

Severn & Magothy SAV transect sampling results, 2007-2011
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Background and methods: Maryland DNR started a program in 2007 to enable watershed groups to do quantitative Submerged Aquatic Vegetation (SAV) sampling using modified oyster tongs. DNR provided instructions and equipment, as well as funding to some of the groups. In 2007 I worked with the South, Severn, and Magothy river watershed groups to do this sampling. DNR did not have additional funding for this after 2007 but I still had a set of equipment, so I've been working with the Severn and Magothy watershed groups to repeat sampling there. The South River group stopped sampling after 2007 because there were almost no grasses left, and let us use their tongs.

The three main SAV species we found in both rivers were widgeongrass (Rm), redhead grass (Ppf), and sago pondweed (Ppc). There was a tiny amount of a fourth species, slender pondweed (Ppu), in one Magothy transect in 2009, but it was left out of the results below.

The four transect sites in each river were chosen in 2007 to be near the centroids of historical SAV beds, along the range of where SAV is found in the river. Table 1 lists the four transect sites in each river. For maps of the transect sites, see Figs. 1 and 2; for depth profiles in each river, see Figs. A-1 and A-2 in the Appendix. For the 1994 SAV cover in both rivers, showing how the Asquith Creek and Gibson Island transects were in these early beds, see this VIMS map at <http://web.vims.edu/bio/sav/sav94/figure15.html>

Table 1. Names and description of the four transect sites in each river, arranged from upriver to downriver.

Severn Transect	Description	Magothy Transect	Description
Sullivan Cove	Next to community marina	Swan Cove	In cove behind N. Ferry Pt, next to one residential pier
Brewer Pond	Just outside the pond on mainstem	South Ferry Pt	Between residential piers; same area has had wild celery since mid-80's
Asquith Creek	On the shoal outside the creek; near where first SAV beds were mapped in 1994 after years of no SAV mapped.	Stonington	Next to a community pier. Used to have much more SAV.
Martins Pond	Outside mouth of tidal pond on mainstem	Gibson Island	On western shore of the island; near where first SAV beds were mapped in 1993 after years of no SAV mapped. Used to have lots of redhead grass.

Fig. 1. Map of 2007 Severn SAV showing transect locations.

