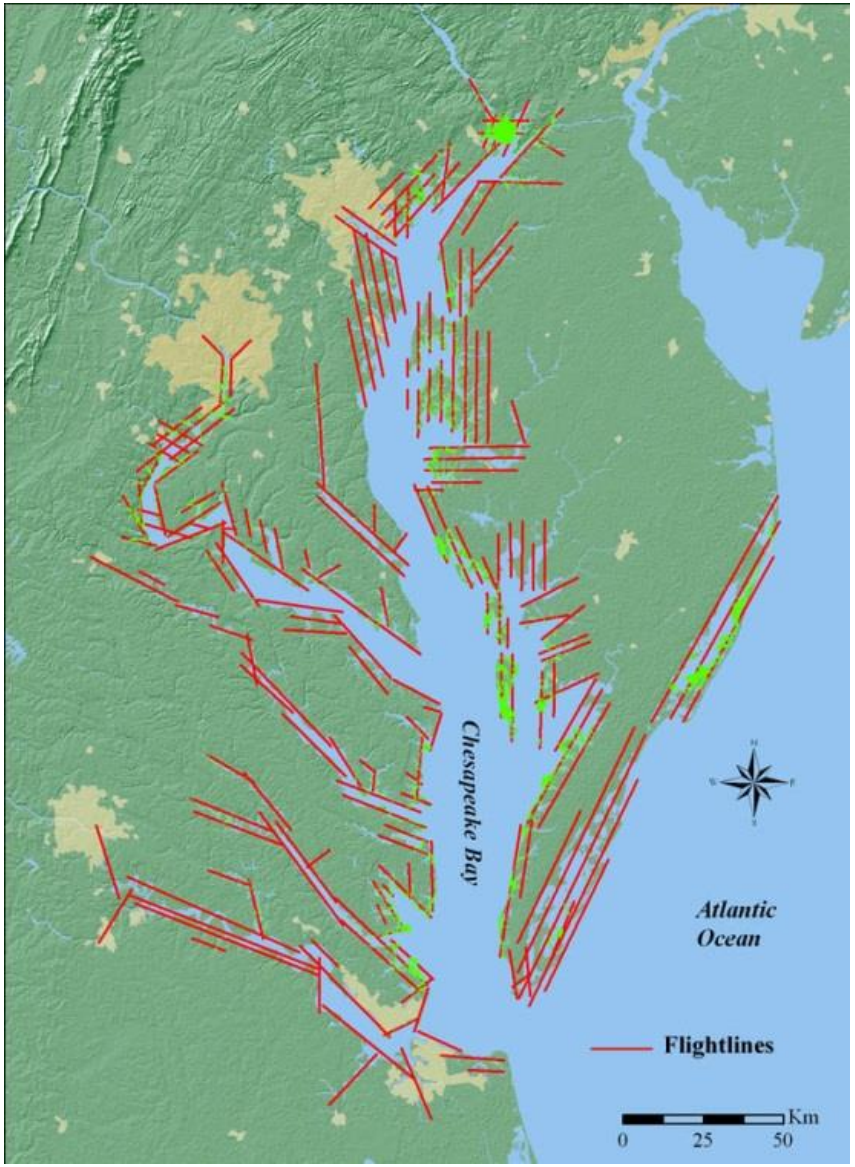
Submerged Aquatic Vegetation (SAV) Update

And The Future Of Annual Baywide Monitoring

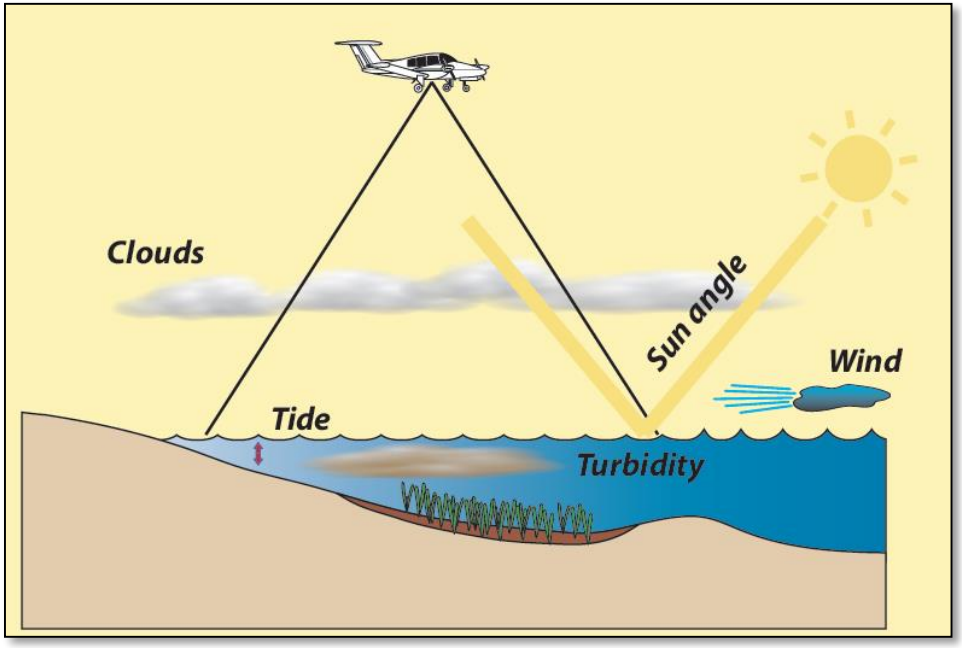
STAR Presentation
May 27, 2016

Bob Orth
VIMS

VIMS maps SAV beds every year



Aerial photographs and digital imagery are acquired from flight lines flown over the entire bay



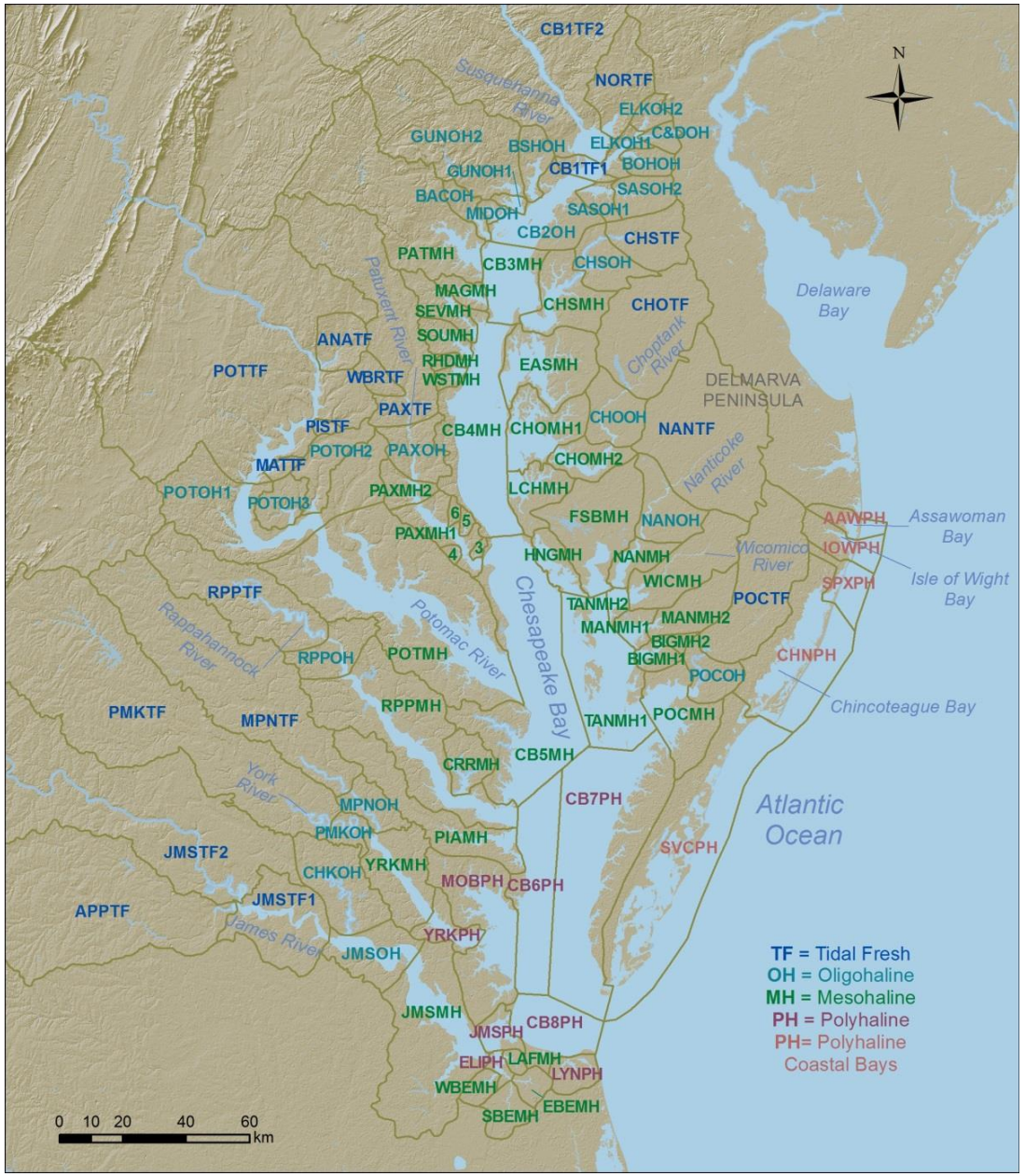
Flights require:

- low wind
- minimal cloud cover
- low tide
- low turbidity
- low sun angle

Funded by:
EPA, NOAA, VA DEQ, MD DNR, VA Coastal Program

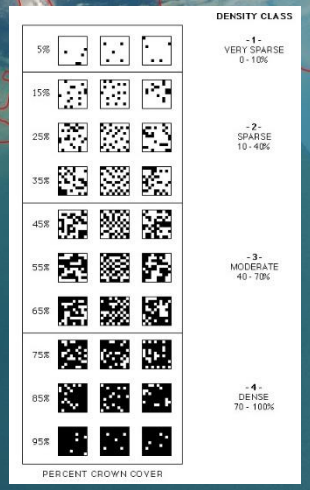
Chesapeake Bay Program Segment reports SAV information and water quality data

- Segments define specific areas of rivers or Bay incorporating watersheds or portions of watersheds
- Each segment has an SAV restoration target



http://vims.edu/bio/sav/
http://vims.edu/bio/sav/maps.html

SAV beds outlined in red and given a density class (1-4)



