the years. We answered the questions to reflect how things are in the present.

We would like more info on the kind of grasses that currently exist in our water - how to maintain them, promote more growth, while protecting existing grasses. How to ID the grasses so we can promote growth of native grasses. Can we plant native grasses? We are looking into the Gunpowder Valley Conservancy raingardens and micro bio-retention gardens. They don't have funds to build on our property. Are there other organizations that do? We'd like to reduce/eliminate rainwater runoff from the street and other impervious surfaces. I heard about a citizen scientist program where we could monitor our water, collect data, and report it. I have not been able to find any info on the program. Would like more info. (contact info removed)

We would need to work with the City of Havre de Grace and our neighbors if bulkhead were to be converted to a living shoreline. We would seriously consider such a project.

Wife doesn't like them, I don't mind them. Not sure why they are back - may be due to power plant that closed.

Would appreciate any assistance the Trust could give us to stop erosion and continue to enhance our natural shoreline.

Appendix D: Ambassador Script for Outreach

Hello, my name is_____.

I am visiting your home on behalf of [GROUP AFFILIATION or AS YOUR NEIGHBOR]. I am here to give you some information about the simple ways many of your neighbors in this community are protecting the Bay.

[HAND OVER FLYER OR DOOR HANGER]

You probably know that your bay grasses provide food and habitat for wildlife, but did you also know that the grasses absorb nutrient pollution and trap sediment? They also protect your shoreline by reducing erosion, improving water clarity, and increasing oxygen.

To protect your shoreline and those of your neighbors from erosion, we are asking residents to leave their bay grasses alone. Let them be, let them grow. While the sea grasses are protecting your shoreline from erosion, they are also providing nursery habitat to young fishes and water birds.

[SHOW SHORELINE SIGN – APPROPRIATE FOR DOORSTEP]

Oh, you are already doing this, great! To show your commitment to leaving your bay grasses alone, we are asking residents to display this sign along their shoreline. This will show your neighbors and those who move past your beautiful shoreline that you are actively protecting the Bay.

Can I count on you to display this sign? Thank you, if you like, I can help you place it now.

[HAND OVER COMMITMENT CARD – APPROPRIATE FOR EVENTS AND DOORSTEP IF YOU HAVE A DESIGNATED PLACE FOR DISPLAY]

Oh, you are already doing this, great! To show your commitment to leaving your bay grasses alone, we are asking residents to sign this card. It states, [READ ALOUD]. The cards are being displayed alongside a beautiful poster of the Bay at [PLACE]. Together, this will show your neighbors and those in the greater Bay community that you are actively protecting the Bay.

Will you sign this card to commit to leaving your bay grasses alone?

Thank you, here is another one for you to keep. These cards are beautiful and are a reminder of your commitment.

As I mentioned, the cards are displayed at [PLACE]. Please come see the display and tell your neighbors about your commitment to protect the Bay.

Additional fallback statements:

Boating – Best practices for boating include raising a boat's motor to avoid cutting SAV and not mooring a boat where it would settle on the bottom during low tides. Your bay grasses have a baffling effect on wakes even in low energy or sheltered shorelines. Jet skis are a big contributor to wakes and bay grasses could mean in less opposition from your neighbors to jet ski use.

Aesthetics – [INSERT SAV SPECIES SPECIF INFORMATION, AS APPROPRIATE FOR THE AREA] Your sea grasses while they may not look attractive to you, are quite effective at reducing wave energy along the shoreline.

Algae – The algae are along your shoreline because of excess nutrients from runoff. The presence of algae may be a good thing as they are sequestering and storing nutrients which otherwise might produce toxic phytoplankton blooms.

Resident wants more information:
The Chesapeake Bay Trust and [NON-PROFIT] have a lot of information about bay grasses and ways to boat and swim even in the thicker grass areas. You can contact them or find out more at [SHOW CONTACT INFORMATION ON THE COMMITMENT CARD OR DOOR HANGER].

Thank you for your time, have a good day.

Report for CBT2 Part 1 – Behavior Training and Consultations

Chesapeake Bay Program

action RESEARCH

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Submitted: Mar 3, 2020

Table of Contents

1: Project Goals and Background

The goal of this work is to use training and webinars to increase the use of community-based social marketing and social science research to change individual behaviors to achieve environmental outcomes across the Chesapeake Bay Watershed. While technology and policy can and do play an important part of achieving these environmental outcomes, motivating individual behavior change also plays a key role, from increasing adoption of new technology to reducing the impact of water runoff from an individual's property. To achieve this goal, we conducted a behavior change training, follow up webinars, and four consultations with workgroups that had specific behavioral goals.

Community-Based Social Marketing

CBSM has emerged as an effective alternative to traditional education campaigns (McKenzie-Mohr, 1996; 1999; 2011; McKenzie-Mohr, Lee, Schultz, & Kotler, 2011; Schultz & Tabanico, 2007; Tabanico & Schultz, 2018). CBSM is based upon research in the social sciences that demonstrates that behavior change is often most effectively achieved through initiatives delivered at the community level that focus on removing barriers to an activity while simultaneously enhancing the activity's benefits. CBSM brings together knowledge from the field of social marketing with a variety of behavior change "tools" drawn from social psychology, environmental psychology, and other social sciences. CBSM uses a five-step process to foster behavior change. These five steps are:

1. Selecting which behaviors to target;
2. Identifying the barriers and benefits to the selected behavior(s);
3. Developing strategies that reduce the barriers to the behavior(s) to be promoted, while simultaneously enhancing the benefits;
4. Piloting the strategies and determining which are most cost-effective; and
5. Broadly implementing the most cost-effective strategies and conducting ongoing evaluation.

2: CBSM Training

The training was conducted on October 31st, 2019, from 8:45 to 4:30pm, at the Chesapeake Bay Foundation headquarters, the Philip Merrill Environmental Center, in Annapolis. The training was led by Jennifer Tabanico and covered the fundamentals of community-based social marketing. The content for the training is often covered in a two-day training but scheduling only allowed for one day of in-person training. A total of 50 participants were arranged into ten groups of 4 to 6 people, based on their work topics, from communication to fish habitat, and worked together on several activities over the course of the training. Follow up webinars were scheduled for January through April 2020.

Training Topics

The training began with introductions and an ice breaker at the table, followed by the foundations of CBSM and a discussion of why information-only campaigns are still often the default. After the first break, the training continued with step 1 (selecting which behaviors to target), including calculating the results of a weight table and mapping a behavior chain. The training then introduced step 2 (identifying barriers and benefits) and the groups discussed different potential research methods prior to lunch. The majority of the remainder focused on step 3 (developing strategies), with time for the tables to discuss how to apply different strategies. Finally, the end of the session included a discussion of step 4 (pilot testing) and step 5 (evaluation), and final questions and answers. The full agenda is included in Appendix *A* with time points, though the final training was flexible on specific timing to the needs of participants.

Recording and Webinars

Prior to the training session, Jennifer Tabanico recorded a one-hour overview session of the one-day session. This recording was meant for interested individuals who were unable to attend the training, either due to a conflict that day or limited room size, as well as those who seek to learn more about CBSM in future years. A link to this session is on the Chesapeake Bay Program Communications Workgroup's website: https://www.chesapeakebay.net/who/group/communications_workgroup.

In the first four months of 2020, Jennifer Tabanico and Kaitlin Phelps also recorded four webinars that explored the first four steps of CBSM in greater depth. A link to each webinar is on the Chesapeake Bay Program Communications Workgroup's website. The webinars occurred on the following dates:

Webinar Topic	Date
Step 1: Selecting Behaviors	January 22, 2020
Step 2: Barrier and Benefit Research	February 26, 2020
Step 3: Strategy Development	March 25, 2020
Step 4: Piloting and Evaluation	April 15, 2020

Evaluation of the Training

After the training, the participants were given an evaluation survey that included the following topics:

1. Reason for attending
2. Usefulness and application of the training
3. Ratings for quality of the training
4. Strengths of the training
5. Areas of improvement
6. Additional comments

7. Interest in additional follow-up

A total of 36 participants provided a completed survey (72% of the 50 participants). The full survey can be found in *Appendix B*. Selected comments are called out in this section, but the full comments are included in *Appendix C*.

Reasons for Attending

Participants were asked an open-ended question about their reason for attending. The reasons for attending varied, including that behavior change is part of their work, the fact that the opportunity was free, and that they wanted to use the information to improve their work projects.

To learn how to effectively convince more people to act in an environmentally beneficial way.

This is an important area to master for working with communities on environmental projects and outreach.

Usefulness and application of the training

Participants rated the usefulness of the training and the ability to apply the training on a scale of 1, *not at all*, to 7, *extremely*. Participants were also asked two open-ended questions; first, how they plan to apply the concepts in their work and second, the barriers and needs they have to applying these concepts to their work.

On average, participants rated the usefulness of the training a 6.25, and their ability to apply a 5.11. Participants spoke of how they would apply the concepts in a variety of ways, from starting to explore behaviors, to re-energize and share with their workgroup and colleagues, incorporating into current campaigns, taking more time to strategize, move away from education only campaigns, and conducting research.

Think about these topics in everyday life and work and consider them while communicating and asking for action. Ask for smaller changes and create steps to make it easier and really consider how big some actions are.

Suggest wording/framing of created materials. Use info during development of workgroup of a behavior change tool. Discourage simple education campaigns.

Start researching the barriers people have to installing living shorelines to determine actions we can take to help motivate and reduce barriers to have more properties install living shorelines.

Participants also reported a variety of challenges and needs, including: Time, money, inability to research as a federal agent, challenging barriers to action, complexity of behaviors, working with people who are not behavioral scientists, expertise.

Finding the right opportunities to apply CBSM and gaining support and buy-in from the appropriate team members and leadership to initiate such a project. Could be overcome by building on the momentum of Chesapeake Bay Program offering today's training.

Time and money to apply concepts. Need additional training.

Being state regulatory agency, don't want to appear "preachy" or "demanding" rather the choice is yours - but choose right. :-)

I feel like I need more time to practice the concepts I learned today. More time and role-playing, that directly relates to my work would be helpful.

Ratings for Quality of the Training

Participants were asked to rate the training quality, activities, presenter knowledge, training venue, and catering from 1, poor, to 7, excellent. On average, participants rated the quality of the training a 6.72, the activities a 5.75, the presenter

knowledge a 6.97, the venue a 6.92, and the catering a 6.48. Participants felt the training, the presenter knowledge, the venue, and the catering were excellent. Participants felt the activities were fairly good.

Strengths of the Training

Participants were asked what they felt the strengths of the training were. Answers included the examples and case studies, the presenter, the eventual additional webinars, and the slides.

Tons of tangible, real-world examples were presented for each tool - these were relevant, interactive, and engaging.

Loved the real-world examples. The instructors were extremely knowledgeable, experienced, and articulate. Excellent overview of the concepts and methods.

Great examples and studies. Very informative! Also, I love the case study handouts. I felt like I needed a 1-pager handout with the steps and this does that w two good examples.

Training Improvements

Participants were also asked what changes they would suggest for the training. The primary suggestions were more time for training, which was expected, and more movement in activities.

It makes sense that it was designed for 2 days - lots of info!

More breaks. More active activities instead of just talking in groups, get us up and moving!

Additional Comments

The last open-ended question to participants was simply asking for any additional comments. Most participants left this blank or expressed gratitude or how this had changed their thought process or excitement for the webinars.

I enjoyed the training. It made me think differently on how to motivate people to engage in an activity. I am interested in the webinars to see if more details will help me feel more confident in applying these methods.

Contact Information

The last section asked if participants were willing to provide a testimonial, had further questions, wanted to host their own workshop, or had a project they wanted input on. Eight participants checked at least one box, with most either being willing to provide a testimonial, host a workshop, or seeking input on a project.

3: Consultations

The goal of the consultations was to assist groups who are working to change behaviors that impact the health of the Chesapeake Bay by providing program recommendations that make best use of the community-based social marketing (CBSM) process and social science research. Each consultation began with a review of group goals, status, needs, and challenges. After the consultation, a recommendation memo was created based on the information collected from the pre-consultation worksheet responses, program summary documents, and the two-hour consultation meeting.

Consultation Workgroups

The consultations were conducted in January 2020 with the following four workgroups s:

1. Wetlands
    a. Kevin DuBois – U.S. Department of the Navy and Member, Wetland Workgroup
    b. Jennifer Greiner – U.S. Fish and Wildlife Service and Coordinator, Habitat Goal Implementation Team
    c. Pam Mason – Marine Scientist, Virginia Institute of Marine Science and Chair, Wetland Workgroup
    d. Megan Ossman – Chesapeake Research Consortium and Staffer, Habitat Goal Implementation Team
    e. Christine Tombleson – Virginia Institute of Marine Science, Marine Scientist
2. Forest Buffers
    a. Katie Brownson – Watershed Specialist, U.S. Forest Service and Member, Forestry Workgroup
    b. Sally Claggett – U.S. Forest Service and Coordinator, Forestry Workgroup
    c. Ryan Davis – Chesapeake Forests Program Manager, Alliance for the Chesapeake Bay
    d. Nora Jackson – Chesapeake Research Consortium and Staffer, Forestry Workgroup
    e. Jenny McGarvey- Senior Program Manager, Alliance for the Chesapeake Bay and Member, Forestry Workgroup
    f. Teddi Stark – Riparian Forest Buffer and Watershed Forestry Program Manager - Pennsylvania Department of Conservation and Natural Resources Bureau of Forestry
3. Tree Canopy
    a. Katie Brownson – Watershed Specialist, U.S. Forest Service and Member, Forestry Workgroup
    b. Nora Jackson - Chesapeake Research Consortium and Staffer, Forestry Workgroup
    c. Lara Johnson – Virginia Department of Forestry
    d. Julie Mawhorter – U.S. Forest Service and Coordinator, Forestry Workgroup
    e. Frank Rodgers – Education & Outreach Director, Cacapon Institute and Member, Forestry Workgroup
4. Fish Habitat
    a. Donna Bilkovic – Virginia Institute of Marine Science and Member, Fish Habitat Workgroup
    b. Morgan Corey – Chesapeake Research Consortium and Staffer, Sustainable Fisheries Goal Implementation Team
    c. Gina Hunt – Maryland Department of Natural Resources and Coordinator, Fish Habitat Workgroup
    d. Margaret McGinty – Maryland Department of Natural Resources and Member, Fish Habitat Workgroup
    e. Bruce Vogt – NOAA and Coordinator, Sustainable Fisheries Goal Implementation Team

Prior to the consultation, each team filled out a worksheet about their team and project context (See *Appendix D: Consultation Worksheet*). The worksheet was reviewed by Action Research prior to the consultation to ensure the consultation was structured to best help the teams move forward with strategic use of social science and community-based social marketing. Action Research also reviewed each teams' Logic and Action Plan, Management Strategy, and Chesapeake Progress documents.

Action Research

Consultations were conducted over two days – Friday, January 17th and Tuesday, January 21st. Senior Project Manager Kaitlin Phelps attended all four consultations in person in Annapolis, MD, while President Jennifer Tabanico and Scientific Advisor Doug McKenzie-Mohr attended via conference call. Workgroup members attended either in person or via call, based on preference and location.