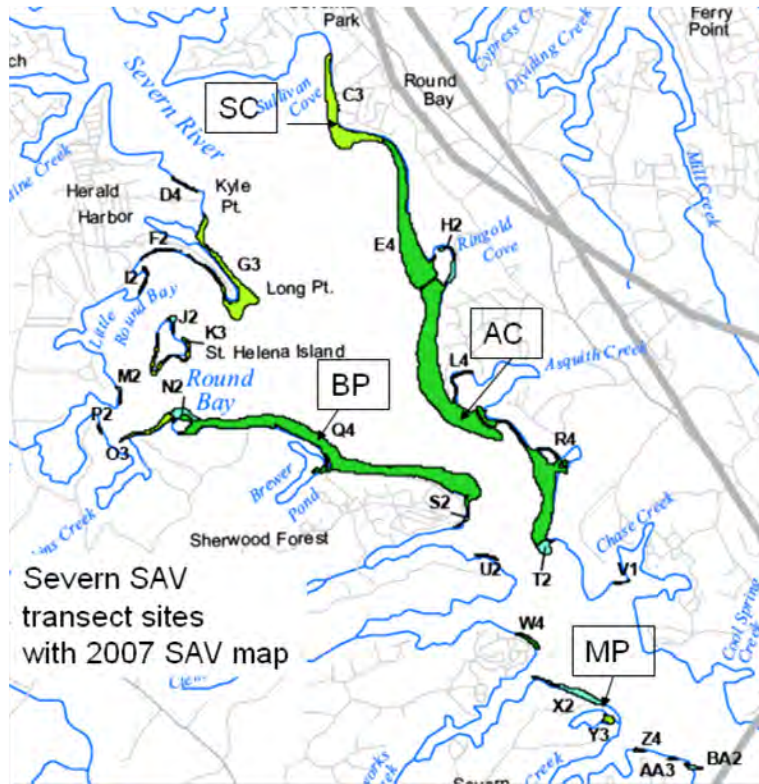
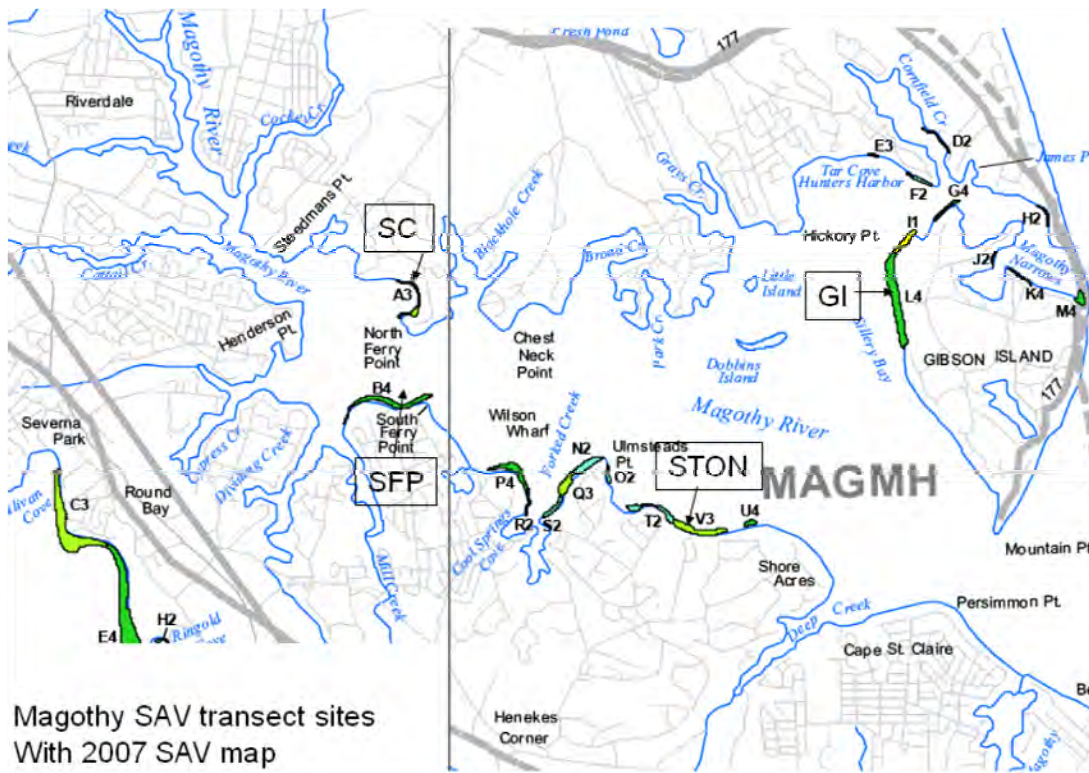


Fig. 2. Map of 2007 Magothy SAV showing transect locations.



Results

Comparing volumes between rivers & among years: The total volume collected was lower in the Magothy than in the Severn in all five years, but the difference went down as the volumes decreased (Tables 2 & 3, Fig. 3). This is consistent with the apparent density of the beds when in the field, since most of the Severn beds usually looked much denser than the Magothy beds. Comparing between years, the total Severn volume went down slightly in 2008, while the total Magothy volume more than doubled in 2008; the total volumes in both rivers dropped sharply in 2009 and stayed low through 2011 (Tables 2 & 3, Fig. 3).

Looking at changes over time at the same transects, two Severn transects, Brewer Pond and Asquith Creek, had the largest volume declines from 2007 to 2011 (Table 2). In 2007, samples at these transects had to be measured in several batches in the largest graduated cylinders we had (500 ml), while in 2011, we could use a 100 ml cylinder at both sites. A decline in transect volume did not mean the bed was gone; it may have moved or contracted, as the Asquith bed did in 2009, when it contracted northward so that our transect was no longer in the bed (see the VIMS SAV map for 2009 at <http://web.vims.edu/bio/sav/sav09/quads/rb023d.html>). A less pronounced decline was seen in the Magothy data (Table 3) at Stonington and Gibson Island from 2007-2008 compared to 2009-2010, but both increased in volume in 2011. The changes in volume at South Ferry Point (high in 2008 & 2010, lower in other years) are probably at least partly a result of the patchy beds there. In some years the tongs hit more dense beds than others.

Spatial patterns along each river: Volumes found for each species by transect and year are shown for the Severn in Table 2 (and Fig. A-3 for 2007-2009) and for the Magothy in Table 3 (and Fig. A-4 for 2007-2009). In the Severn and Magothy, SAV abundance based on the VIMS aerial survey usually appears to be greatest near the middle of the tidal portion, so we expected the most upriver and downriver transects might have less SAV volume than the two midriver transects. In the Severn, water clarity also tends to be better at midriver sampling sites, but this pattern is less apparent in the Magothy.