4

1

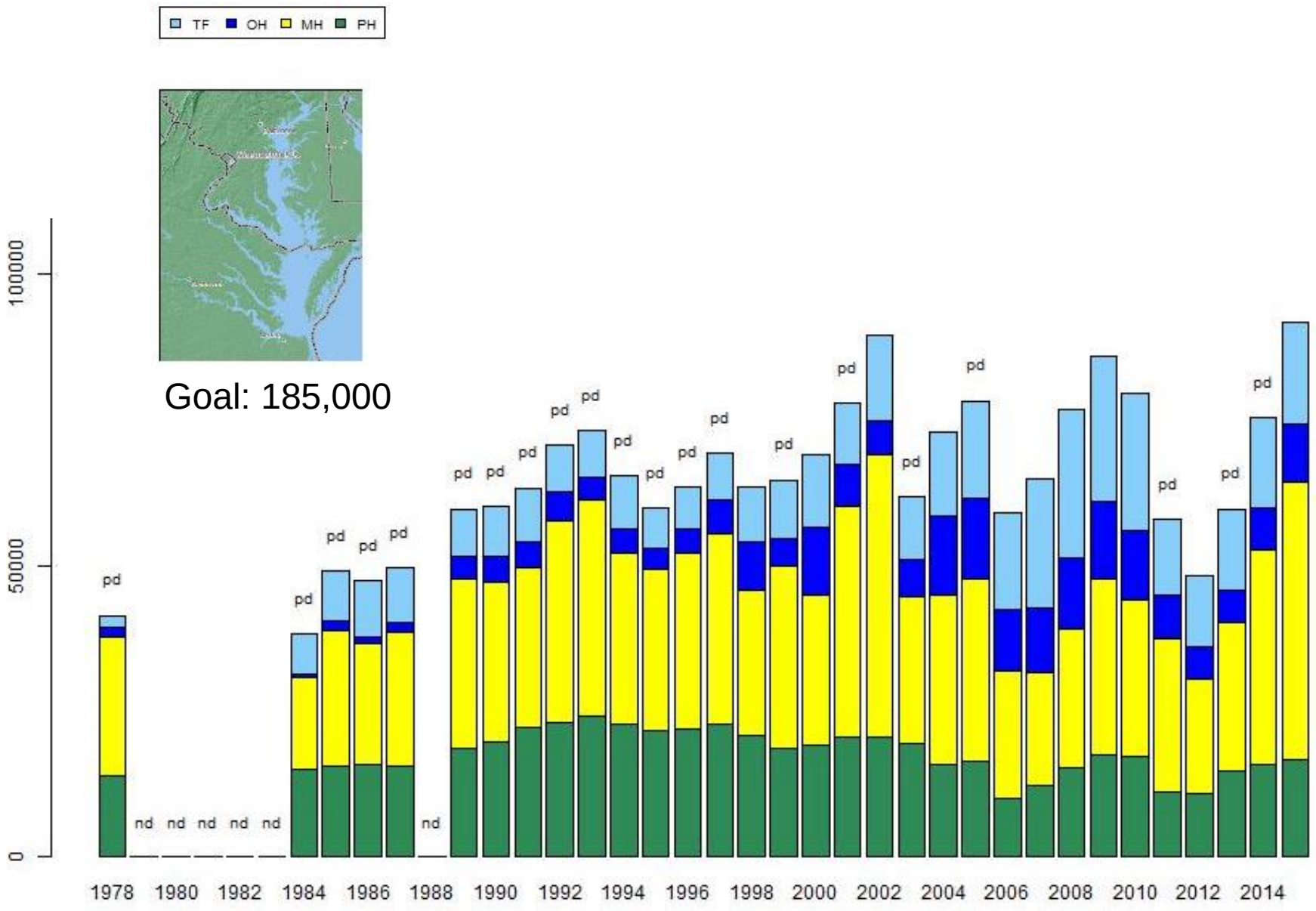
0 0.5 1 Km

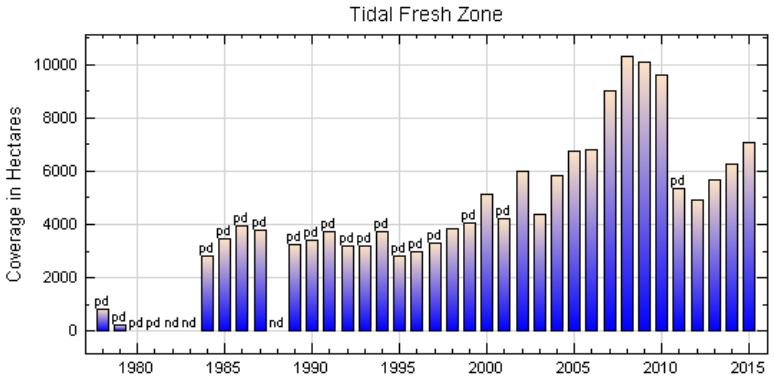
VIMS SAV Ecology, Monitoring, & Restoration Program

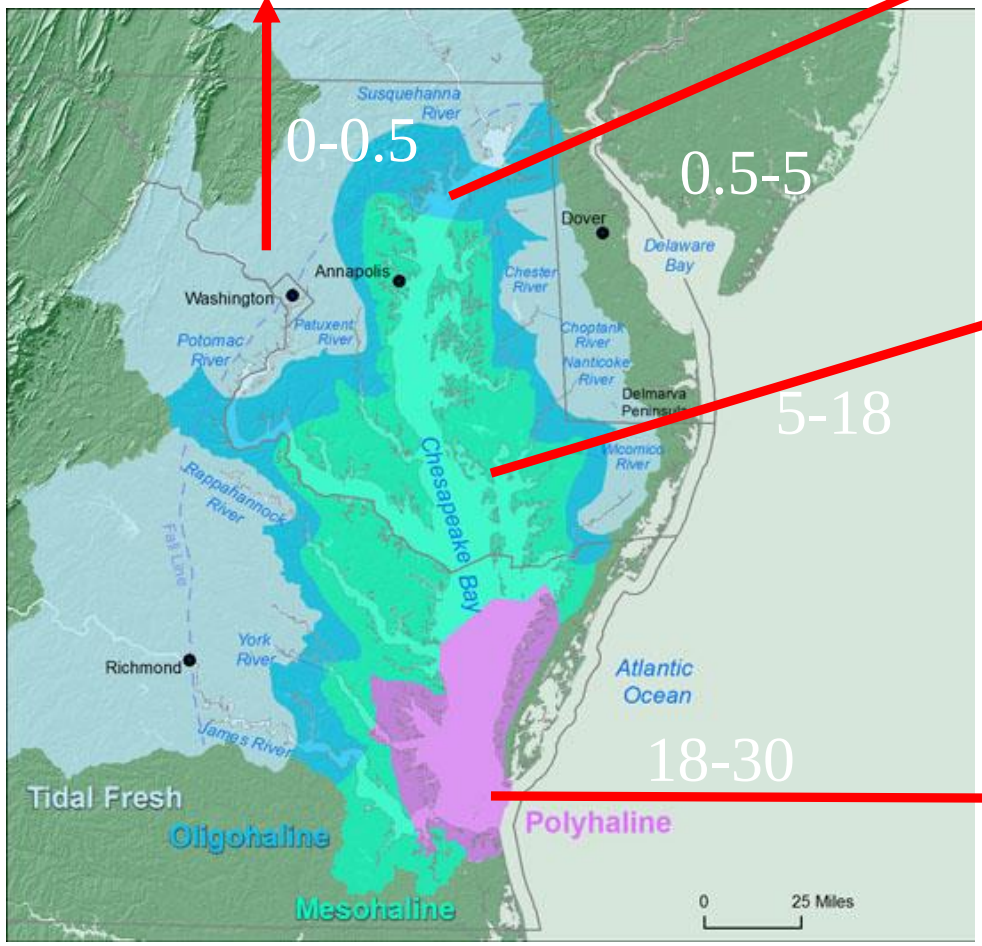
The annual SAV monitoring report and dataset

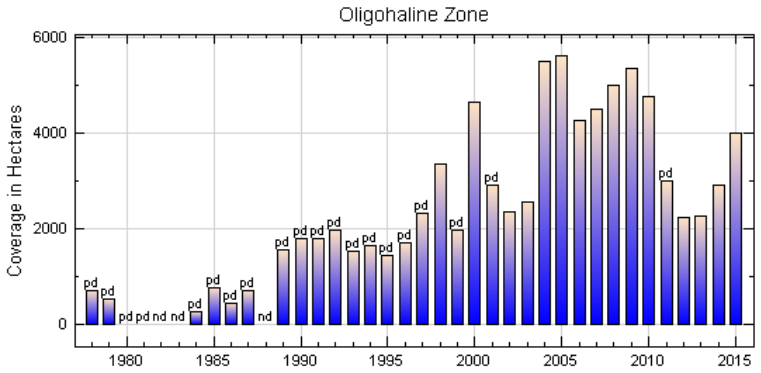
- Large regional changes
- Communicate inter-annual changes
- Water quality standards
- SAV biology and ecology
- Multiple users

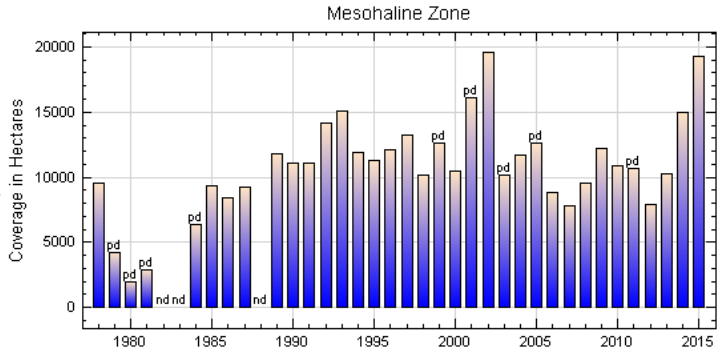
Bay SAV Area by Salinity Zone (Acres)



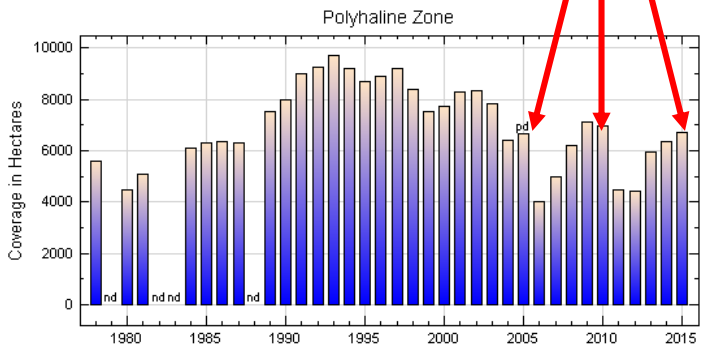

Tidal Fresh Zone
Coverage in Hectares
0
2000
4000
6000
8000
10000
1980
1985
1990
1995
2000
2005
2010
2015