All four consultations focused primarily on step one of CBSM, selecting which behaviors to target, and resulted in a memo summarizing the meeting and recommending a pathway for the workgroup through the CBSM process. The memos are included in *Appendix E: Consultation Memos*.

Appendix A: Training Agenda

DATE:	October 31, 2019
LOCATION:	Philip Merrill Environmental Center; 6 Herndon Avenue; Annapolis, Maryland
TIME:	8:45 am – 4:30 pm
CHECK IN/SOCIAL:	8:45 am – 9:00 am
# OF PARTICIPANTS:	50

WORKSHOP SCHEDULE

7:30 am – 8:45 am FACILITY SET UP/AUDIO TESTING

8:45 am – 9:00 am PARTICIPANT REGISTRATION & CHECK IN

- Issue Name Badges
- Informal Social Time

9:00 am – 9:10 am WELCOME (Katy Phelps)

- Discuss background, purpose, and goals of training
- Introduce self and role on projects in the region
- Discuss consultation opportunities
- Introduce Jennifer

9:10 am – 9:20 am TRAINER INTRODUCTION (Jennifer Tabanico)

- **Opening Story (5 min)**
  - Intro to speaker
- **Ground Rules/Announcements (5 min)**
  - Restroom Locations
  - Emergency Exits
  - Food/Snacks/Water
  - Breaks: 10:30 (15 min); 12:30 (30 min); 2:30 (15 min)

9:20 am – 9:30 am

- **Icebreaker Work in Groups (10 min)**
  - Get to Know Table Mates
    - Name, Agency, Behavior Change, Favorite Halloween Costume or Memory
  - Choose a Spokesperson
  - Come up with a Halloween-Themed Name for your Table

9:30 am – 9:40 am

- **Group Introductions (10 min)**
  - Spokesperson Introduces Table Mates and Spooky Table Name
  - ~1 minute per table

9:40 am – 10:00 am CBSM FOUNDATIONS

Action Research

- **Behavior Matters**
  - How behavior is related to key ecological outcomes
- **Beyond Knowledge and Awareness**
  - Knowledge deficit model
  - Examples of failed campaigns in environment & health

ACTIVITY #1: Discussion. Why do organizations implement information campaigns based on raising knowledge and awareness?

10:00 am – 10:30 am COMMUNITY-BASED SOCIAL MARKETING

- **Brief Overview of Steps**
- **Case Study:** Oceanside Clean Water Program

10:30 am – 10:45 am MORNING BREAK

- **Thought Question for Optional Discussion Over Break:** How well-positioned is your organization to implement CBSM? What are your organizational strengths, weaknesses, needs, or resources?

10:45 am – 11:15 am STEP 1: BEHAVIOR SELECTION

- **Identifying outcomes and sectors**
- **Creating a behavior list**
- **Prioritizing behaviors: IPPA Chart (1 energy-efficiency, 1 shore birds)**

ACTIVITY #2a: Calculate the weights for one line on screen to practice

11:15 am – 11:30 am

- **Behavior Chains (Introduce Basic Concept)**

ACTIVITY #2b: Introduce sheet of end state behaviors. Write a behavioral chain for one behavior on the list. Spokesperson from tables report back.

11:30 am – 12:30 pm STEP 2: BARRIER AND BENEFIT RESEARCH OVERVIEW

ACTIVITY #3: Identify research modes for one behavior from the list. Identify appropriate research modes. Spokesperson from tables report back.

12:30 pm – 1:00 pm LUNCH BREAK

- **Thought Question for Optional Discussion Over Lunch:** What capacities does your organization have for conducting: Literature review? Focus groups? Surveys (web, in-person, phone, online)? Intercept Interviews?

1:00 pm – 1:15 pm STEP 3: DEVELOP STRATEGY

- **Overview of Approach**
- **Case Study:** SD County Over-Irrigation or Fort Worth Recycling. Case study demonstrates clear link between research outcomes (barrier/benefit research) and strategy elements aimed at reducing barriers/enhancing motivation.

1:15 pm – 2:30 pm ADDRESSING BARRIERS

- **Education**
- **Convenience**
- **Prompts**

ACTIVITY #4: Using the list provided or your own behavior, apply education, convenience, or prompts as appropriate.

2:30 pm – 2:45 pm AFTERNOON BREAK

Thought Question for Optional Discussion Over Break: How are strategies typically developed in your organization? Who is involved? What expertise do they bring?

2:45 pm – 3:45 pm ENHANCING MOTIVATION

- **Social Diffusion**
- **Social Norms**
- **Commitment/Goal Setting**

ACTIVITY #5: Using the list provided or your own behavior, apply social norms, social diffusion, commitment, and/or goal setting

3:45 pm – 4:00 pm PROCEED WITH CAUTION

- **Competition**
- **Incentives**

4:00 pm – 4:15 pm EFFECTIVE COMMUNICATION

4:15 pm – 4:30 pm STEP 4: PILOT TESTING & STEP 5: EVALUATION

4:30 pm – 4:45 pm WRAP UP

- **Final Q&A**
- **Complete Workshop Evaluation**

4:45 pm – 5:00 pm PACK UP AND VACATE SPACE

Appendix B: Full Evaluation Survey

Training Feedback Form

Date: Oct 31, 2019
Presenter: Jennifer J. Tabanico
Location: Annapolis, MD

Why did you attend this training?

Using a scale from 1 (Not at All) to 7 (Extremely), how useful was the training? Circle your response:

1 2 3 4 5 6 7
Not at All Extremely

Using a scale from 1 (Not at All) to 7 (Extremely), how ready do you feel to apply what you learned today to your work? Circle your response:

1 2 3 4 5 6 7
Not at All Extremely

How do you plan to apply what you learned today to your work?

What barriers do you face to applying these concepts to your work? What would help you overcome those challenges?

Please rate each of the following elements using a scale from 1 (Poor) to 7 (Excellent). Circle your response:

	Poor						Excellent
a) Overall quality	1	2	3	4	5	6	7
b) Hands-on activities	1	2	3	4	5	6	7
c) Presenter's knowledge of the subject	1	2	3	4	5	6	7
d) Training venue	1	2	3	4	5	6	7
e) Catering	1	2	3	4	5	6	7

What were the strengths of the training?

What changes could be made to improve the training?

Additional comments or suggestions?

OPTIONAL

Please contact me:

- ☐ I would be willing to provide a testimonial about this training for marketing materials.
- ☐ I have specific questions about some of the material from the training.
- ☐ My organization may be interested in sponsoring a training or training.
- ☐ I would like your input on a program that I am developing.
- ☐ Other: _____

Name:

Phone:

Email:

Appendix C: Full Survey Comments

The full survey comments are included below.

Reasons for Attending

Behavior change is extremely applicable to various aspects of my job

Interested in behavior change for various conservation, fisheries, and environmental issues

This is an important area to master for working with communities on environmental projects and outreach

I was interested in the subject, but it helped that I was offered a free opportunity

It was recommended by my supervisor

Interested in the topic and how CBP can use it and I can share resources w my colleagues

Because I want to make our outreach programs and restoration projects effective, durable, and successful, and our communication efforts fall short now

To enhance my work + expand the way I think when working with people and for people

Much of the work we have left to do relies on private landowners and science/money alone won't get us over the finish line. Sustainable actions of landowners that makes it a norm will be more successful. Understanding how to do this is a first stop. I plan to use this info as a manager and funder to know direction for funding and tasking

To learn about behavior change

Offered free through CBP and GIT chair

Curious about interaction between psychology and environment. Looking for actionable steps to take

To learn how to implement more effective messages and programs

Apply lessons learned to work (education)

To learn more about strategies that can help the members in the CBP stewardship GIT

Professional development/learning opportunity

To learn more about engaging people and learn tools and strategies to make change happen

To incorporate CB social marketing into my education better and outreach efforts

Direct correlation to job - educate general public and hoping to lead to behavior change

Very interested in applying more social science methods in my work, particularly around behavioral change. I'm an applied anthropologist but not an (actively) practicing one

To improve and reinvigorate management and compliance

Our programs (MWEE and RiverSmart) heavily work in education and outreach AND rely on behavior change to drive implementation and action projects

Invited as a GIT Coordinator to do so.

Affecting behavior change is a key part of my job

Currently developing an engagement and marketing plan - very helpful

We need to change the behaviors of our rivers residents to make our rivers cleaner

As a staffer for the Wetland and SAV workgroups/habitat goal team - to learn more about this concept and implementation

Honestly, it was mandatory. But its an interesting topic that may factor (tangentially at least) into the messaging and visuals I produce as a communicator

Learn how to implement behavior change projects Re: shorelines, fishing rules, and habitat projects

To learn about changing people's behaviors to help better implement some of our programs

To learn how to effectively convince more people to act in an environmentally beneficial way

I was invited to participate by my supervisor (which is good b/c I wanted to attend, but wasn't sure I would get chosen) since there was limited space

To learn tech and tools to better prioritize behaviors and implement strategies

I have a personal interest to see more social science incorporated in environmental work, and from my limited exposure to CBSM I wanted to learn more tools to use

I'm interested in learning about how to actually get our research change work applied and used by the communities we live and work in

The opportunity to learn more about getting people to care about the environment. I already understood the basic idea of "doing it from their perspective/priorities" and was curious how to do it

Plan to Apply

I will need to do some more reflecting first on what I've learned but I definitely plan to apply a different framework of thinking as I move forward with several projects that would benefit from the tools and ideas that were presented

Increase consumption of blue catfish and raise awareness of the issues. Maybe improve catch reporting of watermen

I'll start exploring behaviors in my audience that I may want to address in a behavioral changing project

We want to incorporate climate resiliency into the other workgroups, but they haven't done it yet. We can now use this process to help change their behavior of not incorporating it

Use concepts to help re-energize workgroup involvement

Research some more, suggest to colleagues considerations for social marketing in future grants/programs. Share examples when appropriate

Going back through our actions plans to identify planned work that could benefit from a behavior change lens and rethink the approaches for maximum impact and more effective

Background research, improve survey methods

Right away it will help me articulate my need for staff that have skills to focus on social change

I'm not sure yet. I'm having a hard time distilling my needs to actionable (non-divisible) steps

Figure out how to get an env. Analysis completed before actually required b/c that is when it would be more effective and meaningful

Will take more time setting up my problems before considering possible solutions. Be more mindful about presenting information in a way that encourages action

Crafting state park trash campaigns. Share info with coworkers

Ask intern to do project. Using CBSM to change behaviors in parks

Suggest wording/framing of created materials. Use info during development of workgroup of a behavior change tool. Discourage simple education campaigns

Action Research
Planning a future survey

Think about these topics in everyday life and work and consider them while communicating and asking for action. Ask for smaller changes and create steps to make it easier and really consider how big some actions are

New program developments/ include in RFP responses. Incorporate principles, as able, into existing programming

Just starting anti-litter campaign so this will help drive decisions. Trying to breathe life into a stalled initiative so hopefully can bring back some attention and enthusiasm

Special projects that are more social science-oriented; trying to increase voluntary adoption of BMPs in agricultural community; incorporate more community-based social marketing in policy development, particularly around water quality

Brainstorm w/ firm to implemented BMPs of clients, policy makers, and inspire management agencies

Techniques of program evaluation and tools of enhancing motivation

In listening sessions w/ communities regarding Green Infrastructure projects for climate resiliency

Work with the team to put together a pathway and think through outreach

I'm currently writing a marketing and engagement plan - perfect timing and extremely helpful. I was making many assumptions - helpful to think about these processes and hot to better approach these topics

We are in the middle of a behavior change project right now with the Ches.Bay.Trust

Bring these ideas back to the SAV and Wetland workgroups. The Wetland group has identified several actions they would like to take to improve communication w landowners - several of these ideas can be applied to these actions to make communication more effective and inspire behavior change

I will avoid normalizing negative behaviors by not amplifying examples of pollution/mis-use of green space/etc. I will continue to highlight the positive role models (including early adopters). I produce stories so I can ask our partners who their early adopters are, so that i can help "diffuse" them

Look for opportunities to implement on other stressors to fish habitat. Perhaps use our community shoreline projects as examples to other communities (diffusion)

Start researching the barriers people have to installing living shorelines to determine actions we can take to help motivate and reduce barriers to have more properties install living shorelines

Part of my mission is to work with Riverkeepers and watershed groups that work directly w volunteers. I want to be able to help them more effectively influence their volunteers (and the people in their watershed) to be good stewards. I'd also like to effectively manipulate my workgroup members to be more active in workgroup efforts :)

Talk to workgroup coordinators and figure out what behaviors and barriers exist in getting more participation

Using social commitment, goal setting, social norms, and social diffusion (when possible) to encourage and motivate teachers to participate in environmental ed. Programs and not cancel programs that they were enrolled in

Interested to apply fish consumption and promoting invasive species on the menu for a Chesapeake Bay speaks

I'm planning to apply what I learned when working on increased engagement for the stream health group and brook trout groups. I'm currently setting goals for the near 2 years so we want to include it then

It doesn't apply to my current work, but I know I will in the future and it was changed my way of thinking, especially concerning grants/deliverables

Barriers to Applying and Needs to Overcome

For when identifying barriers and strategies, we are trying to change the way we work in first incorporating research about communities and from focus groups instead of applying strategies and projects we think would be good based on our biases and hunches. But one huge challenge is that as federal govt we can't collect info from more than 10 people without going through an internal bureaucratic process. Our grantees that are paid by federal dollars can't do this either. We can overcome by partnering with academic and non-profits, and doing interviews with 9 people

Lack of knowledge of issues, palatability, preparation, etc. have a taste/preparation demonstration w informational signs, lack of trust of managers/government --> social diffusion of e-reporting program

There is so much to master for this training before being able to apply it

Climate change is a "wicked" problem and very complex. There are behaviors that we want to change and they are divisible, but we don't even know what all those divisible behaviors are.

Applying concepts from a society/leadership level versus influencing an individual's behavior e.g. acknowledging human-caused climate change science

Working with people who are not versed in this work. Maybe some basic talking points that boil does the benefits of using this process before starting programs of information campaigns

1. Capacity and 2. Time

Shifting the "way we always do things" in a partnership is always difficult but add a sense of urgency to getting practices in place quickly. May not allow for the time it takes to do it right

I don't have direct access to the stakeholders I would like to reach

I am a team of 1. No support, no $, just my brain. Any help of pretty much any kind would be good, but helping ensure that I am properly prioritizing actions would be great

On a comm team - I inform, don't necessarily call people to action. I can write in a way that invokes audience to take action

Time/money/expertise

Cannot conduct interviews/surveys as government worker, so must rely on (often biased) literature

As a younger professional, I'm worried about suggesting ideas from what I've learned but I plan to reference this training to backup my point

Time :)

The nature of my work is more informational forum and we have to rely on other partners to actually do the actions. This makes it hard to use these strategies from a distance

Time and money to apply concepts. Need additional training.

Being state regulatory agency, don’t want to appear "preachy" or "demanding" rather the choice is yours - but choose right :)

I feel like I need more time to practice the concepts I learned today. More time and role-playing, that directly relates to my work would be helpful.