We found this general spatial pattern in Severn data (more SAV volume at mid-river transects) in all five years (Table 2, Fig. A-3 for 2007-2009), with a few exceptions. In 2007, the most upriver Severn transect, Sullivan Cove, had slightly more SAV volume than the next one downriver, Brewer Pond. In 2009, only Brewer Pond had much SAV, although there were denser SAV beds we did not sample downriver from it, and upriver from the Asquith Creek transect. In 2011, only Sullivan Cove, farthest upriver, had much SAV. Since SAV beds often move from year to year, fixed transects may sample the middle of a bed one year and miss it or sample its fringes the next year.

Spatial patterns along the river in Magothy total volume were different from those in the Severn (Table 3 and Fig. A-4 for 2007-2009) (Note that in all of these graphs, SAV volume on the y-axis only goes up to 800 ml, not 4000 ml as in Fig. A-3 with Severn data.) In 2007, total volume went up as one moved downriver, while in 2008, total volume was greatest at one midriver site (South Ferry Point) and least at the other

midriver site, Stonington. In 2009, only the two upriver transects had much SAV (Swan Cove and South Ferry Point), and their volumes were much less than in the previous years. In 2010, most of the SAV we found was at South Ferry Point, while in 2011 it was more evenly distributed among transects. These results are surprising given the Magothy depth profiles (Fig. A-2). One would expect more SAV in the two downriver transects (Stonington and Gibson Island), as we found in 2007, since they are much shallower than the two upriver transects, and thus should have more light reaching the bottom, and thus more SAV.

Table 2. Summed volume of all Severn grabs by species (using the sum of the 3 grabs at each site). These data are graphed for 2007-2009 in Fig. A-3.

Sampling date	Transect	Rm volume (ml)	Ppf volume (ml)	Ppc volume (ml)	Total volume
9-11-2007	Sullivan Cove	895	1538	0	2433
9-11-2007	Brewer Pond	1032	889	0	1921
9-11-2007	Asquith Creek	19	3755	0	3774
9-11-2007	Martins Pond	16	0	0	16
9-11-2007	All	1962	6182	0	8144
7-15-2008	Sullivan Cove	99.5	811.5	0	911
7-15-2008	Brewer Pond	103.0	2402	301	2806
7-15-2008	Asquith Creek	42	2600	0	2642
7-15-2008	Martins Pond	204	0	127	331
7-15-2008	All	448.5	5813.5	428	6690
7-31-2009	Sullivan Cove	54	179	0	233
7-31-2009	Brewer Pond	38	620	31	689
7-31-2009	Asquith Creek	0	2	0	2
7-31-2009	Martins Pond	0	0	22	22
7-31-2009	All	92	801	53	946
7-20-2010	Sullivan Cove	113	142	0	255
7-20-2010	Brewer Pond	84	702	0	786
7-20-2010	Asquith Creek	17	2	0	19
7-20-2010	Martins Pond	0	0	0	0
7-20-2010	All	214	846	0	1060
7-26-2011	Sullivan Cove	773	1	0	774
7-26-2011	Brewer Pond	69	1	0	70
7-26-2011	Asquith Creek	17	0	0	17
7-26-2011	Martins Pond	43	0	0	43
7-26-2011	All	902	2	0	904

Comparing volumes among species: Redhead grass (Ppf) always had the largest volume in both rivers (Tables 2 and 3), except there was much more widgeongrass (Rm) than Ppf in the Severn in 2011 (Table 2), and there was much more sago pondweed (Ppc) than Ppf in the Magothy in 2011 (Table 3). The preponderance of Ppc in the Magothy in 2011 (with no Rm found there, and no Ppc in the Severn) suggests that some of what we called Ppc was probably Rm; we did not have time to examine every shoot to look for bayonets, and there were no flowers or seeds.

In 2008 we found much less Rm and more Ppc in both rivers compared to 2007. Sago pondweed tends to increase in both rivers after a low flow/high salinity summer such as the one we had in 2007, but there is no obvious reason why these conditions would cause a decline in widgeongrass, since it can grow in hypersaline lagoons. In 2009 there was a general decline in abundance for all species (Tables 2 and 3), and that low volume continued in 2010-2011. The main species shift in 2010-2011 was a big decline in Ppf in 2011 in both rivers. The total volume did not decline much in either river in 2011, since 2011 also had an increase in Rm (Severn) or Ppc with likely Rm (Magothy).

Table 3. Summed volume of all Magothy grabs by species (using the sum of the 3 grabs at each site). These data are graphed for 2007-2009 in Fig. A-4.