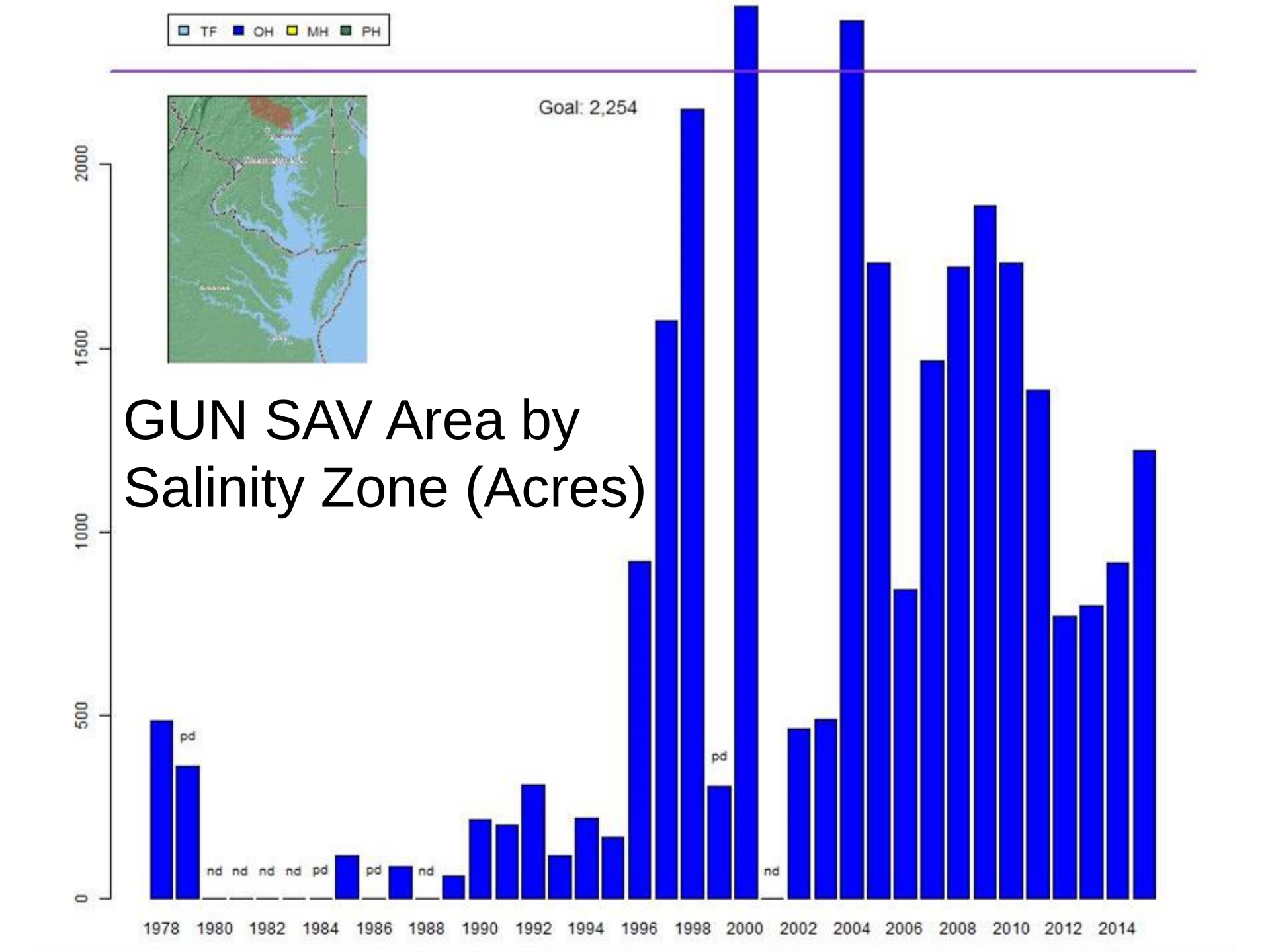

0-0.5
0.5-5
5-18
18-30
Susquehanna River
Dover
Delaware Bay
Annapolis
Washington
Chester River
Patuxent River
Potomac River
Choptank River
Nanticoke River
Delmarva Peninsula
Wicomico River
Chesapeake Bay
Rappahannock River
Fall Line
York River
Richmond
James River
Atlantic Ocean
Tidal Fresh
Oligohaline
Mesohaline
Polyhaline
0
25 Miles

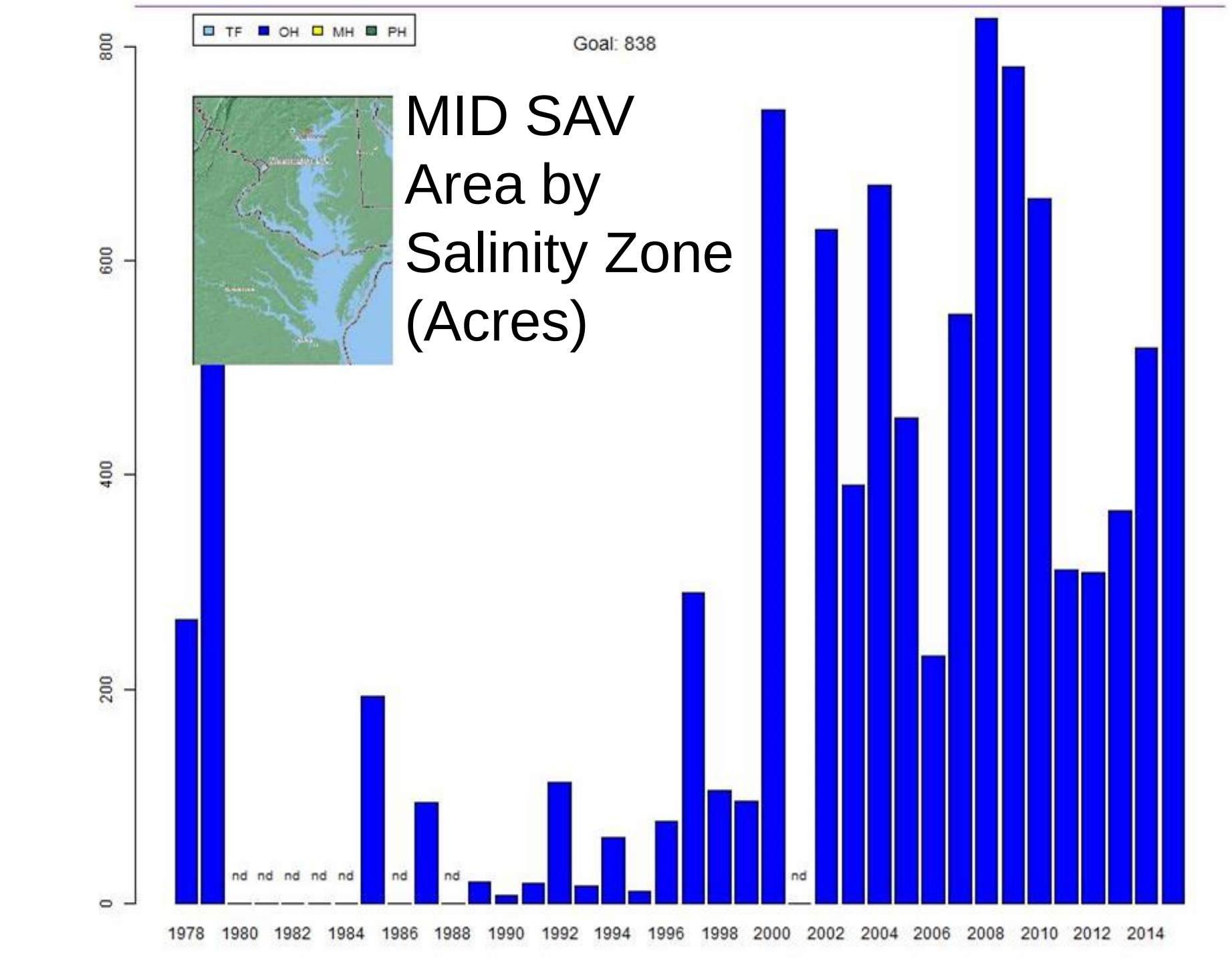

Oligohaline Zone
Coverage in Hectares
0
2000
4000
6000
1980
1985
1990
1995
2000
2005
2010
2015