Education <-> proven validation of techniques that will enhance water quality

Time and cost. Interns and outreaching/partnering with communication officers in our office

Living shorelines have not achieved "Social norm" status; general distrust of government programs. Awareness-building

Action Research

Need the opportunity to get input on specific application of the materials. Not sure with lots of info coming my way that I can remember everything

My barriers are super specific - I'm hoping focus groups can help answer questions about these barriers, but its just tough to get funding support without falling victim to the incentive spiral

Time - this approach requires a lot of planning and strategy

I communicate to a broad audience most often, and so I don't really focus on specific actions as much as inspiring stewardship generally, by showing people their connection to the watershed. It would be great to identify messages particularly suited to visual communication (photo and video)

Identifying barriers and benefits, time, $$

Knowing where to get information. Knowing sometimes what to ask. More examples of projects similar to what we want to do

Time + staff. Not enough of either

I am an environmental staffer and my role is often supportive so I don't always have the authority to impact these changes; time constraints; social norms; funding. Supervisor support to enact change, more time, more funding

The main barriers to achieving the environmental ed. Goals have to do with barriers outside our direct control (teacher time, priorities, capacity, etc.) Having buy-in and support from the public school central office would help

Finding the right opportunities to apply CBSM and gaining support and buying from the appropriate team members and leadership to initiate such a project. Could be overcome by building on the momentum of Chesapeake Bay Program offering today's training

The biggest barrier I face is a luck with authority. I am not a person in the groups that I work with who others look to for Guidance and communication strategies. I think that some way for me to portray w the value of this training to others would be helpful

Just my role/responsibilities, but I imagine the bureaucracy/entrenched ideas of information sharing/education is "enough" and the way I think about grant deliverables

Strengths of the Training

Great examples and studies. Very informative! Also I love the case study handouts. I felt like I needed a 1-pager handout w the steps and this does that w two good examples

Providing many examples of the strategies used throughout the behavior change process was really helpful; presenter was very knowledgeable and had on-hand examples related to group focus

Knowledge of presenter. Experience of the organization presenting

The presenter was very knowledgeable about the subjects. There is going to be more training after this day. I like how at the bottom of this survey you offer your input for someone's program

Really liked the real-world examples

Instructor and materials, examples/slides

Very applicable examples. Timely and relevant.

Clear/visually appealing PowerPoint, lots of great research and examples, great energy (goes a long way)

Presenters knowledge, case studies, exercises

Very knowledgeable contractors, good activities

Very thorough and good overview. Relevant examples based on real science

Well-paced. Strong presenter and pertinent info. Relevant and actionable

Presenter was engaging. Examples were interesting and relevant

Presenter use real life examples. Presenter was knowledgeable and a good communicator

Great examples that are relevant to our field. Interesting content.

Great presenter!

The instructor was knowledgeable and engaging. The content was new and interesting to me. There was a lot of content in 1 day, but I feel like I have good understanding.

Easy to follow and understand

Loved the real-world examples. The instructors were extremely knowledgeable, experienced, and articulate. Excellent overview of the concepts and methods.

Nice format - systematic coverage of concepts

The trainer (Very knowledgeable). The venue (beautiful, but far from my commute - 1 hour drive)

Practical examples of concepts in action. Humor in delivery

Lots of examples (maybe too many?) Easy to understand tools - thangs to think through. Knowledgeable team/trainers

Trainer was excellent with time! Spot on, great pace, timing, clarity, and clear experience

Application

I really liked all the examples of case studies - they really highlighted these ideas and were memorable

There was a wealth of examples of studies to support principles

So many great examples. The step by step process. Looking forward to follow up webinars. Love that there is follow up

The presenter. Good use of breaks and lunch, not too long, not too short. Efficient use of the day.

Presenter (Jennifer) had very effective and relatable examples of the methods she was conveying. It helped to understand the methods and materials

Lots of information and good examples. Activities helped group put into practice the info we were learning. Fun and easy to understand

The top strengths include: How to calculate prioritized behaviors, case study examples, behavior change strategies

Tons of tangible, real-world examples presented for each tool - these were relevant, interactive, and engaging

Sorting people at tables by interest/work where the activities are located is well structured. Great presentation style and anecdotes.

Engaging and interesting presenter, presentation, the activities, and the specific studies and examples that demonstrated the concepts

Changes to Improve the Training

More interaction throughout the presentation to keep people engaged, particularly as the day goes on

Divide it into several sessions

Action Research

The examples provided to be closer linked to the audience. If possible, make it a two day training so that the next day is more centered around the groups connecting it directly to their work. The presenter would be there more to help facilitate and answer questions

Interactive visual activities to help understand concepts. E.g. subaction chain -> have index cards, group writes down subactions and then build the chain

Super long day, too much sitting

Not sure, it was great!

More direct Chesapeake and environmental examples. Highlighting diverse communities

It was a lot to take in (although I know it was 2 days smushed into 1)

Length-information towards end gets lost after long day. Incorporate more types of media into presentation. Switch up speakers/alternate speakers

Get up and move around

Diversify hands-on activities. Spend less time on introductions. Don't explain everything! Some is common sense

I know this was a scheduling conflict but it was a long day with a lot of information.

More breaks. More active activities instead of just talking in groups, get us up and moving!

Just lots of sitting but hard to avoid

It was a lot to cover in one day, so that's not the fault of the instructors. It would be great to have more time to test out the methods beyond the short group exercises

Maybe a few more breaks/activities - but density of info was important

More movement of activities for an 8 hour session. More than one speaker/trainer to keep focus on each topic

Suggestions to step it down to private landowners (audience) on habitat issues (pilot testing) How can door-to-door messengers apply?

Less examples; more time to noodle with group with facilitators actively engaging with groups

Maybe a few more group activities or questions posed to the group for a few minutes

It makes sense that it was designed for 2 days - lots of info!

It would have been helpful to have group facilitators that could have more effectively direct group activities. It was easy to go down rabbit holes and not actually do the exercise. A little more time for activities would have helped too, although I realized we crammed a lot into one day for scheduling

More activities that involve movement so we aren't sitting for so long (but I know this was condensed into 1 day so that might be hard)

Electronic copy of the presentation. More examples of bad campaigns and how AR would have improved them

Try to get people up and moving around more, or promote more engagement and participation with the Mendi Meter or similar

I think that this would be much better as a 2 day training (which I know it is supposed to be). Update case studies, some were over 20 years old

I think that if it was more targeted to what our organizations can do - some of the information, i.e., pros + cons of the different surveys weren't very relevant. Also include much more complex issues, that's what we will face

Additional Comments

Thank you!

I enjoyed the training. It made me think differently on how to motivate people to engage in an activity. I am interested in the webinars to see if more details will help me feel more confident in applying these methods

Thank you for all your time and hard work :)

This is incredible - thank you so much

Great Job!

Did a great job remembering the specific projects of each group throughout the day (and referencing them)

Looking forward to additional webinars to dig deeper

Great, thank you! Didn't know about webinars as a follow up but excited for them.

Thanks so much again - really informative training

Amazing energy for a full day training from Jennifer. I would suggest a research of local impacts of the attendees

Carbs galore. Salads and gluten free options appreciated.

Thanks!

Super helpful training. Would love to see this kind of training made available by CBP for all of our non-profit neighbors/partners. Riverkeepers would find this particularly beneficial

Thank you for spending time with us and giving us all this useful information

Great training! Look forward to learning more

Great training! Jennifer really knows her stuff and made the training fun

Really enjoyed it and learned a lot! I think it might be fun for the attendees to "practice" one of their examples (like the social norm elevator example), some people are told do something or sit a certain way and 1 or 2 people are the "subjects" to see if they go w the group or not

Appendix D: Consultation Worksheet

Changing human behavior is critical for meaningful effects on most environmental issues. Traditional marketing campaigns that focus on awareness and education typically fail because they do not address the underlying motivations for behavior. A plethora of research exists to demonstrate that information-intensive approaches do little to foster long-term changes in behavior. Community-based social marketing (CBSM) has emerged as an effective alternative to these campaigns. The approach has been used worldwide to effectively motivate behavior change across a wide range of domains. Read more at cbsm.com.

We look forward to working with you to help you meet your team's environmental goals by fostering behavior changes in your target audience. The goal of these two-hour consultations is to provide a starting point for developing and refining your team's future behavior change campaign. Depending on your team's goals, we will help you develop an actionable plan to: select meaningful behaviors, identify barrier/benefit research strategies, apply a variety of behavior change tools, design effective program strategies, employ pilot testing, and conduct evaluation.

Training Follow up

The consultations serve as a more in-depth, personalized next step after the training. Many of the activities in each of the GIT teams' workplans would benefit from the incorporation of behavior change campaigns. During the first SRS round, almost every single workgroup identified local engagement and communications as areas where significant work is needed to progress toward meeting your outcomes. Community-Based Social Marketing is a process designed to inspire behavior change and by learning the foundations of this model, it will help you to understand why looking at particular audiences, benefits, barriers and behaviors really are vital components in any work you do to meet your outcomes. **The training will provide the foundation – a consultation will apply it to your team's specific goals and context.**

Details

There will be four consultations available for selected projects within the Chesapeake Bay Program (CBP) organization structure. In each consultation session, Action Research will work with your team in depth to apply CBSM principles, customizing them to your program and goals, brainstorming solutions to challenges, and provide customized recommendations that fit your unique circumstances. The session will result in support for the next steps your team can take to develop your own behavior campaign, such as: (1) how to use existing data to select and prioritize behaviors; (2) how to conduct barrier/benefit research; and/or (3) how to develop and pilot test strategies. Brief bios of our team members are available at the end of the end of this document.

Considerations for Selection

There are only four free consultation spots available. **Our goal is to identify teams that are well suited to apply the consultation recommendations to their projects**. We are looking for teams/projects with:

- ☐ At least one team member attending the October 31st one day training
- ☐ Defined environmental outcome(s)
- ☐ Defined target audience(s)
- ☐ Defined target behavior(s)
- ☐ Existing foundational audience research, or resources to conduct foundational audience research, if needed[1]
- ☐ Responses to the pre-consultation worksheet

We have identified your team as well suited for a consultation. By October 18th, please reach out to Amy Handen (amy_handen@nps.gov) or Rachel Felver (rfelver@chesapeakebay.net) to discuss the opportunity.

[1] **Foundational audience research** can be defined as literature reviews, intercept interviews, focus groups, and mail or phone surveys, with the goal of gathering information about your target audience's current behaviors, attitudes, challenges, and motivators. The key element is information gathered "outside of the office" – meaning you can make data driven decisions about your audience, rather than based on assumption.
Resources needed to conduct research depends on the goals, but likely at least includes staff time to review literature. Research recommendations will be designed with the team's resources in mind.

Pre-Consultation Worksheet

We suggest starting this worksheet prior to the October 31st training. For any questions contact Katy Phelps (phelps@actionresearch-inc.com).

Team name: _____ Participating members' names: _____

Question	Answer
What is your projects' desired environmental outcome?	
What are the audiences that have an impact on that goal? Which audiences does your team want to/already target? Why these audiences?	
What behaviors can the audience take that significantly impact your desired outcome?	
Which of these behaviors do your projects seek to motivate? Why did your team choose these behaviors? Are there other behaviors you want to work on?	
What audience research is available to your team on these behaviors? For example, have you surveyed this audience? Has other research been conducted on this audience that you're aware of?	
What resources do you have to complete additional audience research, if needed?	
What outreach does your team currently use to influence your behavior(s)? (include these materials with this worksheet)	
To change your program, do you need approval from other individuals or groups who would not be present at the consultation?	
Are there specific mandates or requirements you must meet in your team's work?	

Sample Completed Worksheet

The example responses below are not meant to be what the "best" answer would be, but to provide clarity on the questions.

Question	Answer
What is your projects' desired environmental outcome?	Improvement in water quality (N, P)
What are the audiences that have an impact on that goal? Which audiences does your team want to/already target? Why these audiences?	Residential, agricultural. We primarily do outreach to agricultural owners because they are using more fertilizer, but we are doing more work with residential run off
What behaviors can the audience take that significantly impact your desired outcome?	1. Reduce fertilizer use 2. Install rain gardens 3. Install rain barrel 4. Xeriscaping
Which of these behaviors do your projects seek to motivate? Why did your team choose these behaviors? Are there other behaviors you want to work on?	We primarily focus on rain gardens right now, as we got a grant to purchase and give workshops on them, and developed a partnership with the local Master Gardeners. We also want to work more on full xeriscaping.
What audience research is available to your team on these behaviors? For example, have you surveyed this audience? Has other research been conducted on this audience that you're aware of?	We have evaluation surveys from our workshops, and there are case studies on http://chesapeakebehaviorchange.org/. We also leverage the experience of the Master Gardeners
What resources do you have to complete additional audience research, if needed?	We have two staff members who would have availability to do a literature review and to do small scale work. We plan to apply to the Chesapeake Bay Trust for an Outreach and Restoration Grant next cycle to do additional research if needed.
What outreach does your team currently use to influence your behavior(s)? (include these materials with this worksheet)	We currently have our workshop materials and recruitment materials
To change your program, do you need approval from other individuals or groups who would not be present at the consultation?	We need approval from our Board of Directors
Are there specific mandates or requirements you must meet in your team's work?	Yes, we are mandated to host at least 3 educational workshops a year.

Action Research Team

Doug McKenzie-Mohr, Scientific Advisor

QUALIFICATIONS

For over three decades Dr. McKenzie-Mohr has been working to incorporate scientific knowledge on behavior change into the design and delivery of community programs. He is the founder of community-based social marketing and the author/co-author of three books on the topic. One of these books, "Fostering Sustainable Behavior: An Introduction to Community-Based Social Marketing," has been recommended by Time Magazine and with over 50,000 copies in print has become requisite reading for those who deliver programs to promote sustainable behavior.

Dr. McKenzie-Mohr has worked internationally with a diverse array of governmental and non-governmental agencies, assisting them in identifying the barriers to behavior change and in developing and evaluating community-based social marketing initiatives to overcome these barriers. More than 70,000 program managers have attended workshops on community-based social marketing that he has delivered internationally. His work has been featured in the New York Times and he is the recipient of the American Psychological Association's inaugural award for innovation in environmental psychology and the World Social Marketing conference's inaugural award for contributions to the field of social marketing. He is a former Professor of Psychology at St. Thomas University in New Brunswick, Canada where he co-founded the Environment and Society program.