Sampling date	Transect	Rm volume (ml)	Ppf volume (ml)	Ppc volume (ml)	Total volume
9-8-2007	Swan Cove	40	136	0	176
9-8-2007	South Ferry Pt	8	173	21	202
9-8-2007	Stonington	33	110	223	366
9-8-2007	Gibson Island	3	353	92	448
9-8-2007	All	84	772	336	1192
7-22-2008	Swan Cove	5	701	0	706
7-22-2008	South Ferry Pt	0	749	303	1052
7-22-2008	Stonington	10	47	142	199
7-22-2008	Gibson Island	1	340	288	629
7-22-2008	All	16	1837	733	2586
8-17-2009	Swan Cove	85	33	0	128
8-17-2009	South Ferry Pt	0	129	1	130
8-17-2009	Stonington	1	0	0	1
8-17-2009	Gibson Island	0	18	5	23
8-17-2009	All	86	180	6	282
8-4-2010	Swan Cove	19	0	0	19
8-4-2010	South Ferry Pt	35	803	0	838
8-4-2010	Stonington	0	0	0	0
8-4-2010	Gibson Island	3	0	0	3
8-4-2010	All	57	803	0	860
8-9-2011	Swan Cove	0	0	128	128
8-9-2011	South Ferry Pt	0	28	20	48
8-9-2011	Stonington	0	0	221	221
8-9-2011	Gibson Island	0	0	330	330
8-9-2011	All	0	28	699	727

Comparing patchiness of beds among years: The declines in SAV volumes that started in 2009 could mean that the beds were getting thinner, or that the SAV was becoming more patchy over time, or both. I graphed the percent of grabs that had any SAV (Fig. 4) to see if patchiness was increasing, and it appeared that it was. The percent of grabs that had any SAV dropped in the Severn in 2008, and in the Magothy in 2009, and then leveled off in both rivers (Fig. 4).

Fig. 3. Total volume collected by river and year, 2007-2011.

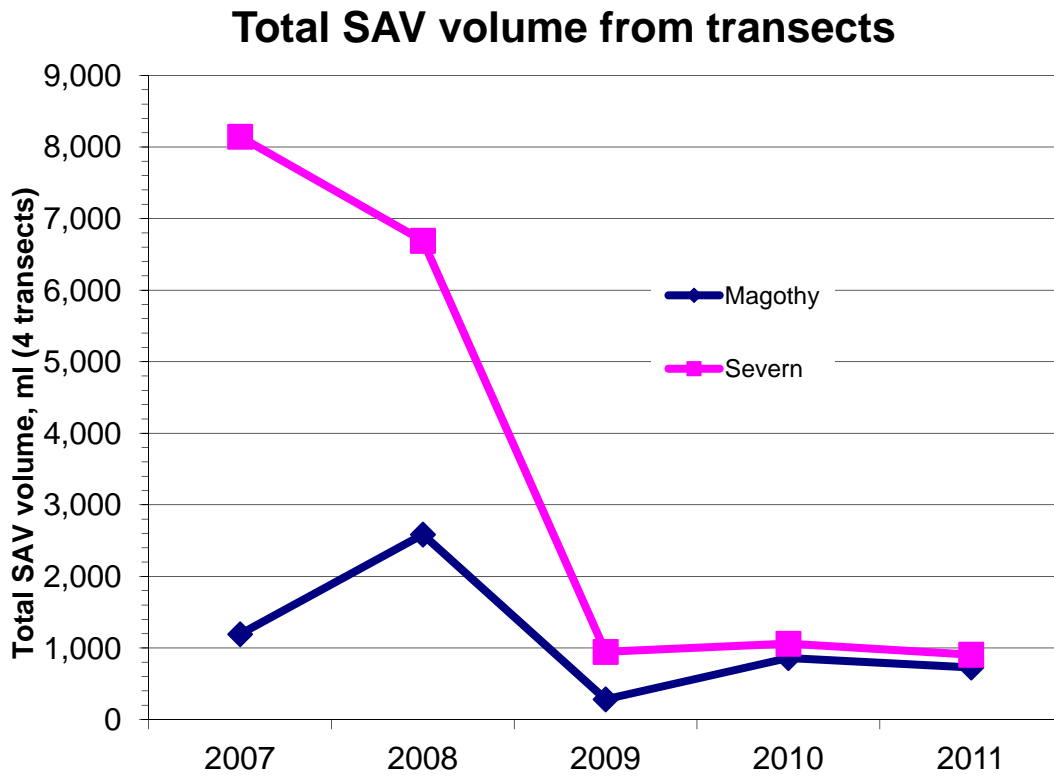
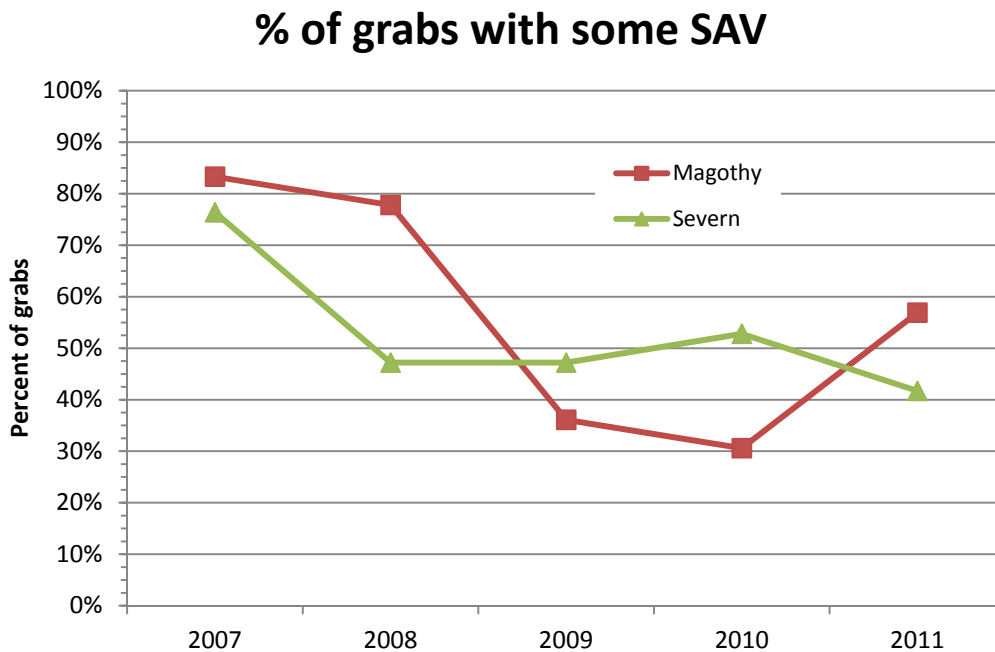