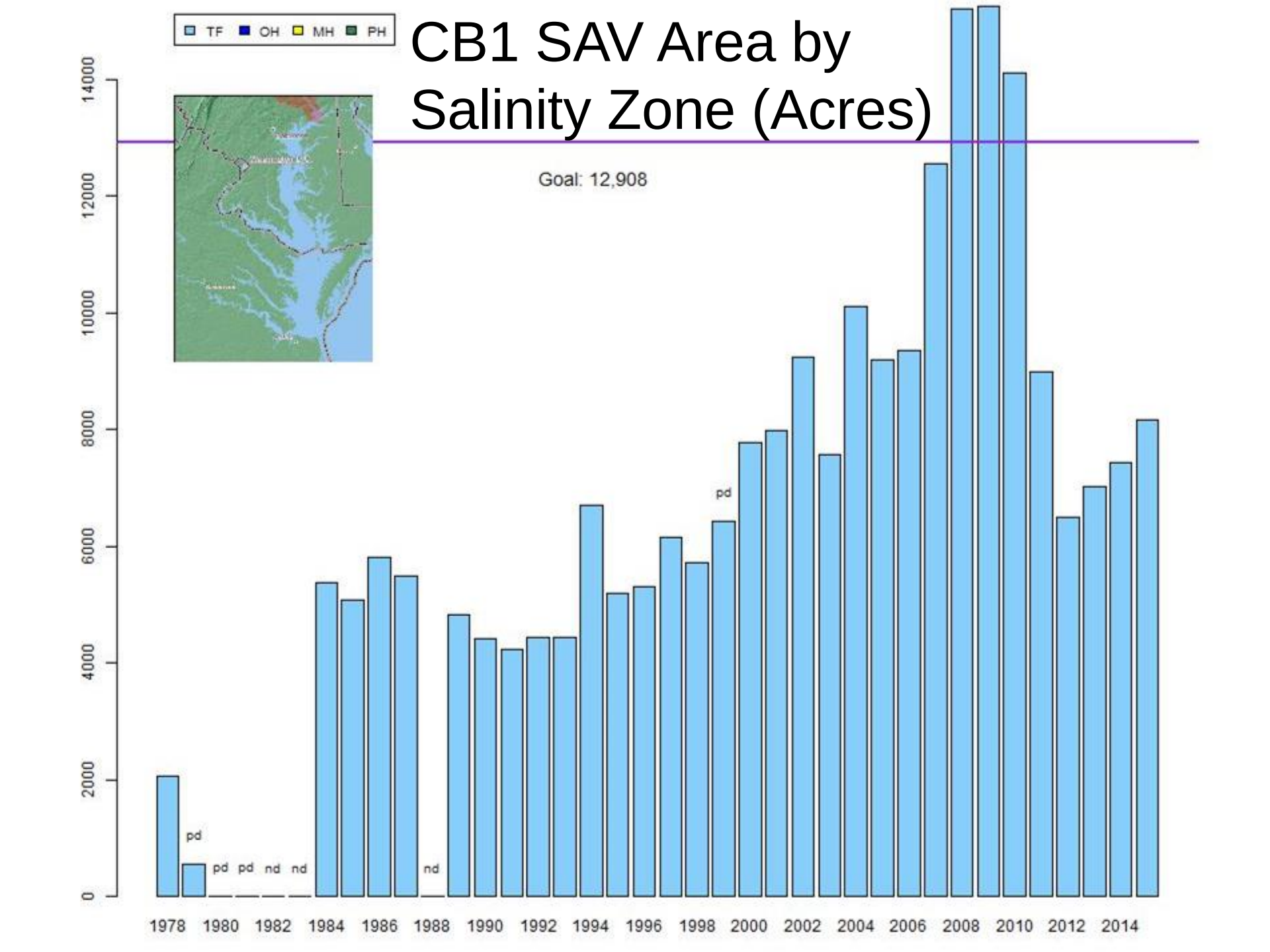

Mesohaline Zone
Coverage in Hectares
0
5000
10000
15000
20000
1980
1985
1990
1995
2000
2005
2010
2015

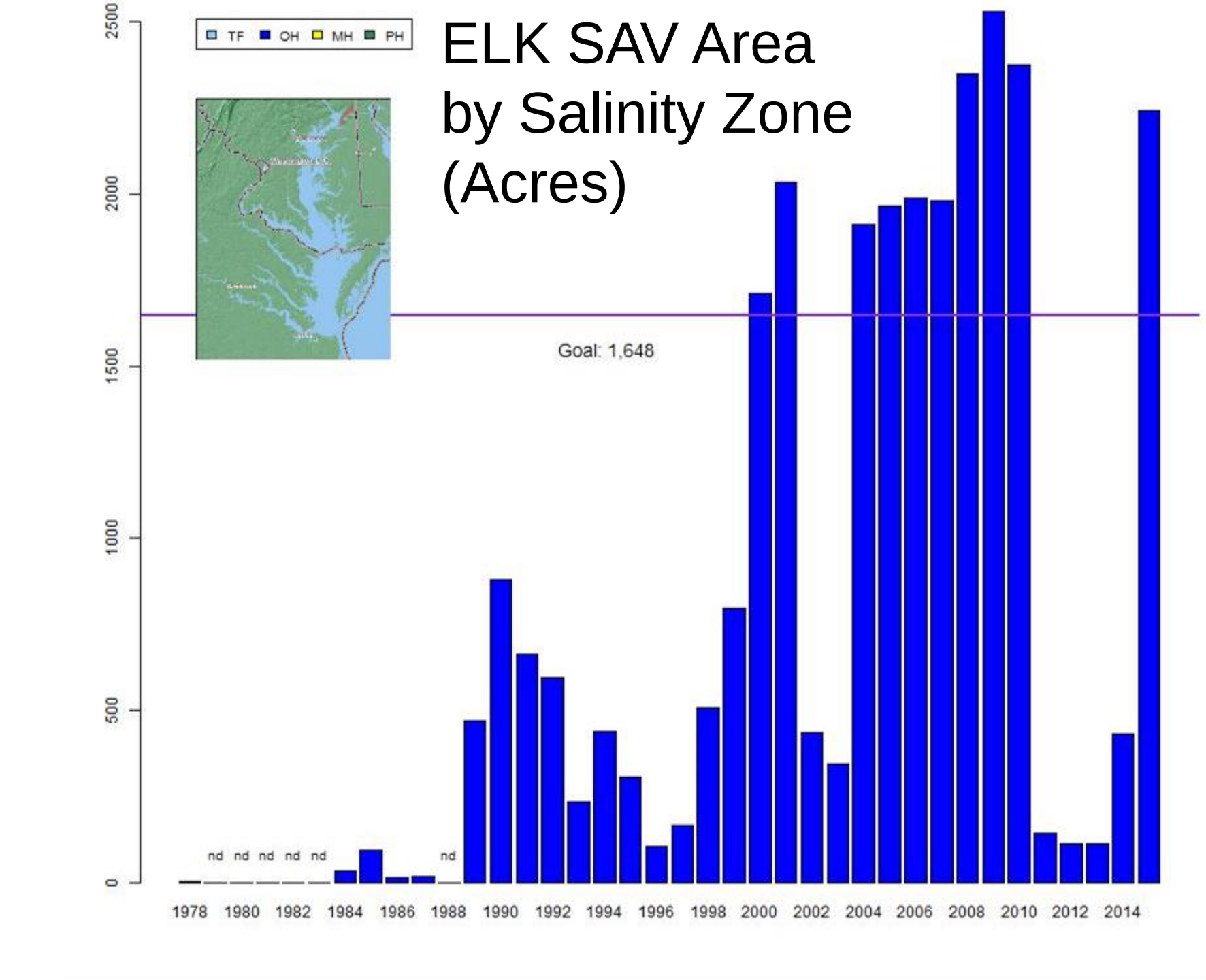
hot


Polyhaline Zone
Coverage in Hectares
0
2000
4000
6000
8000
10000
1980
1985
1990
1995
2000
2005
2010
2015


TF
OH
MH
PH
Goal: 2,254
GUN SAV Area by Salinity Zone (Acres)
0
500
1000
1500
2000
pd
nd
nd
nd
nd
pd
pd
nd
pd
nd
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014

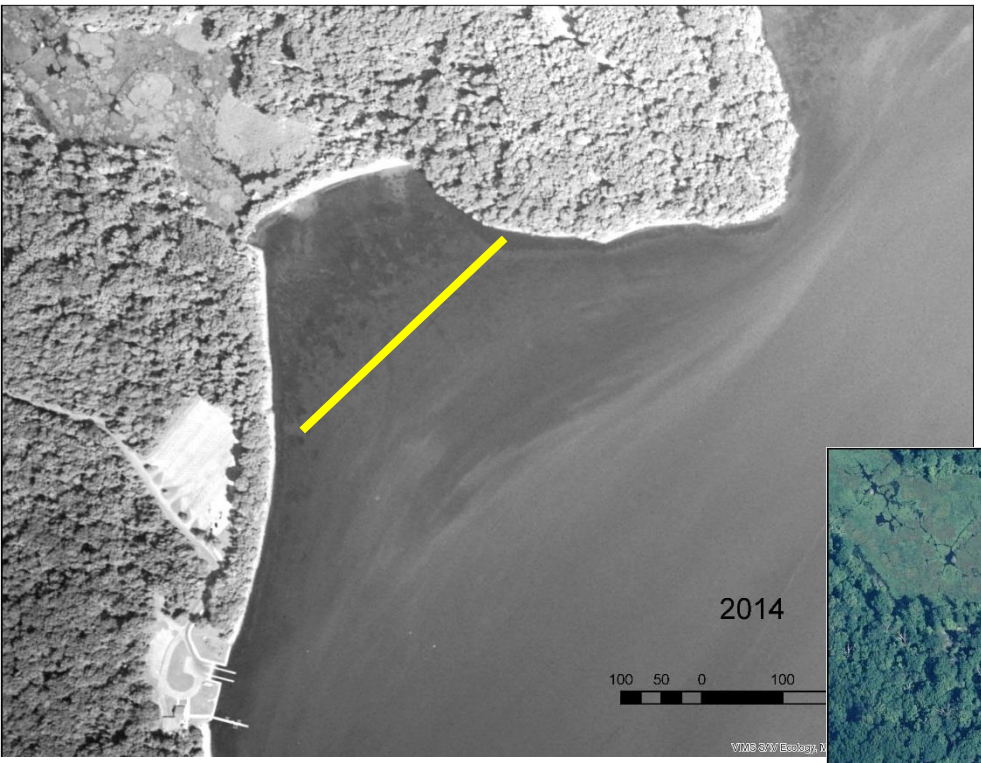

TF
OH
MH
PH
Goal: 838
MID SAV Area by Salinity Zone (Acres)
0
200
400
600
800
nd
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014