EDUCATION

- Ph.D. University of Waterloo
- M.A. University of Waterloo
- B.A. Honors, University of Manitoba (First Class Honors)

SELECTED COMMUNITY BASED SOCIAL MARKETING EXPERIENCE

- **Audubon**, North Carolina shoreline nesting CBSM strategies
- **Agriculture and Agri-food Canada**, *Reducing farm watershed impacts*
- **County of San Diego**, CBSM Watershed Protection training
- **Efficiency Nova Scotia**, Residential Energy Conservation CBSM Pilot
- **Hawaii Energy**, Commercial Energy Conservation CBSM Pilot
- **Monterey Bay Aquarium**, Advisor Seafood Watch Program
- **Ontario Ministry of Natural Resources**, *Species at Risk Program*
- **Southwest Florida Water Management District**, *CBSM watershed protection strategies*

Jennifer Tabanico, President

QUALIFICATIONS

Ms. Tabanico has 17 years of experience working directly with government agencies to develop, implement, and evaluate behavior change campaigns. She has managed projects and maintained positive communications with a range of public and private clients including American Forest Foundation, Build it Green, the Oregon Coast Aquarium, the Cities of Oceanside and San Diego, the Counties of Orange and San Diego, the New York State Energy Research Development Authority (NYSERDA), and the Urban Sustainability Directors Network (USDN). Ms. Tabanico has authored academic and technical publications in the areas of environmental attitudes, social influence, and community-based social marketing. Her work has been published in a variety of outlets including the *Journal of Environmental Psychology*, *Social Influence*, *Social Marketing Quarterly,* and the *Handbook on Household Hazardous Waste.*

EDUCATION

- M.A. in Experimental Psychology, California State University San Marcos
- B.A. in Psychology, Minor in Criminology, California State University San Marcos

SELECTED PROJECT EXPERIENCE

Ms. Tabanico is responsible for overall project design and contributing behavioral expertise.

- **American Forest Foundation:** Audience research to inform outreach to private forest owners; Development of recommendation for promoting the use of conservation easements and sustainable harvesting practices.
- **City of Cupertino:** Audience research and development of two pilot programs to reduce greenhouse gas emissions (reduce water heater temperature and install smart thermostats).
- **County of San Diego Watershed Protection Program:** Audience research and outreach development to promote a range of pollution prevention and water quality protection: (1) pet waste, (2) over-irrigation, (3) litter, (4) watershed education, and (5) erosion control.
- **County of Orange Stormwater Pollution Prevention Program:** Audience research and outreach development to promote a range of pollution prevention and water quality protection: (1) litter, (2) pesticide use, and (3) public outreach communications.
- **National Fish and Wildlife Foundation:** Consult on the application of behavioral science to promote a range behavior changes that support conservation.

Kaitlin Phelps, Senior Project Manager

QUALIFICATIONS

Over the past 8 years, Ms. Phelps has focused on creating sustainable communities through effective programming that fosters voluntary behavior change. Her areas of expertise include strategies to change behavior, program evaluation, and social science research. She has applied this expertise across a multitude of environmental and sustainability topics, including recycling, composting, watershed stewardship, water conservation, and energy conservation.

EDUCATION

- M.A. in Natural Resources & Environment: Behavior, Education, & Communication, University of Michigan
- B.A. in Environmental Science, Social Sciences, Washington University in St Louis

SELECTED EXPERIENCE

- **American Forest Foundation:** Survey and focus group audience research to inform outreach to private forest owners; Development of program recommendation for promoting the use of conservation easements and sustainable harvesting practices.
- **Baltimore County, MD:** Research design of pilots focused on environmental education and outreach to reducing litter and pet waste pollution in target watersheds.
- **California Efficiency Water Partnership**: Online survey research to conserve residential water by increasing replacement of lawns with water efficient landscaping.
- **City of Bowie, MD:** Research design of pilots to foster tree planting and tree maintenance behaviors.
- **City of Sunnyvale, Environmental Services Department:** Literature reviews and interview research and marketing to increase commercial organics recycling.
- **Keep American Beautiful Recycling at Work:** Online survey research with businesses to understand barriers to recycling in the workplace.
- **Massachusetts Department of Environmental Protection and Division of Ecological Restoration**: Research and multiple pilots to conserve residential water by reducing summer lawn watering, include mail surveys and intercept interviews.
- **New York State Energy Research and Development Authority (NYSERDA):** Survey and literature research on a variety of workplace and individual energy efficiency behaviors.
- **StopWaste (County of Alameda, CA)**: Mail survey and telephone survey audience research to improve residential organic recycling rates.
- **Virginia Department of Forestry**: Mail survey to identify woodland landowner barriers to legacy planning.

Appendix E: Consultation Memos

The four memos were delivered to each GIT specifically and are included in this section.

Scope 2 – Fish Habitat Consultation

Purpose

The goal of the consultations is to assist groups who are working to change behaviors that impact the health of the Chesapeake Bay by providing program recommendations that make best use of the community-based social marketing process and social science research. Each consultation began with a review of goals, status, needs, and challenges that were provided through worksheet responses, program summary documents, and a two-hour consultation meeting.

The purpose of this document is to summarize the outcomes of the review and consultation meeting discussion and offer suggestions for strategic next steps. The document begins with a description of community-based social marketing (CBSM) and a summary of the information collected during the consultation meeting organized under each of the CBSM steps. Following the summary, we have provided recommendations for next steps that will guide the Fish Habitat GIT in moving forward with CBSM.

Community-Based Social Marketing

CBSM has emerged as an effective alternative to traditional education campaigns (McKenzie-Mohr, 1996; 1999; 2011; McKenzie-Mohr, Lee, Schultz, & Kotler, 2011; Schultz & Tabanico, 2007; Tabanico & Schultz, 2018). CBSM is based upon research in the social sciences that demonstrates that behavior change is often most effectively achieved through initiatives delivered at the community level that focus on removing barriers to an activity while simultaneously enhancing the activity's benefits. CBSM brings together knowledge from the field of social marketing with a variety of behavior change "tools" drawn from social psychology, environmental psychology, and other social sciences. CBSM uses a five-step process to foster behavior change. These five steps are:

1. Selecting which behaviors to target;
2. Identifying the barriers and benefits to the selected behavior(s);
3. Developing strategies that reduce the barriers to the behavior(s) to be promoted, while simultaneously enhancing the benefits;
4. Piloting the strategies and determining which are most cost-effective ; and
5. Broadly implementing the most cost-effective strategies and conducting ongoing evaluation.

Fish Habitats Behavioral Review

In 2019, the Chesapeake Bay Program goal implementation teams (GIT) were introduced to CBSM as a process for developing behavior change programs. Four GITs were selected to receive support from CBSM experts so that they could more effectively apply the approach to their efforts. The information below frames the Fish Habitat GIT around the relevant steps of CBSM.

Selecting the Behavior

The two-hour Fish Habitat GIT consultation meeting primarily focused on the first step in CBSM – selecting which behaviors to target. The Fish Habitat GIT group is tasked with improving habitats where fish live across the entire Chesapeake Bay. The habitats include submerged aquatic vegetation (SAV), streams, the water column, wetlands, shorelines, and more. These habitats can be affected by a variety of stressors, including pollution, climate change, and development. Given the breadth of this endeavor, the Fish Habitat GIT is understandably uncertain regarding how to prioritize specific sectors and behaviors over others, which is a key element in CBSM and in effective behavior change. Action Research worked with the team to discuss the availability of relevant information and data that could be used to guide prioritization.

The primary environmental outcome sought by the Fish Habitat GIT is to **maintain and increase the quality and quantity of fish habitat**. To create successful programs, it is important for organizations to understand which audiences or sectors would have the greatest impact on their goals.

In discussions with the Fish Habitats GIT, the potential priority habitats include:

- Tidal freshwater;
- Headwaters;
- Non-tidal rivers; and
- Tidal saltwater.

We recommended that the Fish Habitat GIT start by identifying which specific stressors have the most significant negative consequences on habitats, and if these threats vary by different habitat types. By identifying the greatest stressors, the GIT can change behaviors that impact the primary stressors.

The stressors identified as most critical were:

- Habitat loss through increased hardened shorelines, which results in
    - Loss of breeding and feeding areas;
    - Reduced water quality; and
    - Reduced connectivity and tidal flow.
- Climate change leading to temperature changes that negatively impact fish health.
- Increased impervious surfaces, leading to increased pollution run-off
    - Excessive nutrients;
    - Litter;
    - Herbicides and pesticides; and
    - Other hazardous waste.

Finally, the potential sectors/audiences that were identified as creating these stressors include:

- Landowners;
- Agricultural;
- Local governments; and,
- Contractors.

Our understanding is that the Fish Habitat GIT may currently have insufficient data to develop a full understanding of what the highest priorities should be for increasing the quality and quantity of fish habitats. However, using the available data will still allow a more strategic approach to programming decisions than basing decisions on hunches or convenience. These behavior-focused programs could then be implemented by various organizations across the watershed to achieve broad changes.

Recommendations

Action Research has outlined a set of recommendations based on the available data sources and data gaps that were identified in the consultation meeting. The recommendations include analysis of existing data as well as some additional data collection. Overall, we recommend that the Fish Habitat GIT dedicate resources to refining their understanding of the highest priority sectors and the behaviors that will be most impactful to increase the quality and quantity of fish habitats. The GIT should refer to the CBSM webinar series, starting with the one-hour overview, for specific information on these topics and how to best approach them. As these are recorded, they will be available on the CBP communication website.[1]

Narrow Focus by Identifying Key Sectors

The Fish Habitat GIT identified existing work that can be leveraged before any new research is conducted. This phased approach will help to ensure efficiency in the spending of research funds.

1. Use GIS layers to better understand what land types have the most potential for improved fish habitat, such as layers that show current land use (residential, agricultural, municipal), existing wetlands, miles of hardened shoreline, and current erosion rates.
    a. This information can be used to answer questions such as, “What geographic area is in the most need for increased fish habitat?” and “What is the most significant threat to fish habitat?”
    b. Focusing on a specific sector (audience), stressor (threat to fish habitats), and ultimately a specific behavior, will be critical for successfully motivating action. Barriers and benefits vary significantly between different actions (e.g., there are different challenges regarding reducing fertilizer runoff as compared to removing hardened shorelines) and different audiences (e.g., different challenges exist with agricultural land as compared to residential land).
2. Review other work to see if there are data that can be leveraged to prioritize sectors or audiences. Useful data sources may include shoreline permit data, priority habitat funding maps at a county level, surveys on property owners, and academic research.

[1] https://www.chesapeakebay.net/who/group/communications_workgroup

    a. Consider if data can be used to create pie charts that mimic the pie charts on energy usage in the *Selecting Behavior* webinar (see section on *Strategic Selection*) to narrow the team's focus.
3. Based on the results of bullets one and two:
    a. If a top stressor or sector emerges, move to creating a behavior list for that stressor or sector.
    b. If no clear stressor or sector emerges, move to creating a behavior list with the top two stressors or sectors in mind, and use the additional behavior list data collection effort to further refine the sector or stressors.

Create a Behavior List

After the sector(s) and stressor(s) have been prioritized, we recommend that the Fish Habitat GIT create a list of end-state, non-divisible behaviors[2] that lead to direct positive impacts on the stressor(s), and determine what data are available to prioritize the actions. Ultimately, by focusing on behaviors that have the best combination of impact, probability and penetration, the chance that the improved fish habitats will be achieved is increased. See the webinar on *Selecting Behaviors* for more information.

1. Create an initial list of end-state, non-divisible behaviors. See the table below.

#	What is the Behavior?	Part of behavior chain?
1		☐ YES ☐ NO
2		☐ YES ☐ NO
3		☐ YES ☐ NO
4		☐ YES ☐ NO
5		☐ YES ☐ NO

[2] End-state is defined as by doing the behavior, fish habitat is improved or increased. Non-divisible is defined as the behavior cannot be divided into smaller sub-actions.

Prioritize Behaviors

Conduct a short survey of fish habitat experts to gather independent ratings on the impact of each behavior. See webinar on *Selecting Behaviors* (section on *Impact*) for more information. The survey might have two impacts, improved water quality and increased population of [species], as well as any additional impacts of interest, such as increased wetlands or improved climate resiliency. A sample of a survey to collect impact information from a project focused on human-wildlife conflict reduction is below.

HUMAN-WILDLIFE CONFLICT

1. There are many actions that a resident can engage in to **reduce human-wildlife conflict**. Using a scale from 0 to 10, where 0 means ***no impact*** and 10 means ***significant impact***, how much of an impact do you feel each of the following actions would have on **reducing human-wildlife conflict in residential areas**?

		No Impact										Significant Impact
A	Residents place garbage out on the curb for pick-up within the timeframe identified by community bylaws and as near to pick up time as possible.	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
B	Residents store garbage indoors in a secure location.	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
C	Residents store garbage in a secure shed.	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
D	Residents store garbage in a certified bear-resistant container.	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐

2. Create a table that combines the data from the fish habitat experts with available data on the penetration (using data such as voluntary reporting, observational data, permit databases, or surveys/academic research to understand how many members of the target audience have already taken this action), probability (using survey research or case studies to understand how likely audience members are to take the action), and applicability (GIS maps of forest abundance or observational data recorded along the water to understand the percentage of the audience members that could take the action) of each behavior on the list. .
    a. It is possible that not all columns will be filled in. For example, there may not be survey data about probability, or the current penetration may be dated. However, the GIT can still prioritize a few behaviors (3 to 5) for further research. The behaviors would be prioritized based on the weight that is determined by multiplying impact by applicability (if the other two factors are not available).
    b. In this situation, the GIT can include questions about any missing penetration, probability, and applicability data in the barrier and benefit research and use them to further prioritize between the top 3 to 5 behaviors.

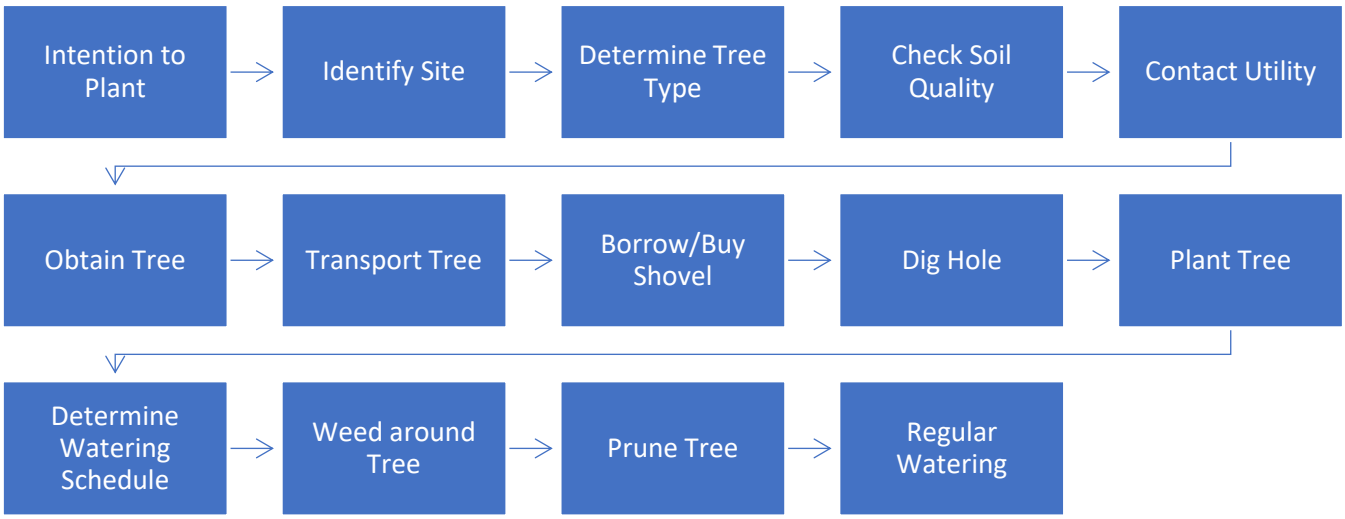
c. A sample blank table is below. The last column, **Weight,** is calculated by multiplying **Impact*Probability*Reach*Applicability**. The weight is used to prioritize between behaviors.