Fig. 4. Percent of grabs that had some SAV by river and year, 2007-2011.



Conclusions:

- In both rivers, redhead grass predominated by volume at almost all sites through 2010, and then widgeongrass (Severn) and sago pondweed (Magothy) dominated in 2011.
- Spatial patterns in total volume along the river (based on previous SAV patterns and depth gradients) generally fit with what we expected in the Severn, with more SAV in the middle transects, but usually not in the Magothy.
- There was more total volume in the Severn, as expected from visual observation of the beds, but the differences were small in 2010-2011.
- Changes in total volume from 2007 to 2008 were not consistent; volume declined in the Severn but went up in the Magothy. Volume in both rivers declined in 2009, and stayed near that low level through 2011 in the Severn, with a small increase in the Magothy in 2010.
- The percent of grabs that had any SAV declined in 2008 (Severn) and 2009 (Magothy), then leveled off, suggesting that patchiness increased over time.

Acknowledgments: Thanks to all of the Severn Riverkeeper (SRK) and Magothy River Association (MRA) volunteers and agency staff who provided boats and labor that made these surveys possible (see Table A-1). Thanks to the South River Federation for letting us use the oyster tongs they got from MD DNR in 2007.

APPENDIX: Additional graphs and tables of methods and results

Fig. A-1. Depth profiles for the 4 Severn transects, all sampled near low tide. All transects had similar profiles except AC (Asquith) had little or no gradient, since it is next to a channel, not the shore.