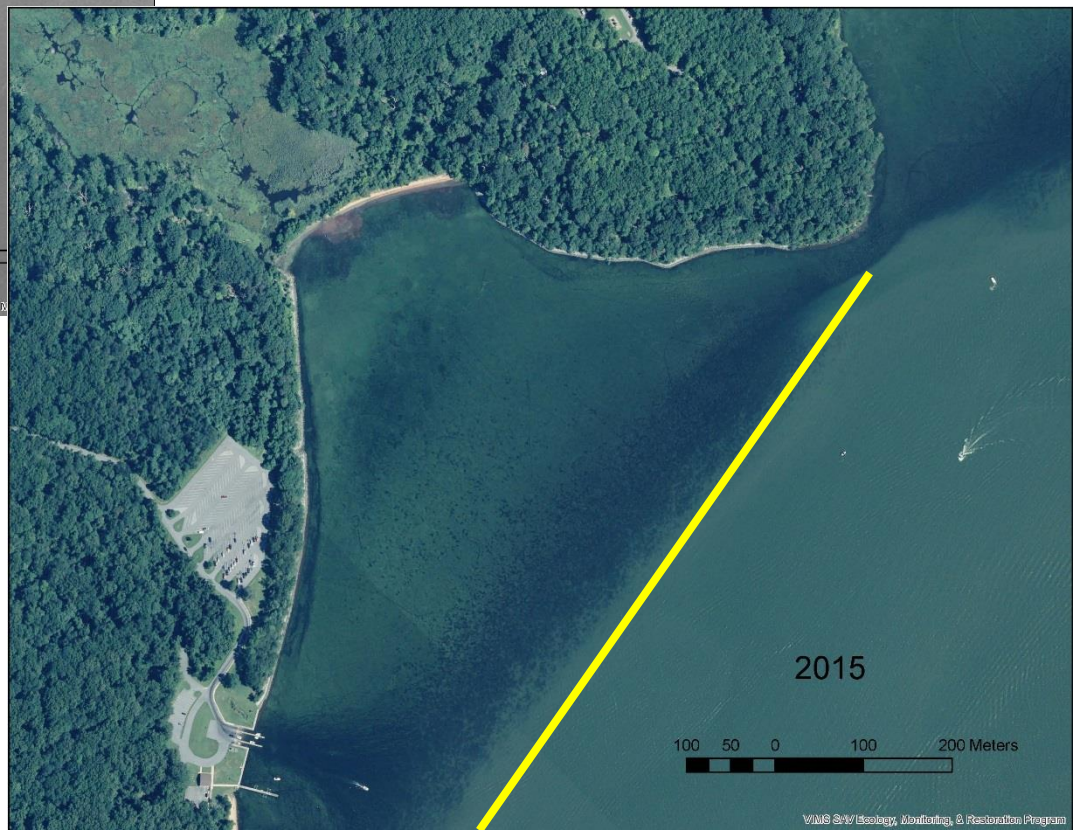

TF
OH
MH
PH
CB1 SAV Area by Salinity Zone (Acres)
Goal: 12,908
0
2000
4000
6000
8000
10000
12000
14000
pd
pd
pd
nd
nd
nd
pd
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014


TF
OH
MH
PH
ELK SAV Area
by Salinity Zone
(Acres)
Goal: 1,648
nd
nd
nd
nd
nd
nd
0
500
1000
1500
2000
2500
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014

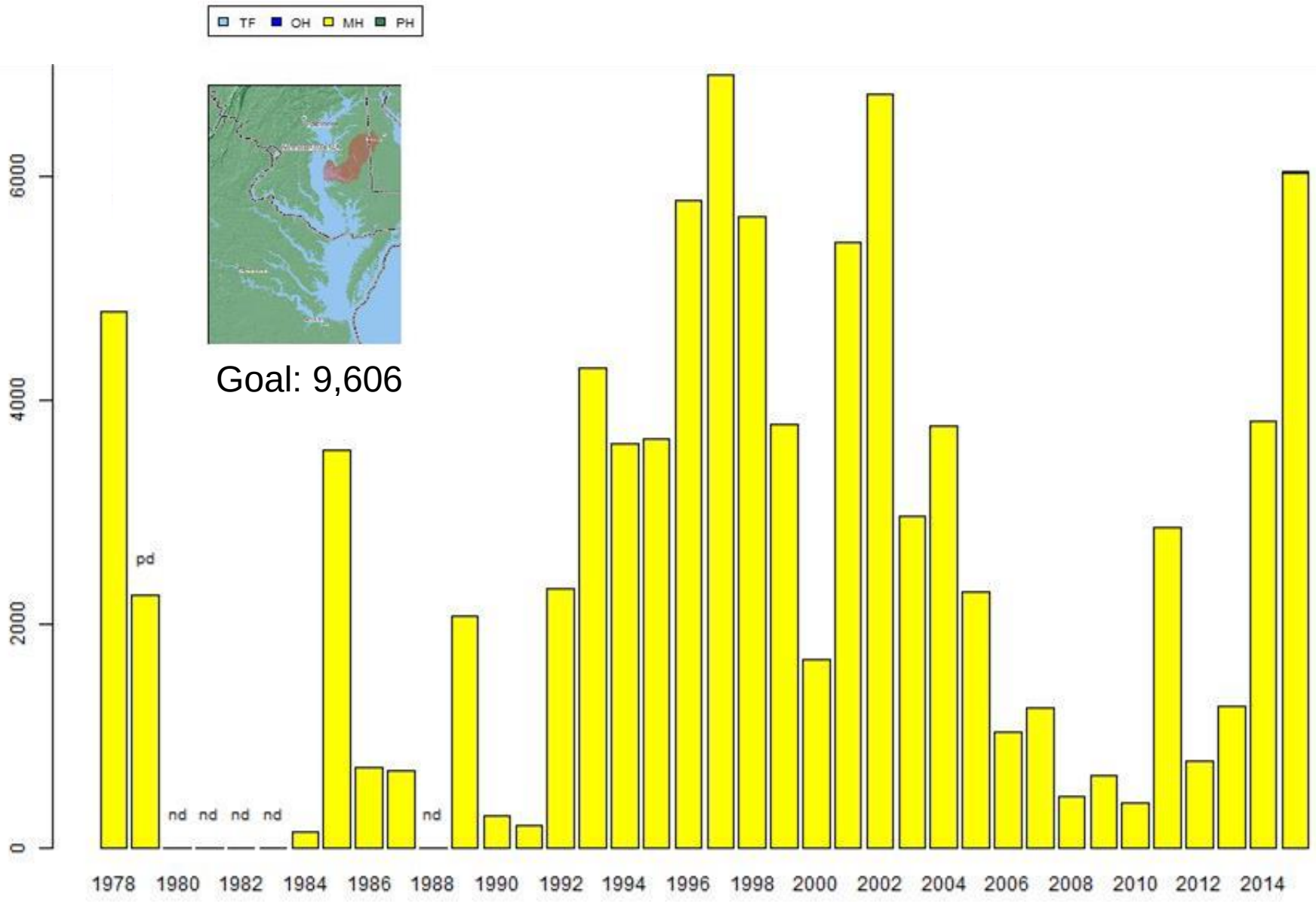
Dramatic expansion of wild celery in the Elk River

2014 vs 2015



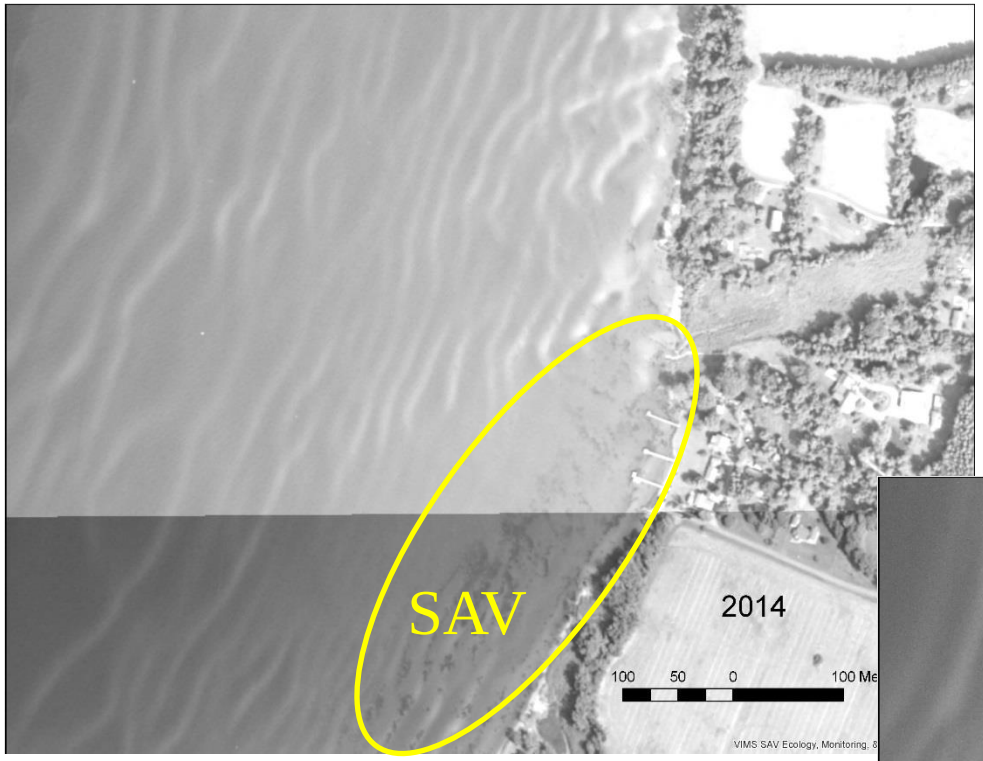


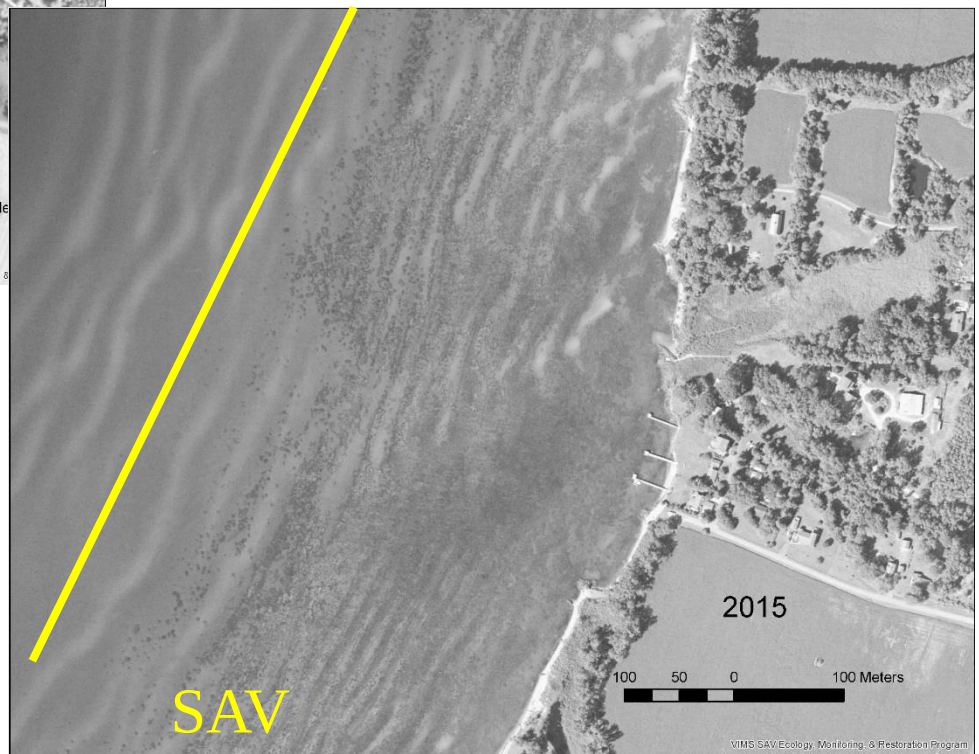
CHO SAV Area by Salinity Zone (Acres)