Behavior	Impact	Probability	Penetration	Reach (1-Penetration)	Applicability	Weight (I*P*R*A)

Map Behavior Chains

Where relevant in the prioritized actions, map the behavior beginning with "Intent to Act" to the completed action that establishes or preserves a wetland. See webinar on *Selecting Behaviors* (section on *Behavior Chains*) for more information.

1. For example, for a behavior such as, "Plant trees on your residential property" the chain might look like the following:



2. Mapping the chain can help the GIT identify potential barriers or benefits. For example, the chain demonstrates that there may be knowledge barriers around tree types or transportation barriers to obtaining a tree. Further, the chain helps to isolate "chain sections" where programs may be able to shorten the chain by removing actions (such as, providing tree delivery and planting). It can also demonstrate visually how difficult an ask a behavior might be and how important it is to address all the barriers participants face, even after they are sufficiently motivated to act.

Barrier and Benefit Research

Once the behavior(s) have been selected, we suggest that the Fish Habitat GIT consider selecting a local community group to collaborate with for the remaining steps. Barriers and benefits can be very

localized (such as, different social norms or available contractors). The results of the initial two steps can provide support for local groups to take a more strategic approach to their outreach. This approach can provide a balance to the Fish Habitat GIT working more broadly across the watershed by supporting multiple small groups and aggregating their research to inform subsequent research and programs. However, if the resources are available to conduct broad barrier and benefit research (such as through state-wide mail surveys), this step could stay with the Fish Habitat GIT, and instead the strategy development or piloting steps could be reliant on smaller groups.

1. Conduct research on the challenges the target audience faces to taking the prioritized actions. The format will depend on the audience and budget, as discussed in the *Barrier and Benefits* webinar. For example, a residential audience is best studied with either a mail survey or intercept interviews, depending on the budget, and a school or municipal audience will likely necessitate door-to-door interviews as a research format.
2. Depending on the budget and generalizability goals, this research can either be conducted internally, in collaboration with a university, or using a private consultant. Sample questions for intercept interviews are included as part of the webinar series on *Barrier and Benefit* research.
3. We recommend that the Fish Habitat GIT communicates with the Wetlands GIT during this process. While we recommend that Fish Habitat work through the prioritization process on their own to specifically prioritize fish habitats, collaborating with the Wetland GIT may help research funding go further.
    a. If Fish Habitat decides to focus on behaviors related to increased wetlands, installed living shorelines, or armor removal, the following resources may be helpful:
    b. CBP EPA Scope 13 work by Action Research on living shorelines (in progress);
    c. Colehour + Cohen, Applied Research Northwest, Social Marketing Services, Futurewise and Coastal Geologic Services' research on removing armoring in Puget Sound; and
    d. Nature Conservancy, Ducks Unlimited, NFWF, and Opinion Works's work on Landowner Attitudes Toward Wetland Restoration.

Strategy Development & Pilot Testing

As described in the previous barrier and benefit research section, this step may be more successfully carried out in partnership with local organization(s).

1. Once the barrier and benefit research has been conducted, the findings should be linked to strategies to help overcome barriers and leverage benefits that are meaningful to the audience. More information on this topic is available in the *Strategy Development* webinar. The key element is linking the barrier directly to a strategy. For example, if the primary barrier is forgetfulness, prompts are a good strategy to use. However, if forgetfulness is not a barrier, prompts would not be a useful tool.
2. Depending on the budget and organizational capacity, this research can either be conducted internally, in collaboration with a university, or using a private consultant with social science expertise. This ensures that social science tools are strategically paired with research findings and used intentionally with best practices of implementation.
3. The ultimate form of the end product depends on the research – **strategies should not be developed without fully understanding barriers/benefits unique to this context**.
4. Once strategies have been developed, CBSM recommends a small-scale pilot before full implementation. See the *Pilot Testing and Evaluation* webinar for more information. If piloting is successful, the results can be used to develop a "toolkit" type program that can be picked up by local organizations, such as customizable outreach documents and step-by-step instructions of how to implement in a local community.

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Scope 2 – Forest Buffers Consultation

Purpose

The goal of the consultations is to assist groups who are working to change behaviors that impact the health of the Chesapeake Bay by providing program recommendations that make best use of the community-based social marketing process and social science research. Each consultation began with a review of goals, status, needs, and challenges that were provided through worksheet responses, program summary documents, and a two-hour consultation meeting.

The purpose of this document is to summarize the outcomes of the review and consultation meeting discussion and offer suggestions for strategic next steps. The document begins with a description of community-based social marketing (CBSM) and a summary of the information collected during the consultation meeting organized under each of the CBSM steps. Following the summary, we have provided recommendations for next steps that will guide the Forest Buffers goal implementation team (GIT) in moving forward with CBSM.

Community-Based Social Marketing

CBSM has emerged as an effective alternative to traditional education campaigns (McKenzie-Mohr, 1996; 1999; 2011; McKenzie-Mohr, Lee, Schultz, & Kotler, 2011; Schultz & Tabanico, 2007; Tabanico & Schultz, 2018). CBSM is based upon research in the social sciences that demonstrates that behavior change is often most effectively achieved through initiatives delivered at the community level that focus on removing barriers to an activity while simultaneously enhancing the activity's benefits. CBSM brings together knowledge from the field of social marketing with a variety of behavior change "tools" drawn from social psychology, environmental psychology, and other social sciences. CBSM uses a five-step process to foster behavior change. These five steps are:

1. Selecting which behaviors to target;
2. Identifying the barriers and benefits to the selected behavior(s);
3. Developing strategies that reduce the barriers to the behavior(s) to be promoted, while simultaneously enhancing the benefits;
4. Piloting the strategies and determining which are most cost-effective ; and
5. Broadly implementing the most cost-effective strategies and conducting ongoing evaluation.

Forest Buffers Behavioral Review

In 2019, the Chesapeake Bay Program goal implementation teams (GIT) were introduced to CBSM as a process for developing behavior change programs. Four GITs were selected to receive support from CBSM experts so that they could more effectively apply the approach to their efforts. The information below frames the Forest Buffers GIT around relevant steps of CBSM.

Selecting the Behavior

The two-hour Forest Buffer GIT consultation meeting primarily focused on the first step in CBSM - selecting which behaviors to target. The Forest Buffer GIT is tasked with restoring riparian forest buffer and conserving existing buffers across the entire Chesapeake Bay. Given the breadth of this endeavor, the Forest Buffer GIT is understandably uncertain regarding how to prioritize specific sectors and behaviors over others, which is a key element in CBSM and in effective behavior change. Action Research worked with the team to discuss the availability of relevant information and data that could be used to guide prioritization.

The primary environmental outcome sought by the Forest Buffer GIT is to **maintain and increase the quality and quantity of riparian forest buffers, as well as prevent further degradation and reverse decline of already-impacted habitats**. To create successful programs, it is important for organizations to understand which audiences or sectors would have the greatest impact on their goals.

In discussions with the Forest Buffer GIT, the potential sectors/audiences include:

- Agricultural;
- Homeowners;
- Local governments; and
- Contractors/Technical Service Providers (TSPs).

Our understanding is that the Forest Buffers GIT may currently have insufficient data to develop a full understanding of what the highest priorities should be for increasing the quality and quantity of forest buffers. However, using the available data will still allow a more strategic approach to programming decisions than basing decisions on hunches or convenience. These behavior-focused programs could then be implemented by various organizations across the watershed to achieve broad changes.

Recommendations

Action Research has outlined a set of recommendations based on the available data sources and data gaps that were identified in the consultation meeting. The recommendations include analysis of existing data as well as some additional data collection. Overall, we recommend that the Forest Buffer GIT dedicate resources to refining their understanding of the highest priority sectors and the behaviors that will be most impactful in terms of increasing forest buffers. The GIT should refer to the CBSM webinar series, starting with the one-hour overview, for specific information on these topics and how to best approach them. As these are recorded, they will be available on the CBP communication website.[1]

[1] https://www.chesapeakebay.net/who/group/communications_workgroup

Narrow Focus by Identifying Key Sectors

The Forest Buffers GIT identified existing work that can be leveraged before any new research is conducted. This phased approach will help to ensure efficiency in the spending of research funds.

1. Use GIS layers to better understand what land types have the most potential for preserving or increasing forest buffers, such as GIS layers that show current land use (residential, agricultural, municipal), existing forest buffers coverage, and miles of "bufferable" land.
    a. This information can be used to answer questions such as, "What geographic area is in the most need for increased forest buffers?" and "What is the most significant threat to forest buffers?"
    b. Focusing on a specific sector (audience) and ultimately a specific behavior will be critical for successfully motivating action. Barriers and benefits vary significantly between different actions (e.g., there are different challenges regarding a resident planting trees on their own versus engaging with a program that provides support for tree planting) and different audiences (e.g., different challenges exist with respect to agricultural land as compared to residential land).
    c. Based on the initial discussion at the consultation meeting, agriculture was identified as the likely primary audience as the group suspected the greatest opportunity for enhancing forest buffers existed on agricultural property. This suspicion should be confirmed by reviewing available data sources.
2. Review other work to see if there are data that can be leveraged to prioritize sectors or audiences. Useful data sources may include surveys of property owners, regional data on planting practices, water implementation plan (WIP) goals, and academic research.
    a. Consider if data can be used to create pie charts that mimic the pie charts on energy usage in the *Selecting Behaviors* webinar (see section on *Strategic Selection*) to narrow the team's focus.
3. Based on the results of bullets one and two:
    a. If a top sector emerges, move to creating a behavior list for that sector.
    b. If no clear sector emerges, move to creating a behavior list with the top two sectors in mind, and use the additional behavior list data collection effort to further refine the sector.

Create a Behavior List

After the sector(s) have been prioritized, we recommend that the Forest Buffer GIT create a list of end-state, non-divisible behaviors[2] that lead to direct positive impacts on increased or conserved forest buffers, and determine what data are available to prioritize the actions. Ultimately, by focusing on behaviors that have the best combination of impact, probability and penetration, the chance that the improved fish habitats will be achieved is increased. See the webinar on *Selecting Behaviors* for more information.

1. Create an initial list of end-state, non-divisible behaviors. See the table below, which includes behaviors mentioned during the consultation meeting. These behaviors focus on the goal of increased buffers, but the team may want to also consider behaviors that meet the goal of protecting existing buffers. It is important to note that behaviors 1, 2, and 3, may be further divisible by the species of trees being planted, if there are likely different barriers with tree species (such as, higher cost or different actions for prep or maintenance)

#	What is the Behavior?	Part of behavior chain?
1	**Owners DIY planting riparian forest buffers on agricultural land**	☐ YES ☐ NO
2	**Program supported riparian forest buffers planting on agricultural land**	☐ YES ☐ NO
3	**Leaving lands untouched to regrow forests**	☐ YES ☐ NO
4		☐ YES ☐ NO
5		☐ YES ☐ NO

[2] End-state is defined as by doing the behavior, forest buffers are improved or increased. Non-divisible is defined as the behavior cannot be divided into smaller sub-actions.

Prioritize Behaviors

1. Conduct a short survey of forest buffer experts to gather independent ratings on the impact of each behavior. See webinar on *Selecting Behaviors* (section on *Impact*) for more information. The survey might have two impacts, increased acreage and increased forest buffer health, as well as any additional impacts of interest, such as improved water quality. A sample of a survey to collect impact information from a project focused on human-wildlife conflict reduction is below.

HUMAN-WILDLIFE CONFLICT

1. There are many actions that a resident can engage in to **reduce human-wildlife conflict**. Using a scale from 0 to 10, where 0 means ***no impact*** and 10 means ***significant impact***, how much of an impact do you feel each of the following actions would have on **reduce human-wildlife conflict in residential areas**?

		No Impact										**Significant Impact**
A	Residents place garbage out on the curb for pick-up within the timeframe identified by community bylaws and as near to pick up time as possible.	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
B	Residents store garbage indoors in a secure location.	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
C	Residents store garbage in a secure shed.	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
D	Residents store garbage in a certified bear-resistant container.	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐

2. Create a table that combines the data from the forest buffer experts with available data on the penetration (using data such as voluntary reporting of planting, permit databases, GIS data, or surveys/academic research to understand how many members of the target audience have already taken this action), probability (using survey research or case studies to understand how likely audience members are to take the action), and applicability (GIS maps of forest abundance or observational data recorded along the water to understand the percentage of the audience members that could take the action) of each behavior on the list.
    a. It is possible that not all columns will be filled in. For example, there may not be survey data about probability, or the current penetration may be dated. However, the GIT can still prioritize a few behaviors (3 to 5) for further research. The behaviors would be prioritized based on the weight that is determined by multiplying impact by applicability (if the other two factors are not available).
    b. In this situation, the GIT can include questions about any missing penetration, probability, and applicability data in the barrier and benefit research and use them to further prioritize between the top 3 to 5 behaviors.

c. A sample blank table is below. The last column, **Weight**, is calculated by multiplying **Impact*Probability*Reach*Applicability**. The weight is used to prioritize between behaviors.

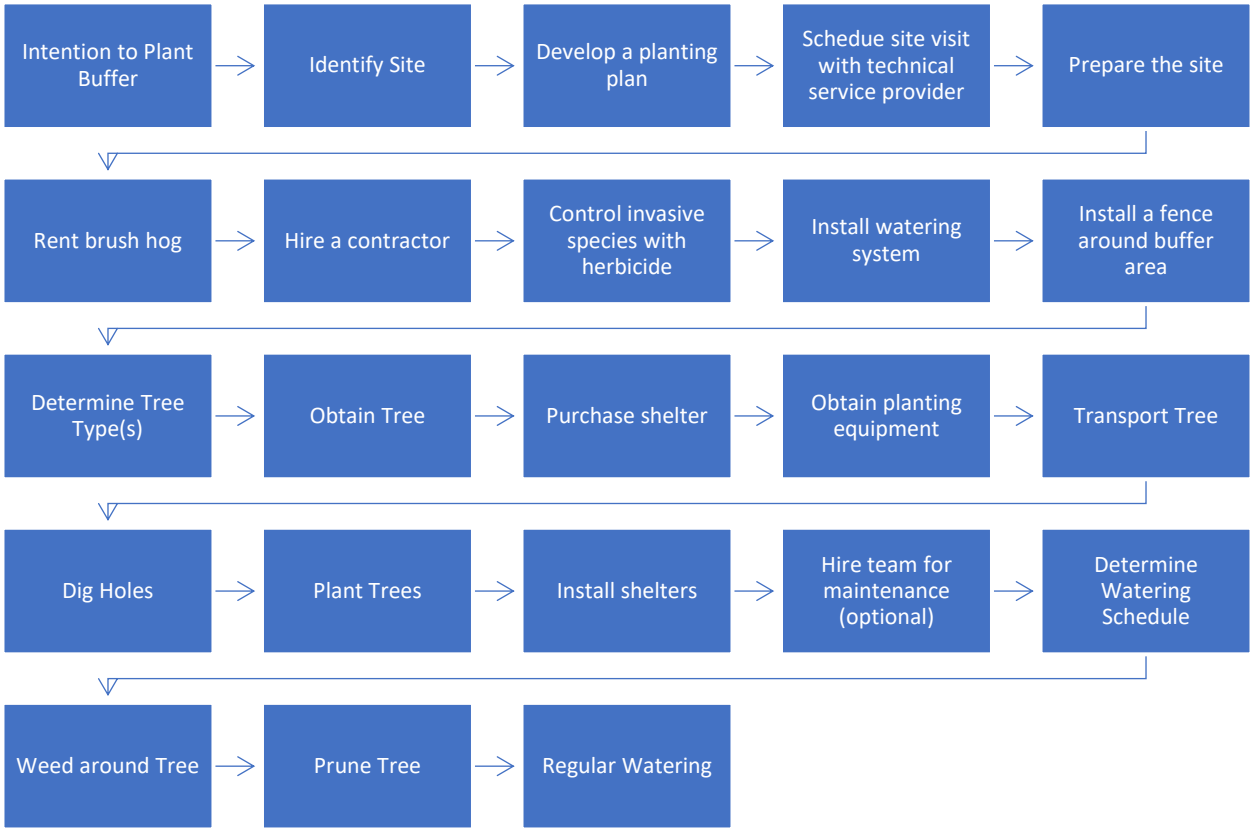
Behavior	Impact	Probability	Penetration	Reach (1-Penetration)	Applicability	Weight (I*P*R*A)

Map Behavior Chains

Where relevant in the prioritized actions, map the behavior beginning with “Intent to Act” to the completed action that establishes or preserves forest buffers. See webinar on *Selecting Behaviors* (section on *Behavior Chains*) for more information.