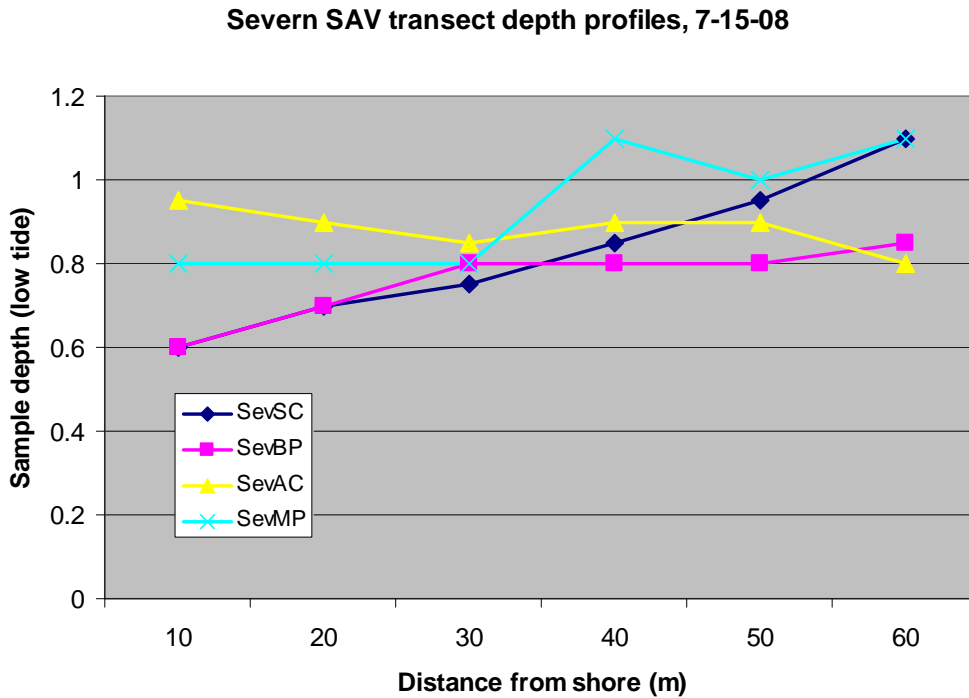


Fig. A-2. Depth profiles for the 4 Magothy transects, adjusted to low tide depth (by subtracting 0.35 m). The two upriver transects (Swan Cove, SC and South Ferry Point, SF) are much deeper than the two downriver ones.

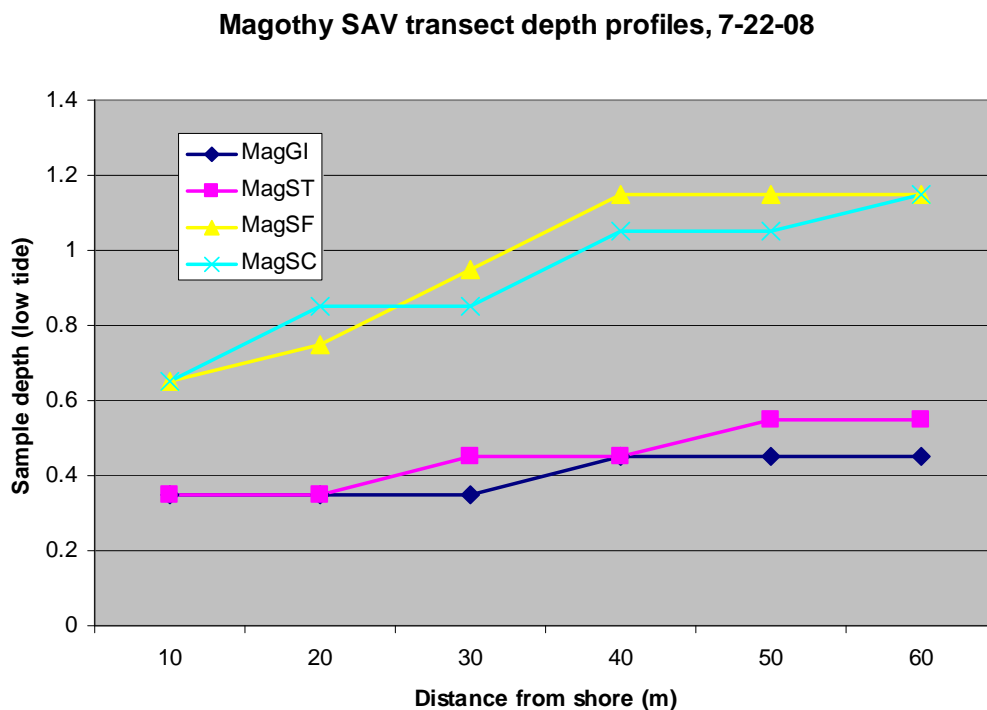


Fig. A-3. Total volume collected by species and transect for 2007-09 Severn transects.