Dramatic expansion of Widgeongrass in Claiborne

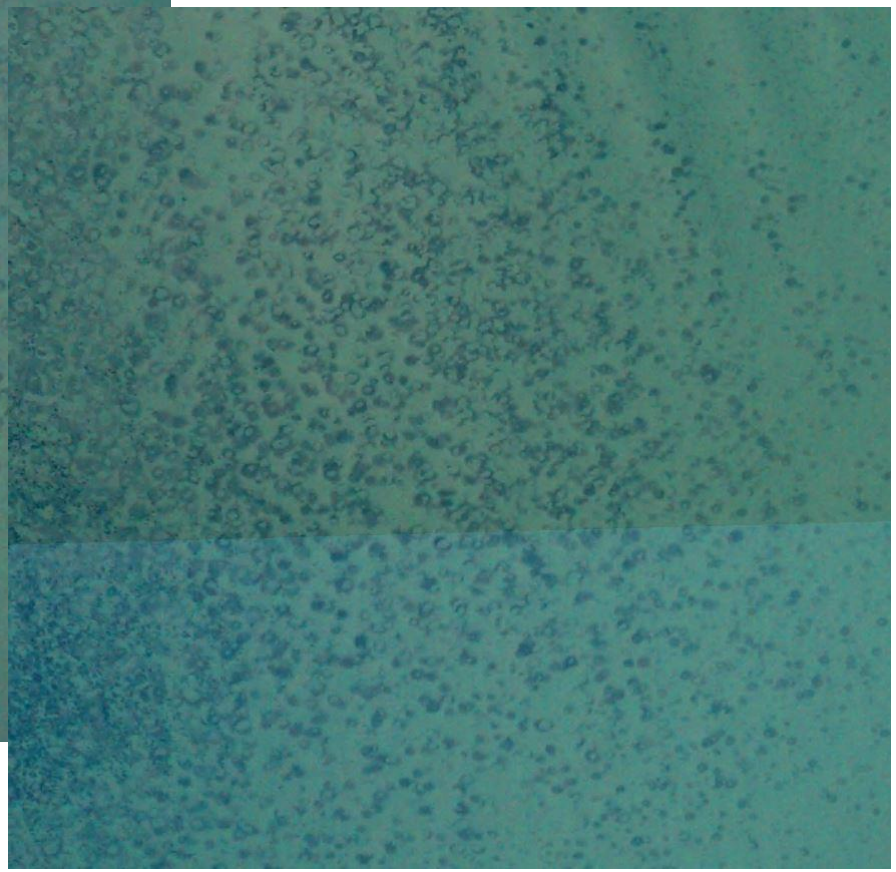
2014 vs 2015



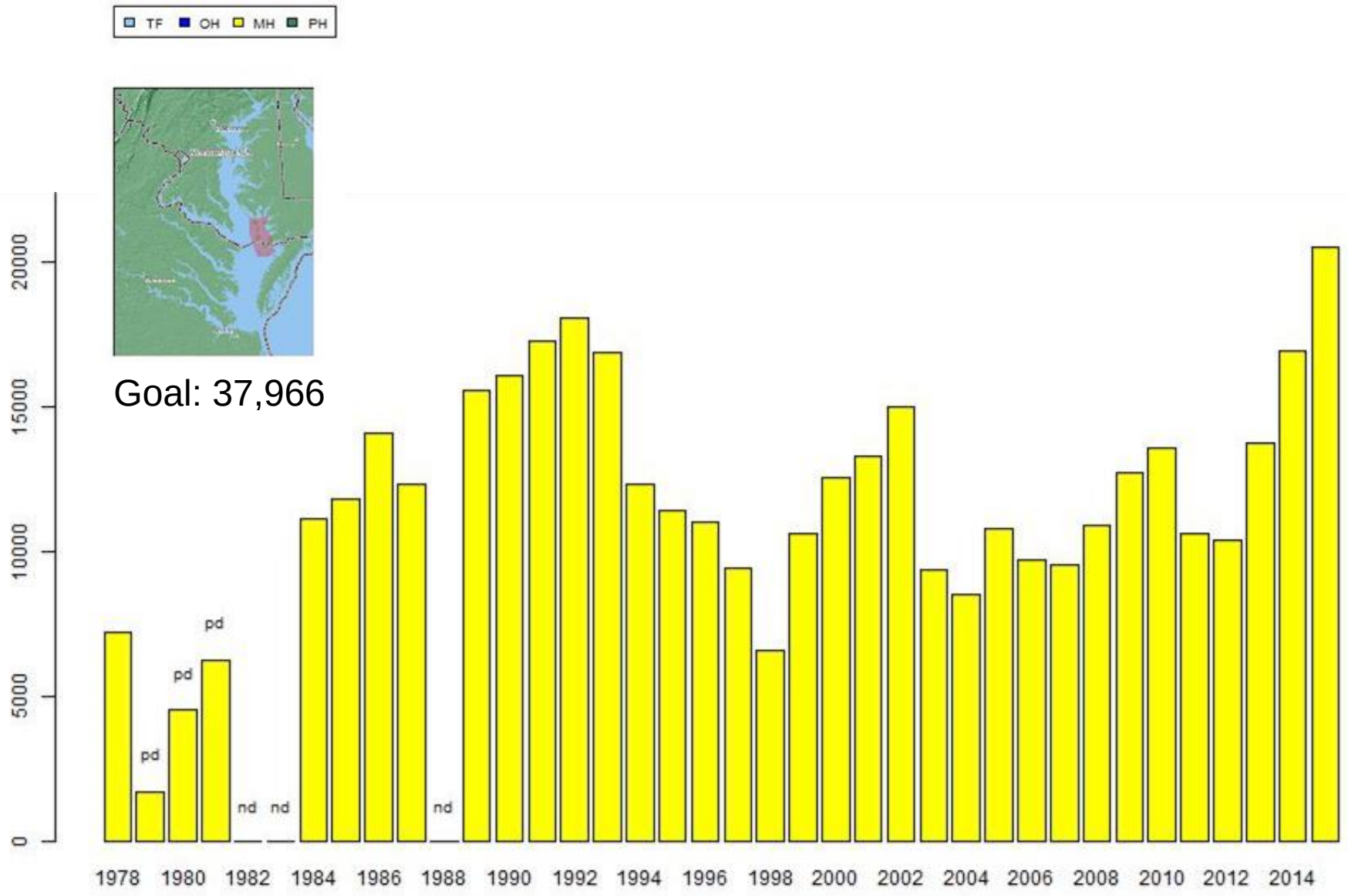


Widgeongrass ‘donuts’

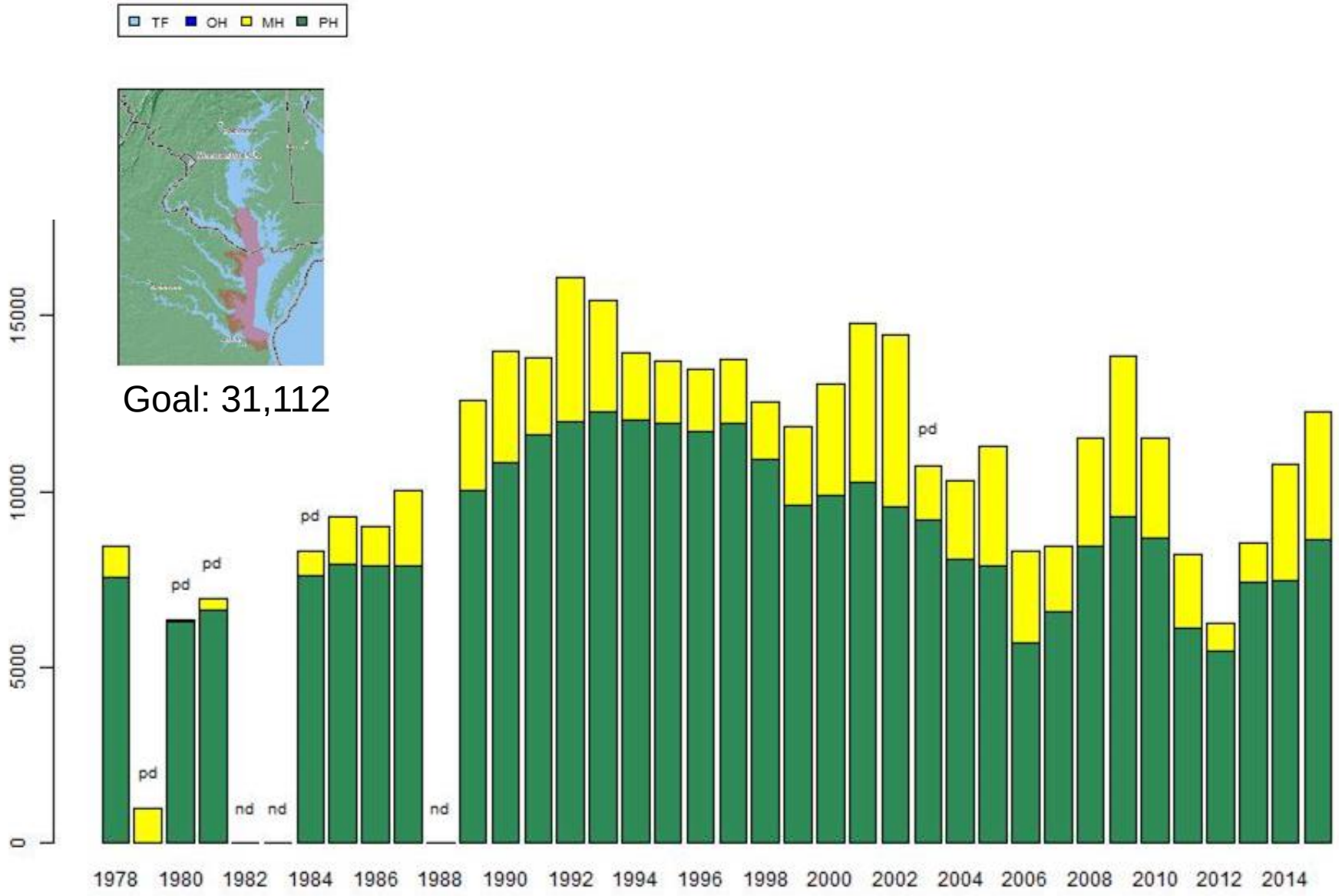
aka
Rich Batiuk



TAN SAV by Salinity Zone (Acres)