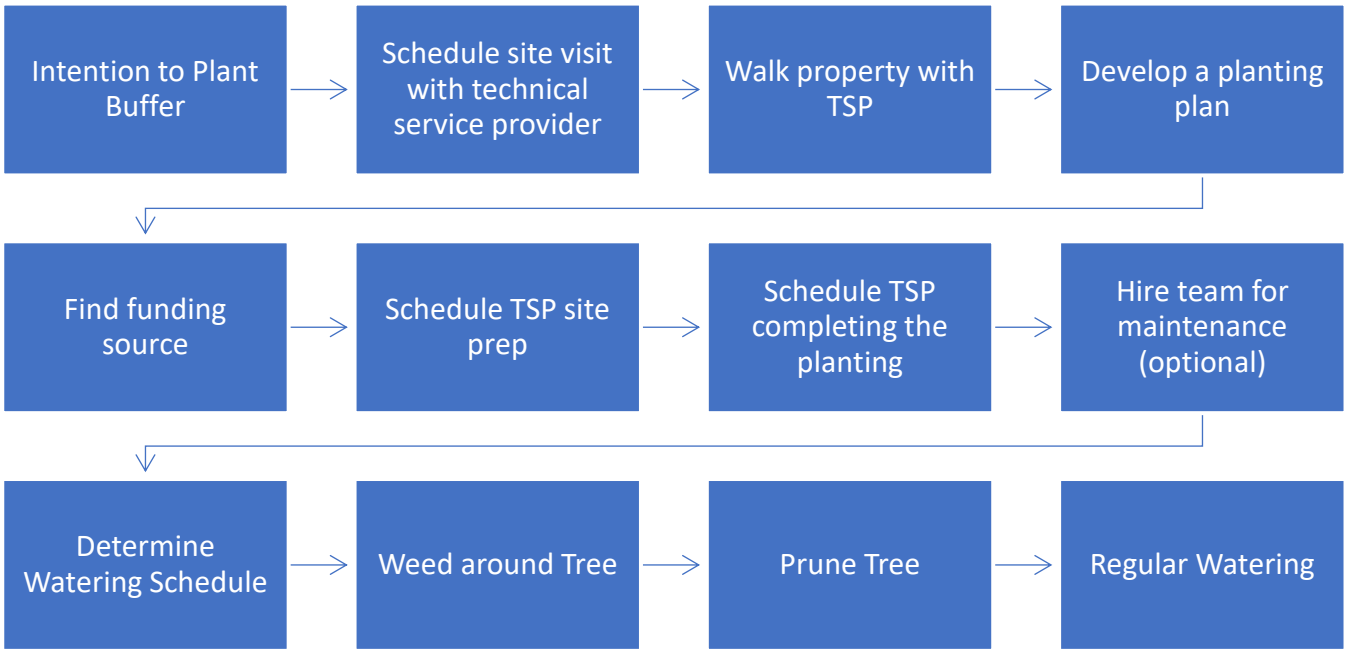
1. Several behavior chains were mapped during the meeting, below. We recommend that the GIT draw these chains out so that various forks in the path can be further detailed.
    a. For example, once the landowner has done their site selection, they may have an option of completing the long-term maintenance themselves or with a hired team, which has a different pathway. Moreover, there may be other paperwork steps in the program support plantings, or if these chains look different with different tree types.

Behavior Chain – Plant DIY RFB

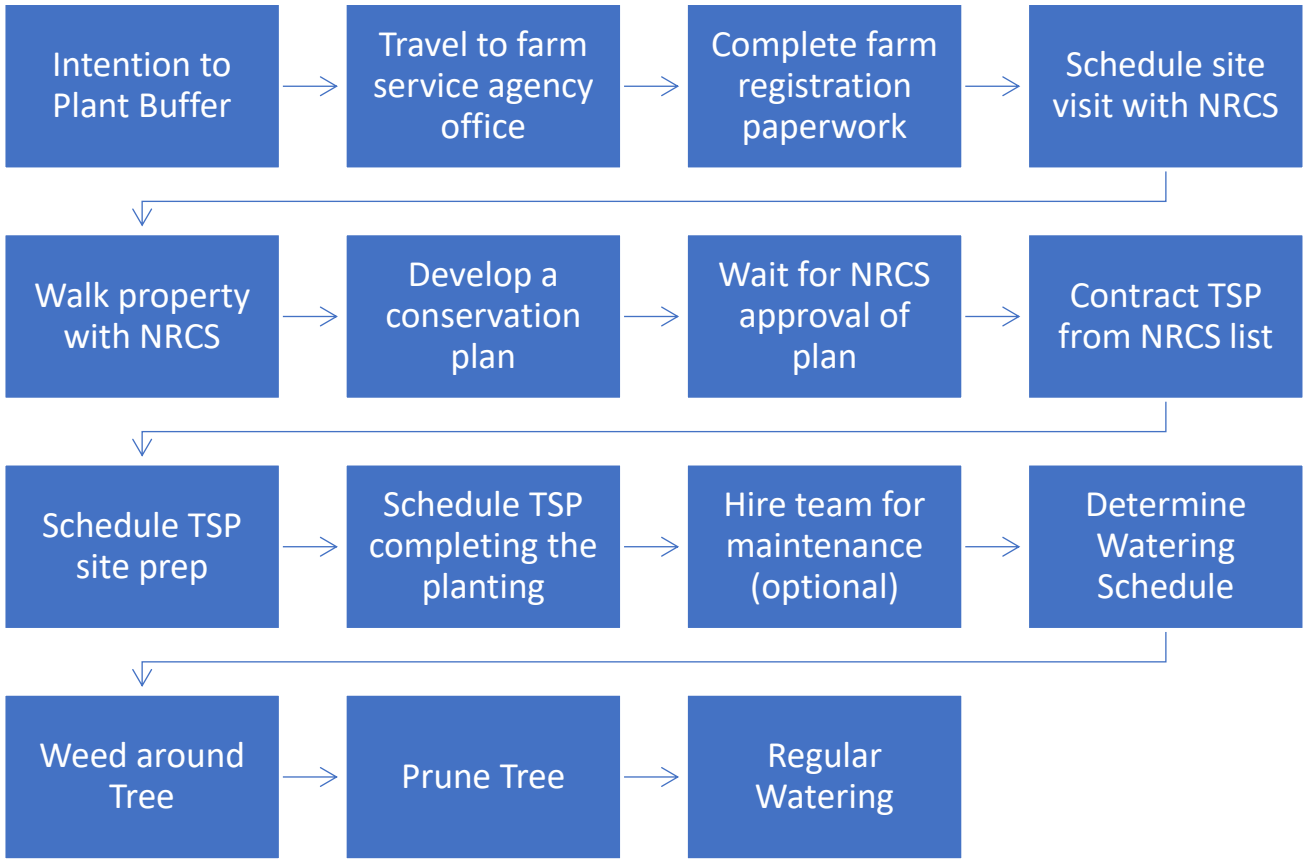


Behavior Chain – Program supported RFB Planting – Two options

General Program



CREP RFP Planting



2. Mapping the chain can help the GIT identify potential barriers or benefits. For example, the chain demonstrates that there may be knowledge barriers around which tree types are best or transportation barriers to obtaining a tree. Further, the chain helps to isolate “chain sections” where programs may be able to shorten the chain by removing actions (such as, providing tree delivery and planting). It can also demonstrate visually how difficult an ask a behavior might be and how important it is to address all the barriers participants face, even after they are sufficiently motivated to act.

Barrier and Benefit Research

Once the behavior(s) have been selected, we suggest that the Forest Buffer GIT consider selecting a local community group to collaborate with for the remaining steps. Barriers and benefits can be very localized (such as, different social norms or available contractors). The results of the initial two steps can provide support for local groups to take a more strategic approach to their outreach. This approach can provide a balance to the Forest Buffer GIT working more broadly across the watershed by supporting multiple small groups and aggregating their research to inform subsequent research and programs. However, if the resources are available to conduct broad barrier and benefit research (such as through state-wide mail surveys), this step could stay with the Forest Buffer GIT, and instead the strategy development or piloting steps could include smaller groups.

1. Conduct research on the challenges the target sector faces to taking the prioritized actions. The format will depend on the audience and budget, as discussed in the *Barrier and Benefits* webinar. For example, a residential audience is best studied with either a mail survey or intercept interviews, depending on the budget, while an agricultural audience may be better suited for a mail survey or door-to-door interviews, and a commercial audience will likely necessitate door-to-door interviews as a research format.
2. As this audience is primarily rural or agricultural, there are specific methodologies that can increase the likelihood of a good sample.
    a. First, if conducting a mail survey, obtaining a clean address list will be key – rural lists often have more bad addresses than a typical urban or suburban list.
    b. Second, consider the messenger for the survey/research effort – Who is the most trustworthy organization for this audience? Agricultural audiences may be less trusting of governmental groups.
3. Depending on the budget and generalizability goals, this research can either be conducted internally, in collaboration with a university, or using a private consultant. Sample questions for intercept interviews are included as part of the webinar series on *Barrier and Benefit* research.
4. We recommend leveraging existing research on tree planting to understand the range of potential barriers and benefits that should be included in a research effort. The Forest Buffer GIT has access to research on agricultural, urban, and suburban audiences who have buffer gaps as compared to those audiences who do not have buffer gaps, and findings on the differences between these groups can be leveraged for this work.

Strategy Development & Piloting

As described in the previous barrier and benefit research section, this step may be more successfully carried out in partnership with local organization(s).

1. Once the barrier and benefit research has been conducted, the findings should be linked to strategies to help overcome barriers and leverage benefits that are meaningful to the audience. More information on this topic is available in the *Strategy Development* webinar. The key element is linking the barrier directly to a strategy. For example, if the primary barrier is forgetfulness, prompts are a good strategy to use. However, if forgetfulness is not a barrier, prompts would not be a useful tool.
2. Depending on the budget and organizational capacity, this research can either be conducted internally, in collaboration with a university, or using a private consultant with social science expertise. This ensures that social science tools are strategically paired with research findings and used intentionally with best practices of implementation.
3. The ultimate form of the end product depends on the research – **strategies should not be developed without fully understanding barriers/benefits unique to this context**.
4. Once strategies have been developed, CBSM recommends a small-scale pilot before full implementation. See the *Pilot Testing and Evaluation* webinar for more information. If piloting is successful, the results can be used to develop a "toolkit" type program that can be picked up by local organizations, such as customizable outreach documents and step-by-step instructions of how to implement in a local community.

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Scope 2 – Tree Canopy Consultation

Purpose

The goal of the consultations is to assist groups who are working to change behaviors that impact the health of the Chesapeake Bay by providing program recommendations that make best use of the community-based social marketing process and social science research. Each consultation began with a review of group goals, status, needs, and challenges that were provided through worksheet responses, program summary documents, and a two-hour consultation meeting.

The purpose of this document is to summarize the outcomes of the review and consultation meeting discussion and offer suggestions for strategic next steps. The document begins with a description of community-based social marketing (CBSM) and a summary of the information collected during the consultation meeting organized under each of the CBSM steps. Following the summary, we have provided recommendations for next steps that will guide the Tree Canopy goal implementation team (GIT) in moving forward with CBSM.

Community-Based Social Marketing

CBSM has emerged as an effective alternative to traditional education campaigns (McKenzie-Mohr, 1996; 1999; 2011; McKenzie-Mohr, Lee, Schultz, & Kotler, 2011; Schultz & Tabanico, 2007; Tabanico & Schultz, 2018). CBSM is based upon research in the social sciences that demonstrates that behavior change is often most effectively achieved through initiatives delivered at the community level that focus on removing barriers to an activity while simultaneously enhancing the activity's benefits. CBSM brings together knowledge from the field of social marketing with a variety of behavior change "tools" drawn from social psychology, environmental psychology, and other social sciences. CBSM uses a five-step process to foster behavior change. These five steps are:

1. Selecting which behaviors to target;
2. Identifying the barriers and benefits to the selected behavior(s);
3. Developing strategies that reduce the barriers to the behavior(s) to be promoted, while simultaneously enhancing the benefits;
4. Piloting the strategies and determining which are most cost-effective ; and
5. Broadly implementing the most cost-effective strategies and conducting ongoing evaluation.

Tree Canopy Behavioral Review

In 2019, the Chesapeake Bay Program goal implementation teams (GIT) were introduced to CBSM as a process for developing behavior change programs. Four GITs were selected to receive support from CBSM experts so that they could more effectively apply the approach to their efforts. The information below frames the Tree Canopy GIT around the relevant steps of CBSM.

Selecting the Behavior

The two-hour Tree Canopy GIT consultation meeting primarily focused on the first step in CBSM - selecting which behaviors to target. The Tree Canopy GIT is tasked with increasing and protecting urban tree canopy across the entire Chesapeake Bay. Given the breadth of this endeavor, the Tree Canopy GIT is understandably uncertain regarding how to prioritize specific sectors and behaviors over others, which is a key element in CBSM and in effective behavior change. Action Research worked with the team to discuss the availability of relevant information and data that could be used to guide prioritization.

The primary environmental outcome sought by the Tree Canopy GIT is to **maintain and increase the quality and quantity of urban tree canopies in the Chesapeake Bay.** To create successful programs, it is important for organizations to understand which audiences or sectors would have the greatest impact on their goals.

In discussions with the Tree Canopy GIT, the potential sectors/audiences include:

- Homeowners;
- Local governments; and,
- Schools.