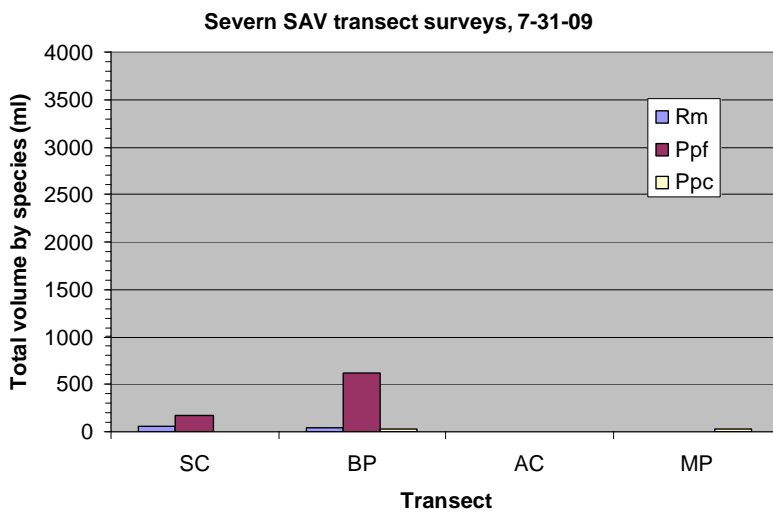
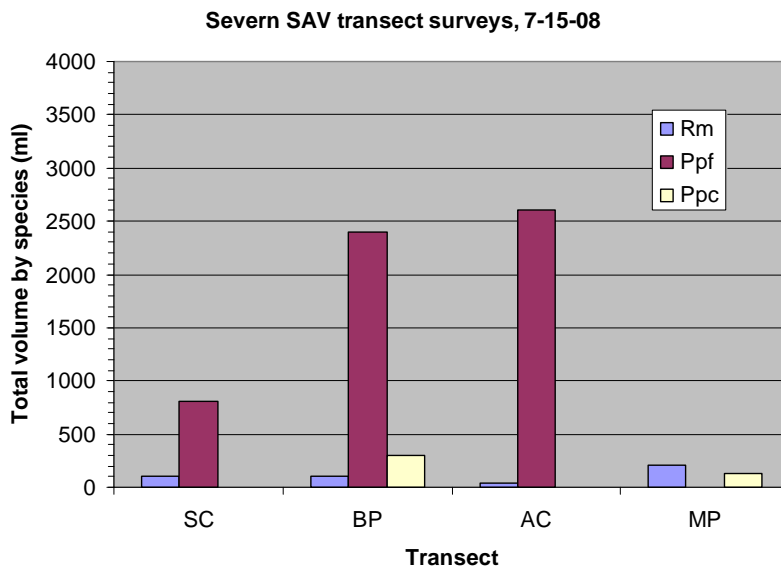
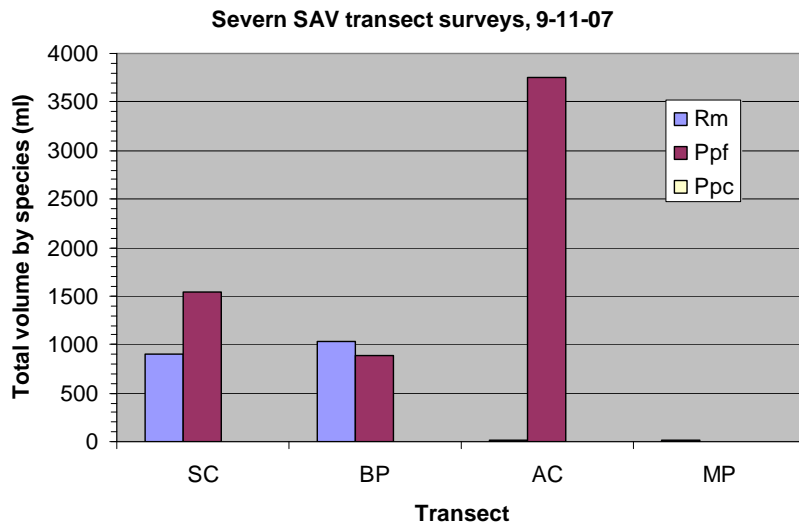


Fig. A-4. Total volume collected by species and transect for 2007-09 Magothy transects.