WB SAV by Salinity Zone (Acres)



The annual SAV monitoring report and dataset

- Large regional changes
- Communicate inter-annual changes
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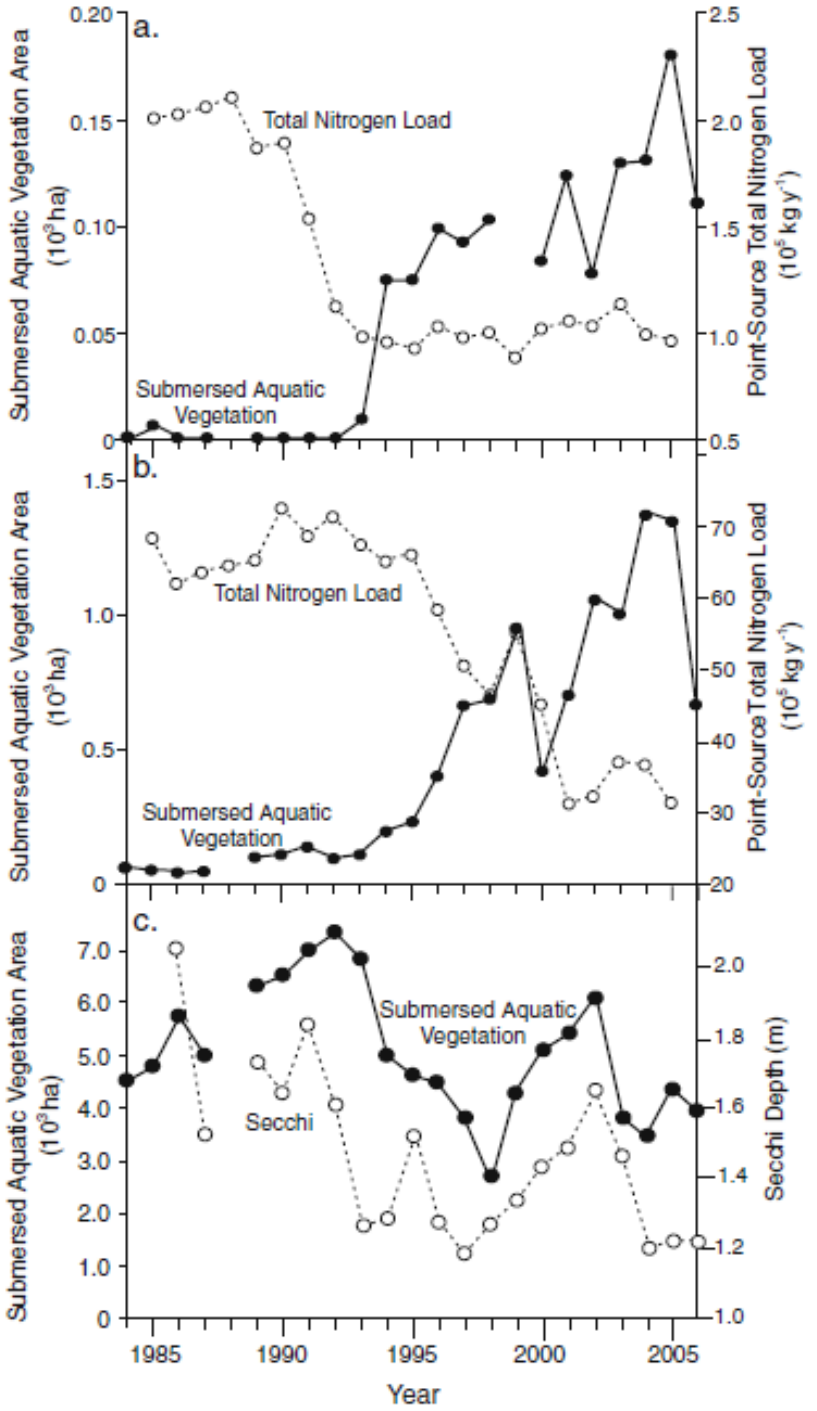
- SAV biology and ecology
- Multiple users