Our understanding is that the Tree Canopy GIT may currently have insufficient data to develop a full understanding of what the highest priorities should be for increasing the quality and quantity of tree canopies. However, using the available data will still allow a more strategic approach to programming decisions than basing decisions on hunches or convenience. These behavior-focused programs could then be implemented by various organizations across the watershed to achieve broad changes.

Recommendations

Action Research has outlined a set of recommendations based on the available data sources and data gaps that were identified in the consultation meeting. The recommendations include analysis of existing data as well as some additional data collection. Overall, we recommend that the Tree Canopy GIT dedicate resources to refining their understanding of the highest priority sectors and the behaviors that will be most impactful to increase the quality and quantity of urban tree canopy. The GIT should refer to the CBSM webinar series, starting with the one-hour overview, for specific information on these topics and how to best approach them. As these are recorded, they will be available on the CBP communication website.[1]

[1] https://www.chesapeakebay.net/who/group/communications_workgroup

Narrow Focus by Identifying Key Sectors

The Tree Canopy GIT identified existing work that can be leveraged before any new research is conducted. This phased approach will help to ensure efficiency in the spending of research funds.

1. Use GIS layers to better understand what land types have the most potential for protecting or increasing tree canopy, such as layers that show current land use (residential, agricultural, municipal) and existing tree canopy coverage.
    a. This information can be used to answer questions such as, “What geographic area is in the most need for increased tree canopy?” and “What is the most significant threat to tree canopy?”
    b. Focusing on a specific sector and ultimately a specific behavior will be critical for successfully motivating action. Barriers and benefits vary significantly between different actions (e.g., there are different challenges regarding a resident planting trees on their own versus engaging with a program that provides support for tree planting) and different audiences (e.g., different challenges exist with respect to public land as compared to residential land).
    c. Based on the initial discussion at the consultation meeting, the residential community was identified as the likely primary audience as the group suspected the greatest opportunity for enhancing canopy existed on residential property. This suspicion should be confirmed by reviewing available data sources.
2. Review other work to see if there are data that can be leveraged to prioritize sectors or audiences. Useful data sources may include surveys of property owners, regional data on planting practices, water implementation plan (WIP) goals, and academic research.
    a. Consider if data can be used to create pie charts that mimic the pie charts on energy usage in the *Selecting Behaviors* webinar (see section on *Strategic Selection*) to narrow the team’s focus.
    b. It was indicated in the meeting that there was a social marketing database that had tree planting research, which may be useful for prioritizing sectors, selecting behaviors, and determining potential barriers and benefits.
3. Based on the results of bullets one and two:
    a. If a top sector emerges, move to create a behavior list for that sector.
    b. If no clear sector emerges, move to create a behavior list with the top two sectors in mind, and use the additional behavior list data collection effort to further refine the sector.

Create a Behavior List

After the sector(s) have been prioritized, we recommend that the Tree Canopy GIT create a list of end-state, non-divisible[2] behaviors that lead to direct positive impacts on increased or conserved tree canopy, and determine what data are available to prioritize the actions. Focusing on behaviors that have the best combination of impact, probability and penetration will increasing the chance that an increase in tree canopy acreage will be achieved. See the webinar on *Selecting Behaviors* for more information.

1. Create an initial list of end-state, non-divisible behaviors. See the table below, which includes behaviors mentioned during the consultation meeting. These behaviors focus on the goal of increased tree canopy, but the team may want to also consider behaviors that meet the goal of protecting existing canopy. It is important to note the behaviors may be further divisible by the species of trees being planted, if there are likely different barriers with tree species (such as, higher cost or different actions for prep or maintenance).

#	What is the Behavior?	Part of behavior chain?
1	**Owners DIY planting trees on private land**	☐ YES ☐ NO
2	**Program supported tree planting on private land**	☐ YES ☐ NO
3	**Program supported tree planting on school land**	☐ YES ☐ NO
4	**Program supported tree planting on public land**	☐ YES ☐ NO
5		☐ YES ☐ NO

[2] End-state is defined as by doing the behavior, tree canopy is improved or increased. Non-divisible is defined as the behavior cannot be divided into smaller sub-actions.

Prioritize Behaviors

1. Conduct a short survey of tree canopy experts to gather independent ratings on the impact of each behavior. See webinar on *Selecting Behaviors* (section on *Impact*) for more information. The survey might have two impacts, increased acreage and increased canopy health, as well as any additional impacts of interest, such as increased habitat. A sample of a survey to collect impact information from a project focused on human-wildlife conflict reduction is below.

HUMAN-WILDLIFE CONFLICT

1. There are many actions that a resident can engage in to **reduce human-wildlife conflict**. Using a scale from 0 to 10, where 0 means ***no impact*** and 10 means ***significant impact***, how much of an impact do you feel each of the following actions would have on **reducing human-wildlife conflict in residential areas**?

		No Impact										Significant Impact
A	Residents place garbage out on the curb for pick-up within the timeframe identified by community bylaws and as near to pick up time as possible.	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
B	Residents store garbage indoors in a secure location.	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
C	Residents store garbage in a secure shed.	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
D	Residents store garbage in a certified bear-resistant container.	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐

2. Create a table that combines the data from the tree canopy experts with available data on the penetration (using data such as voluntary reporting of planting, permit databases, or surveys/academic research to understand how many members of the target audience have already taken this action), probability (using survey research or case studies to understand how likely audience members are to take the action), and applicability (GIS maps of forest abundance or observational data recorded along the water to understand the percentage of the audience members that could take the action) of each behavior on the list.
    a. The consultation meeting identified that there was likely existing data on tree planting that could be used for this work. Action Research conducted a pilot in the City of Bowie on residential tree planting, the results of which could be leveraged, and were sent with this memo. Additionally, during the meeting, Doug McKenzie-Mohr distributed a study from TreePeople, conducted by Action Research, on urban planting.
    b. It is possible that not all columns will be filled in. For example, there may not be survey data about probability, or the current penetration may be dated. However, the GIT can still prioritize a few behaviors (3 to 5) for further research. The behaviors would be prioritized based on the weight that is determined by multiplying impact by applicability (if the other two factors are not available).

c. In this situation, the GIT can include questions about any missing penetration, probability, and applicability data in the barrier and benefit research and use them to further prioritize between the top 3 to 5 behaviors.
d. A sample blank table is below. The last column, **Weight,** is calculated by multiplying **Impact*Probability*Reach*Applicability**. The weight is used to prioritize between behaviors.

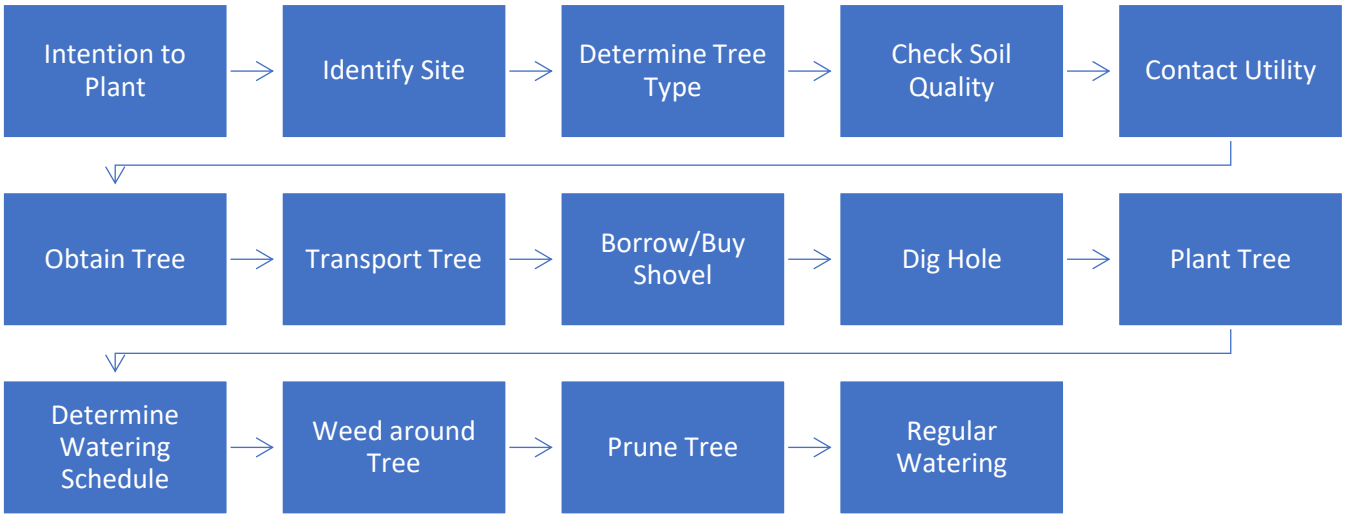
Behavior	Impact	Probability	Penetration	Reach (1-Penetration)	Applicability	Weight

Map Behavior Chains

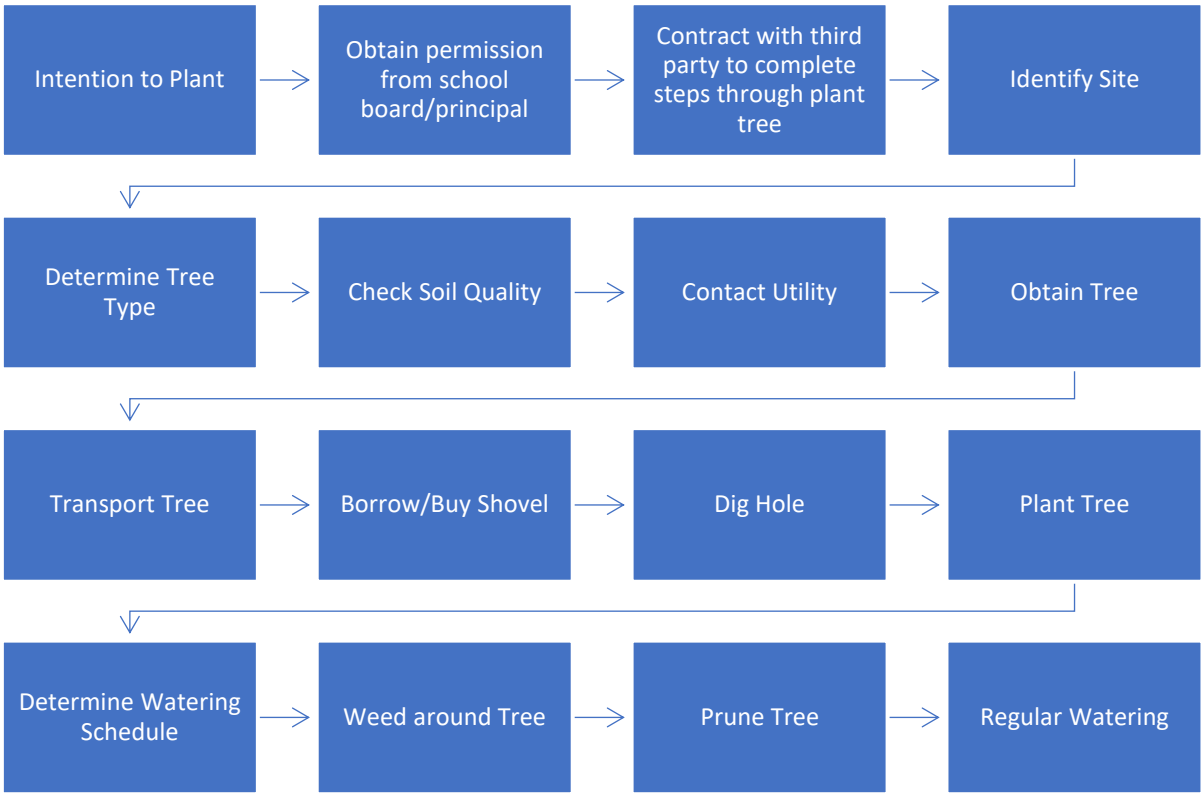
Where relevant in the prioritized actions, map the behavior beginning with “Intention to Act” to the completed action that establishes or preserves a tree canopy. See webinar on *Selecting Behavior*s (section on *Behavior Chains*) for more information.

1. Several behavior chains were mapped during the meeting, below. We recommend that the GIT draw these chains out so that various forks in the path can be further detailed.
    a. For example, once the homeowner has done their site selection, they may have an option of completing the process on their own or working with a local government program, which has a different pathway.

Behavior Chain – Residential DIY



Behavior Chain – School



2. Mapping the chain can help the GIT identify potential barriers or benefits. For example, the chain demonstrates that there may be knowledge barriers around tree types or transportation barriers to obtaining a tree. Further, the chain helps to isolate “chain sections” where programs may be able to shorten the chain by removing actions (such as, providing tree delivery and planting). It can also demonstrate visually how difficult an ask a behavior might be and how important it is to address all the barriers participants face, even after they are sufficiently motivated to act.

Barrier and Benefit Research

Once the behavior(s) have been selected, we suggest that the Tree Canopy GIT consider selecting a local community group to collaborate with for the remaining steps. Barriers and benefits can be regionally localized (such as, different social norms or available contractors). The results of the initial two steps can provide support for local groups to take a more strategic approach to their outreach. This approach can provide a balance to the Tree Canopy GIT working more broadly across the watershed by supporting multiple small groups and aggregating their research to inform subsequent research and programs. However, if the resources are available to conduct broad barrier and benefit research (such as through state-wide mail surveys), this step could stay with the Tree Canopy GIT, and instead the strategy development or piloting steps could include smaller groups.

1. Conduct research on the challenges the target audience faces to taking the prioritized actions. The format will depend on the audience and budget, as discussed in the *Barrier and Benefits* webinar. For example, a residential audience is best studied with either a mail survey or intercept interviews, depending on the budget, and a school or municipal audience will likely necessitate door-to-door interviews as a research format.
2. Depending on the budget and generalizability goals, this research can either be conducted internally, in collaboration with a university, or using a private consultant. Sample questions for intercept interviews are included as part of the webinar series on *Barrier and Benefit* research.
3. We recommend leveraging existing research on tree planting to understand the range of potential barriers and benefits that should be included in a research effort. The Forest Buffer GIT may be able to provide access to a research study on agricultural, urban, and suburban research on individuals who have buffer gaps compared to those who do not, and findings on the differences between these groups. Action Research has not reviewed the study but the information on barriers and benefits for planting buffers may be a good starting point for tree canopy work.

Strategy Development & Pilot Testing

As described in the previous barrier and benefit research section, this step may be more successfully carried out in partnership with local organization(s).