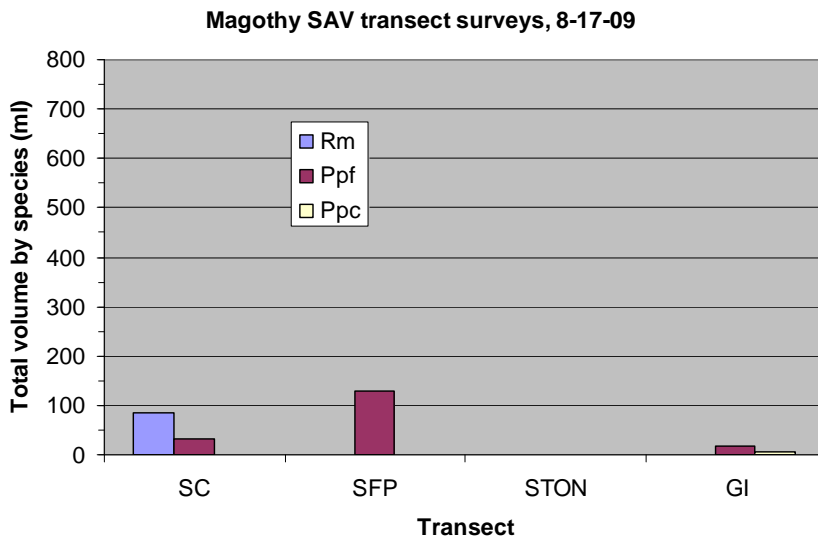
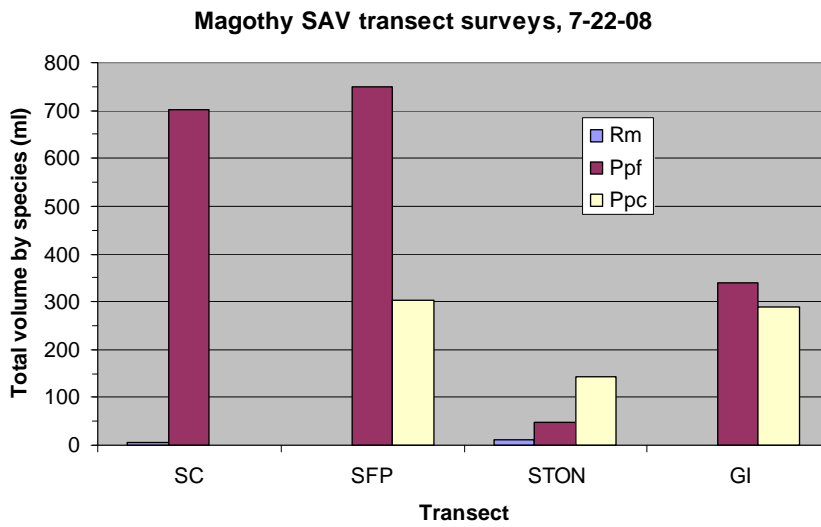
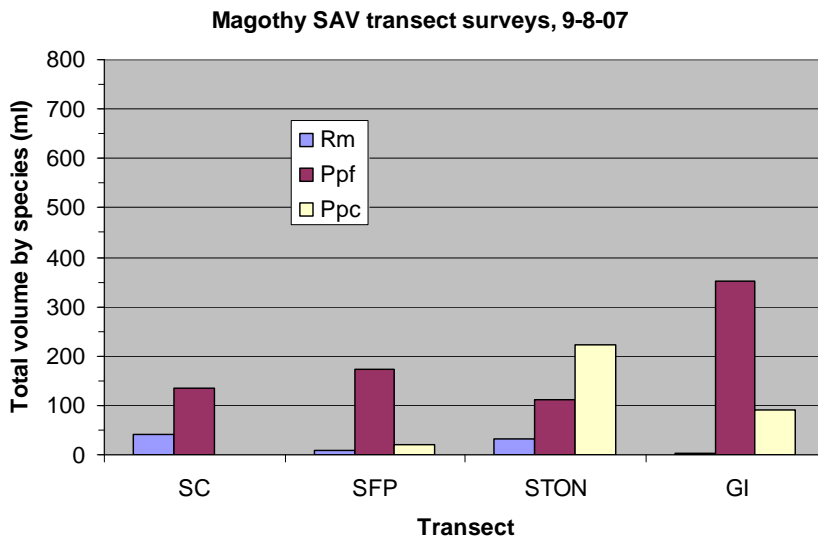


Table A-1. Dates the transects were sampled, and others who helped me sample. The first person listed provided and drove the boat we used.

Severn date	Other samplers	Magothy date	Other samplers
9/11/07	Pierre Henkart, Danalee Henkart, Linda Smith, Mark Lewandowski	9/8/07	Dave & Conner Lines
7/15/08	Pierre Henkart, PJ Klavon, Christie Sandvik, Brooke Warrington	7/22/08	Mark Lewandowski, Carol Auer, Bri Langford, Jay Lazar, Kate Parks
7/31/09	Pierre Henkart, Wiley Laufman, Aaron Canale, Eric	8/17/09	Carl Treff, Tom Horeff, Al Tober, Pete Penoyar, Michael Wagman
7/20/10	Pierre Henkart, Aaron Canale, Nate	8/4/10	Carl & Alex Treff, Tim Decker, Al Tober
7/26/11	Steve Barry, Dan Somers, Ashley Jarvis, Elena Chiras	8/9/11	Carl & Alex Treff, Sally Hornor, Tim Decker