1. Once the barrier and benefit research has been conducted, the findings should be linked to strategies to help overcome barriers and leverage benefits that are meaningful to the audience. More information on this topic is available in the *Strategy Development* webinar. The key element is linking the barrier directly to a strategy. For example, if the primary barrier is forgetfulness, prompts are a good strategy to use. However, if forgetfulness is not a barrier, prompts would not be a useful tool.
2. Depending on the budget and organizational capacity, this research can either be conducted internally, in collaboration with a university, or using a private consultant with social science expertise. This ensures that social science tools are strategically paired with research findings and used intentionally with best practices of implementation.
3. The ultimate form of the end product depends on the research – **strategies should not be developed without fully understanding barriers/benefits unique to this context**. However, given our understanding of barriers to tree planting, a program could be designed that provides a guide for local communities to communicate with residential owners about the benefits homeowners would receive from trees, leveraging social norms. Given the high level of difficulty and large amount of knowledge needed to properly plant a tree, the program might lay out how local communities should provide assistance throughout the planting process. Although they will be able to reach fewer households, they will be more likely to successfully get trees in the ground. This approach was recommended by Action Research in our work in the City of Bowie. This is only provided as an example that could be developed. As the GIT works through the process, they may not choose to focus on tree planting, but instead on behaviors that increase the health of existing tree canopies.
4. Once strategies have been developed, CBSM recommends a small-scale pilot before full implementation. See the *Pilot Testing and Evaluation* webinar for more information. If piloting is successful, the results can be used to develop a “toolkit” type program that can be picked up by local organizations, such as customizable outreach documents and step-by-step instructions of how to implement in a local community.

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Scope 2 – Wetlands Consultation

Purpose

The goal of the consultations is to assist groups who are working to change behaviors that impact the health of the Chesapeake Bay by providing program recommendations that make best use of the community-based social marketing process and social science research. Each consultation began with a review of group goals, status, needs, and challenges that were provided through worksheet responses, program summary documents, and a two-hour consultation meeting.

The purpose of this document is to summarize the outcomes of the review and consultation meeting discussion and offer suggestions for strategic next steps. The document begins with a description of community-based social marketing (CBSM) and a summary of the information collected during the consultation meeting organized under each of the CBSM steps. Following the summary, we have provided recommendations for next steps that will guide the GIT in moving forward with CBSM.

Community-Based Social Marketing

CBSM has emerged as an effective alternative to traditional education campaigns (McKenzie-Mohr, 1996; 1999; 2011; McKenzie-Mohr, Lee, Schultz, & Kotler, 2011; Schultz & Tabanico, 2007; Tabanico & Schultz, 2018). CBSM is based upon research in the social sciences that demonstrates that behavior change is often most effectively achieved through initiatives delivered at the community level that focus on removing barriers to an activity while simultaneously enhancing the activity's benefits. CBSM brings together knowledge from the field of social marketing with a variety of behavior change "tools" drawn from social psychology, environmental psychology, and other social sciences. CBSM uses a five-step process to foster behavior change. These five steps are:

1. Selecting which behaviors to target;
2. Identifying the barriers and benefits to the selected behavior(s);
3. Developing strategies that reduce the barriers to the behavior(s) to be promoted, while simultaneously enhancing the benefits;
4. Piloting the strategies and determining which are most cost-effective ; and
5. Broadly implementing the most cost-effective strategies and conducting ongoing evaluation.

Wetlands Behavioral Review

In 2019, the Chesapeake Bay Program goal implementation teams (GIT) were introduced to CBSM as a process for developing behavior change programs. Four GITs were selected to receive support from CBSM experts so that they could more effectively apply the approach to their efforts. The information below frames the Wetlands GIT around relevant steps of CBSM.

Selecting the Behavior

The two-hour Wetlands GIT consultation meeting primarily focused on the first step in CBSM - selecting which behaviors to target. The Wetlands GIT group is tasked with increasing and enhancing wetland acreage across the entire Chesapeake Bay through efforts that improve water quality, provide recreational value, slow erosion, provide habitat, protect land from flooding, and store carbon. Given the breadth of their endeavor, the Wetlands GIT is understandably uncertain regarding how to prioritize specific sectors and behaviors over others, which is a key element in CBSM and in effective behavior change. Action Research worked with the team to discuss the availability of relevant information and data that could be used to guide prioritization.

The primary environmental outcome sought by the Wetland GIT is **increasing the acreage of tidal and non-tidal wetlands in the Chesapeake watershed**. To create successful programs, it is important for organizations to consider which audiences or sectors are most important to target based on a consideration of which would have the greatest impact on wetlands.

In discussions with the Wetlands GIT, the potential sectors/audiences include:

- Agricultural;
- Residential;
- Municipal/public; and
- Urban/commercial.

Our understanding is that the Wetlands GIT may currently have insufficient data to develop a full understanding of what the highest priorities should be for increasing the quality and quantity of wetlands. However, using the available data will still allow a more strategic approach to programming decisions than basing decisions on hunches or convenience. These behavior-focused programs could then be implemented by various organizations across the watershed to achieve broad changes.

Recommendations

Action Research has outlined a set of recommendations based on the available data sources and data gaps that were identified in the consultation meeting. The recommendations include analysis of existing data as well as some additional data collection. Overall, we recommend that the Wetlands GIT dedicate resources to refining their understanding of the highest priority sectors and the behaviors that will be most impactful in terms of increasing the acreage of wetlands. The GIT should refer to the CBSM webinar series, starting with the one-hour overview, for specific information on these topics and how to

best approach them. As these are recorded, they will be available on the CBP communication workgroup site.[1]

Narrow Focus by Identifying Key Sectors

The Wetlands GIT identified existing work that can be leveraged before any new research is conducted. This phased approach will help to ensure efficiency in the spending of research funds. This phased approach will help to ensure efficiency in the spending of research funds.

1. Use GIS layers to better understand what land types have the most potential for increased wetland acreage, such as layers that show current land use (residential, agricultural, municipal), miles of hardened shorelines, and existing wetlands.
    a. The group discussed that GIS data is problematic for several reasons including age of data sets, lack of reporting, and funding. These issues are important to report along with the data to provide context – however, it is our understanding this is the best available data to make these decisions.
    b. This information should be used to answer questions such as, ""What geographic area is in the most need for increased wetlands?" and "What is the most significant threat to wetlands?"
    c. Focusing on a specific sector (audience), stressor (threat to wetlands), and ultimately a specific behavior, will be critical for successfully motivating action. Barriers and benefits vary significantly between different actions (e.g., there are different challenges regarding a resident creating wetlands on their own versus engaging with a program that provides support for wetland installation) and different audiences (e.g., different challenges exist with respect to public land as compared to residential land).
2. Review other work to see if there are data that can be leveraged to prioritize sectors or audiences. Useful data sources may include shoreline permit data, surveys on property owners, water implementation plan (WIP) goals, and academic research.
    a. Consider if data can be used to create pie charts that mimic the pie charts on energy usage in the *Selecting Behaviors* webinar (see section on *Strategic Selection*). Creating these charts with the best available data will narrow the GIT's focus.
3. Based on the results of bullets one and two:
    a. If a top sector emerges, move to creating a behavior list for that sector.
    b. If no clear sector emerges, move to creating a behavior list with the top two sectors in mind, and use the additional behavior list data collection effort to further refine the list.

[1] https://www.chesapeakebay.net/who/group/communications_workgroup

Create a Behavior List

After the sector(s) have been prioritized, we recommend that the Wetlands GIT create a list of end-state, non-divisible[2] behaviors that lead to direct positive impacts on wetlands, and determine what data are available to prioritize the actions. Focusing on behaviors that have the best combination of impact, probability and penetration will increasing the chance that an increase in wetland acreage will be achieved. See the webinar on *Selecting Behaviors* for more information.

1. Create an initial list of end-state, non-divisible behaviors. See table below.

#	What is the Behavior?	Part of behavior chain?
1		☐ YES ☐ NO
2		☐ YES ☐ NO
3		☐ YES ☐ NO
4		☐ YES ☐ NO
5		☐ YES ☐ NO

[2] End-state is defined as by doing the behavior, wetlands are improved or increased. Non-divisible is defined as the behavior cannot be divided into smaller sub-actions.

Prioritize Behaviors

1. Conduct a short survey of wetlands experts to gather independent ratings on the impact of each behavior. See *Selecting Behavior* webinar (section on *Impact*) for more information. The survey might have two impacts, increased wetland acreage and increased wetland health, as well as any additional impacts of interest, such improved water quality. A sample of a survey to collect impact information from a project focused on human-wildlife conflict reduction is below.

HUMAN-WILDLIFE CONFLICT

1. There are many actions that a resident can engage in to **reduce human-wildlife conflict**. Using a scale from 0 to 10, where 0 means ***no impact*** and 10 means ***significant impact***, how much of an impact do you feel each of the following actions would have on **reduce human-wildlife conflict in residential areas**?

		No Impact										Significant Impact
A	Residents place garbage out on the curb for pick-up within the timeframe identified by community bylaws and as near to pick up time as possible.	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
B	Residents store garbage indoors in a secure location.	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
C	Residents store garbage in a secure shed.	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
D	Residents store garbage in a certified bear-resistant container.	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐

2. Create a table that combines the data from the wetland experts with available data on the penetration (using data such as voluntary reporting of wetlands, permit databases, or surveys/academic research to understand how many members of the target audience have already taken this action), probability (using survey research or case studies to understand how likely audience members are to take the action), and applicability (GIS maps of wetland abundance or observational data recorded along the water to understand the percentage of the audience members that could take the action) of each behavior on the list.
    a. It is possible that not all columns will be filled in. For example, there may not be survey data about probability, or the current penetration may be dated. However, the GIT can still prioritize a few behaviors (3 to 5) for further research. The behaviors would be prioritized based on the weight that is determined by multiplying impact by applicability (if the other two factors are not available).
    b. In this situation, the GIT can include questions about any missing penetration, probability, and applicability data in the barrier and benefit research and use them to further prioritize between the top 3 to 5 behaviors.

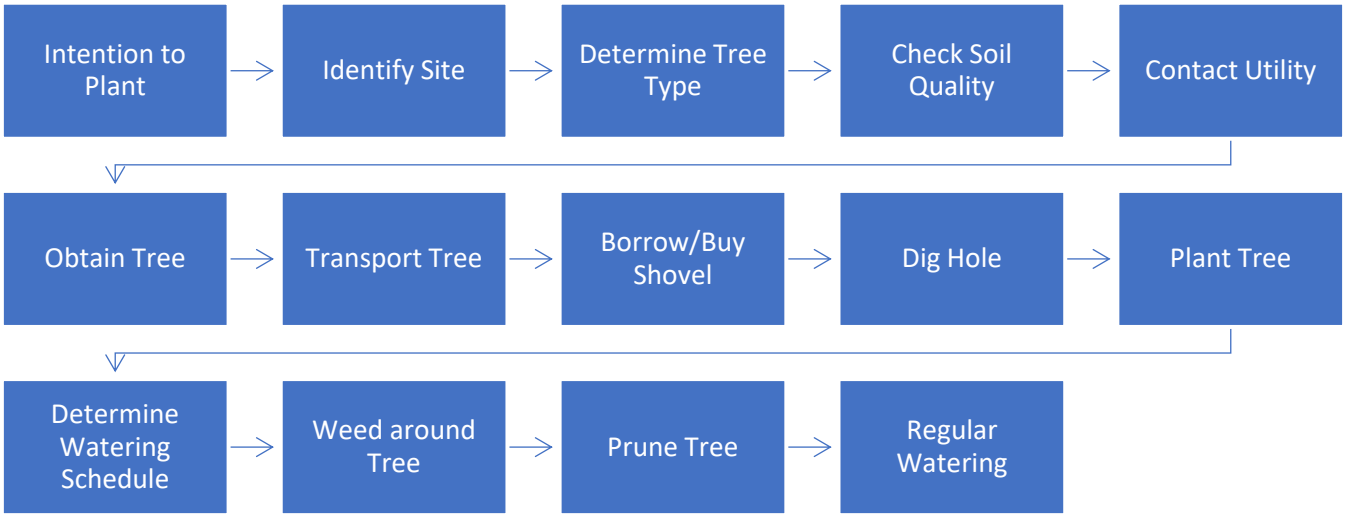
c. A sample blank table is below. The last column, **Weight,** is calculated by multiplying **Impact*Probability*Reach*Applicability**. The weight is used to prioritize between behaviors.

Behavior	Impact	Probability	Penetration	Reach (1-Penetration)	Applicability	Weight

Map Behavior Chains

Where relevant in the prioritized actions, map the behavior beginning with "Intention to Act" to the completed action that establishes or preserves a wetland. See webinar on *Selecting Behaviors* (section on *Behavior Chains*) for more information.

1. For example, for a behavior such as, "Plant trees on your residential property" the chain might look like the following:



2. Mapping the chain can help the Wetland GIT identify potential barriers or benefits (such as, in the example chain, the chain demonstrates there may be knowledge barriers around tree types or transportation barriers to transport a tree), as well as places where programs may be able to shorten the chain by removing actions (such as, providing tree delivery and planting). It can also demonstrate visually how difficult an ask a behavior might be and how important it is to address all the barriers participants face, even after they are sufficiently motivated to act.

Barrier and Benefit Research

Once the behavior(s) have been selected, we suggest that the Wetlands GIT consider selecting a local community group to collaborate with for the remaining steps. Barriers and benefits can be very localized (such as, different social norms or available contractors). The results of the initial two steps can provide support for local groups to take a more strategic approach to their outreach. This approach can provide a balance to the Wetlands GIT working more broadly across the watershed by supporting multiple small groups and aggregating their research to inform subsequent research and programs. However, if the resources are available to conduct broad barrier and benefit research (such as through state-wide mail surveys), this step could stay with the Wetlands GIT, and instead the strategy development or piloting steps could be reliant on smaller groups.

1. Conduct research on the challenges the target audience faces to taking the prioritized actions. The format will depend on the audience and budget, as discussed in the *Barrier and Benefits* webinar. For example, a residential audience is best studied with either a mail survey or intercept interviews, depending on the budget, and a commercial audience will likely necessitate door-to-door interviews as a research format.
2. Depending on the budget and generalizability goals, this research can either be conducted internally, in a collaboration with a university, or using a private consultant. Sample questions for intercept interviews are included as part of the webinar series on *Barrier and Benefit* research.
3. This group may also be well served to review the following:
    a. CBP EPA Scope 13 work by Action Research on living shorelines (in progress);
    b. Colehour + Cohen, Applied Research Northwest, Social Marketing Services, Futurewise and Coastal Geologic Services' research on removing armoring in Puget Sound; and
    c. Nature Conservancy, Ducks Unlimited, NFWF, and Opinion Works's work on Landowner Attitudes Toward Wetland Restoration.

Strategy Development & Pilot Testing

As described in the previous barrier and benefit research section, this step may be more successfully carried out in partnership with local organization(s).

1. Once the barrier and benefit research has been conducted, the findings should be linked to strategies to help overcome barriers and leverage benefits that are meaningful to the audience. More information on this topic is available in the *Strategy Development* webinar. The key element is linking the barrier directly to a strategy. For example, if the barrier is forgetfulness, prompts are a good strategy to use. However, if forgetfulness is not a barrier, prompts would not be a useful tool.
2. Depending on the budget and organizational capacity, this research can either be conducted internally, in collaboration with a university, or using a private consultant with social science expertise. This ensures that social science tools are strategically paired with research findings and used intentionally with best practices of implementation.
3. The ultimate form of the end product depends on the research – **strategies should not be developed without fully understanding barriers/benefits unique to this context**.
4. Once strategies have been developed, CBSM recommends a small-scale pilot before full implementation. See the *Pilot Testing and Evaluation* webinar for more information. If piloting is successful, the results can be used to develop a "toolkit" type program that can be picked up by local organizations, such as customizable outreach documents and step-by-step instructions of how to implement in a local community.

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