Status and Trends

First Baywide Analysis 2006

Local Analysis: Choptank, Susquehanna Flats, Upper Potomac River, Sub-estuaries



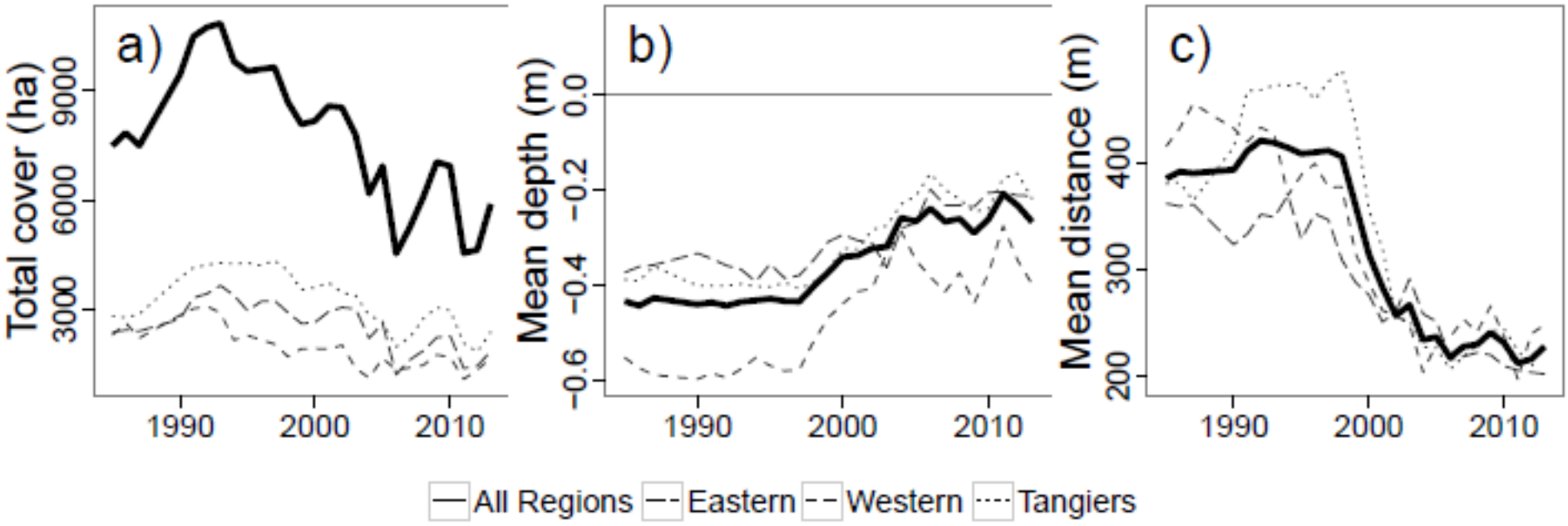
Upper Patuxent River

Lower Potomac River

Tangier Sound

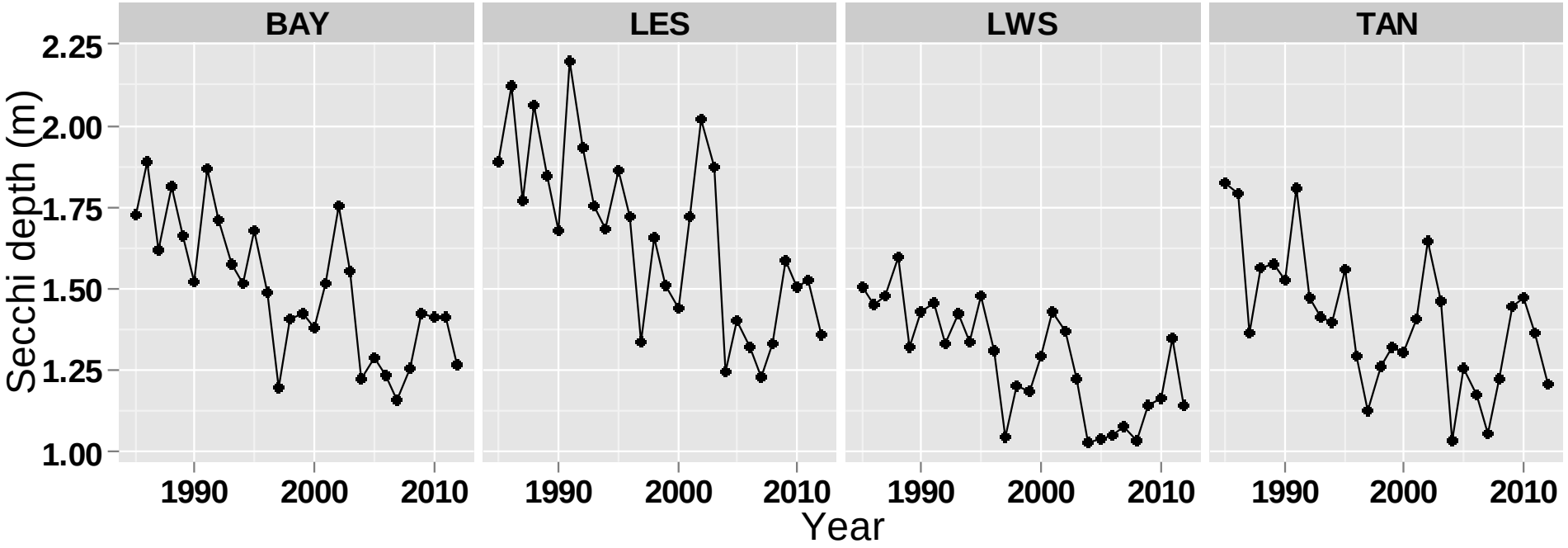
The Eelgrass Story

Eelgrass cover changes by depth and distance from the deep edge

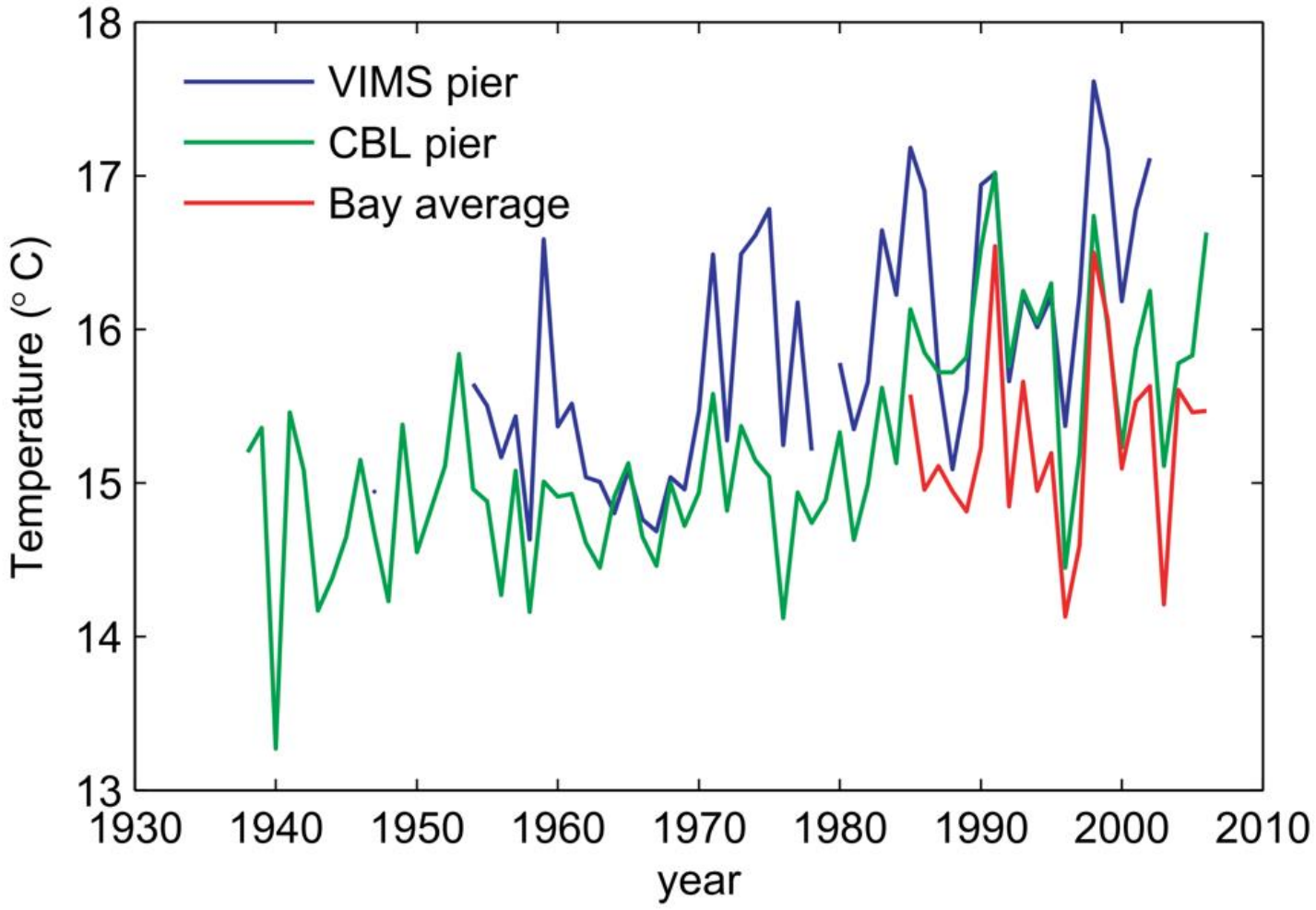


WHY THESE CHANGES ??

Water clarity has decreased dramatically



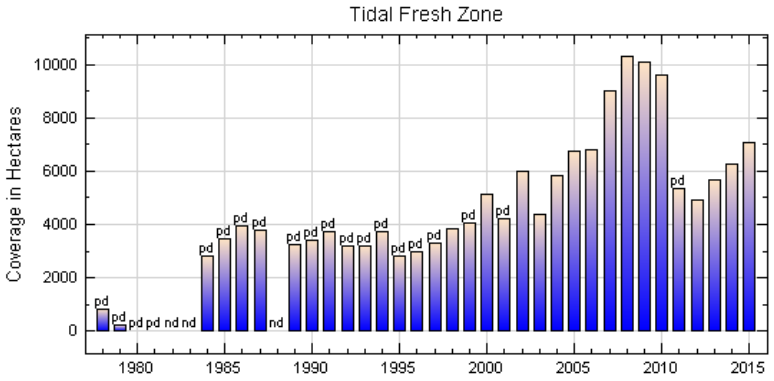
Annual average surface temperatures have steadily increased in the Chesapeake bay

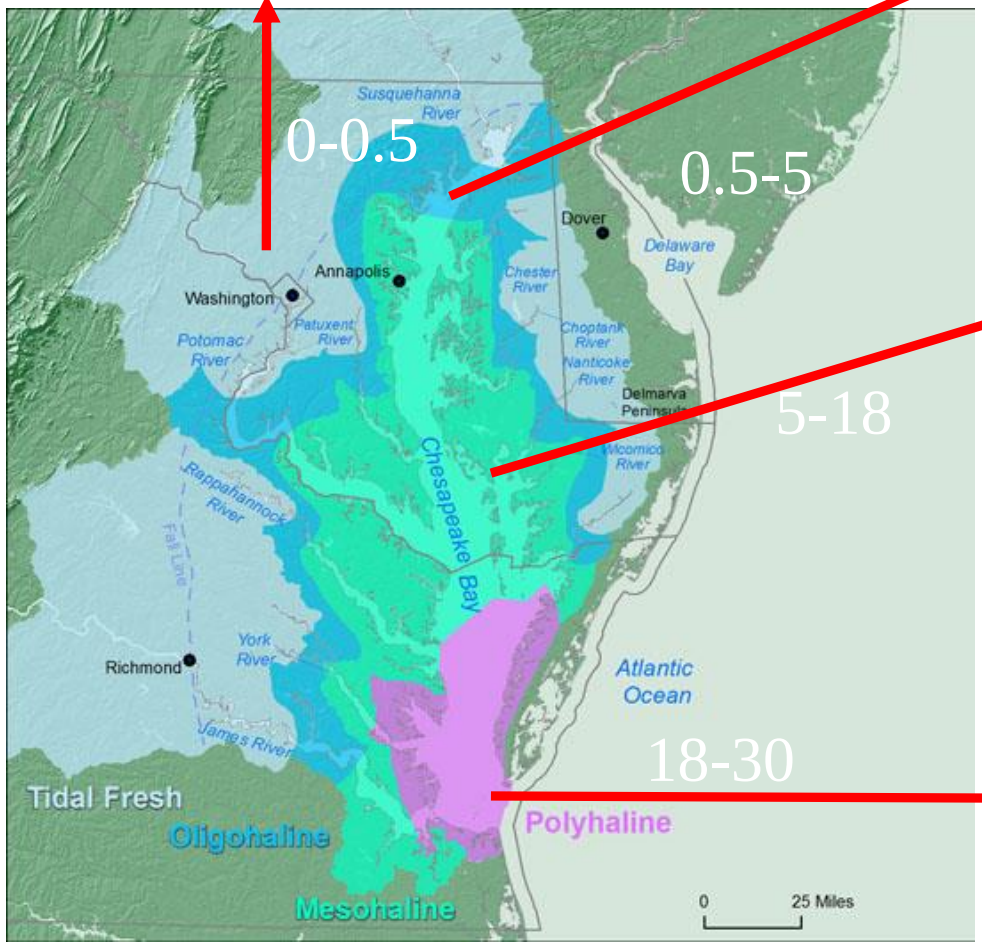


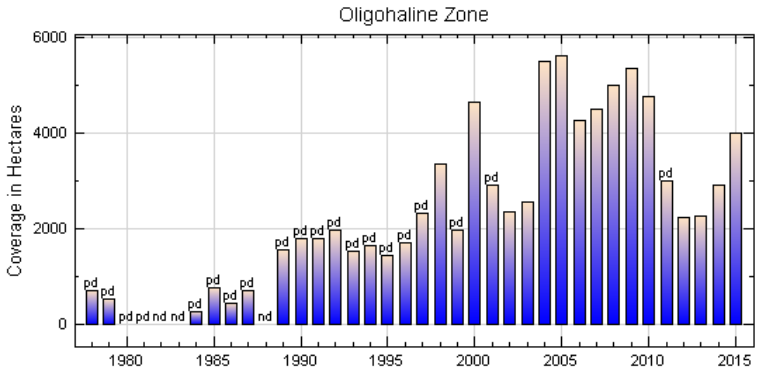
VIMS pier = mouth of the York River

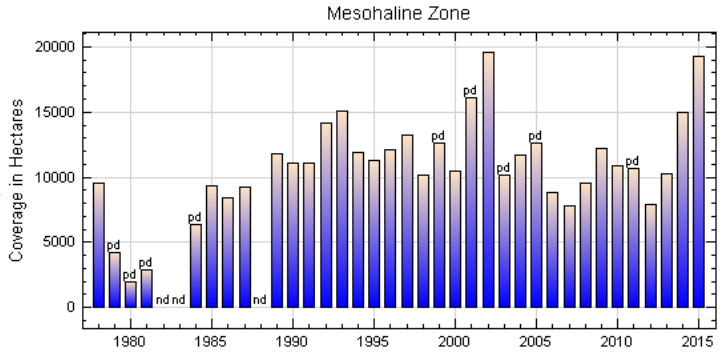
CBL pier = mouth of the Patuxent River

Bay average = main-stem Chesapeake Bay

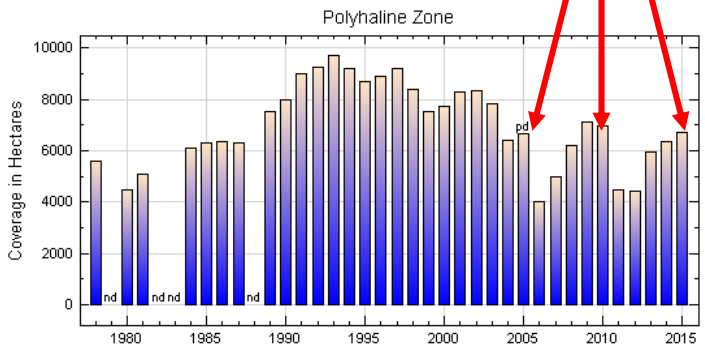

Tidal Fresh Zone
Coverage in Hectares
0
2000
4000
6000
8000
10000
1980
1985
1990
1995
2000
2005
2010
2015


0-0.5
0.5-5
5-18
18-30
Susquehanna River
Dover
Delaware Bay
Annapolis
Washington
Chester River
Patuxent River
Potomac River
Choptank River
Nanticoke River
Delmarva Peninsula
Wicomico River
Chesapeake Bay
Rappahannock River
Fall Line
York River
Richmond
James River
Atlantic Ocean
Tidal Fresh
Oligohaline
Mesohaline
Polyhaline
0
25 Miles

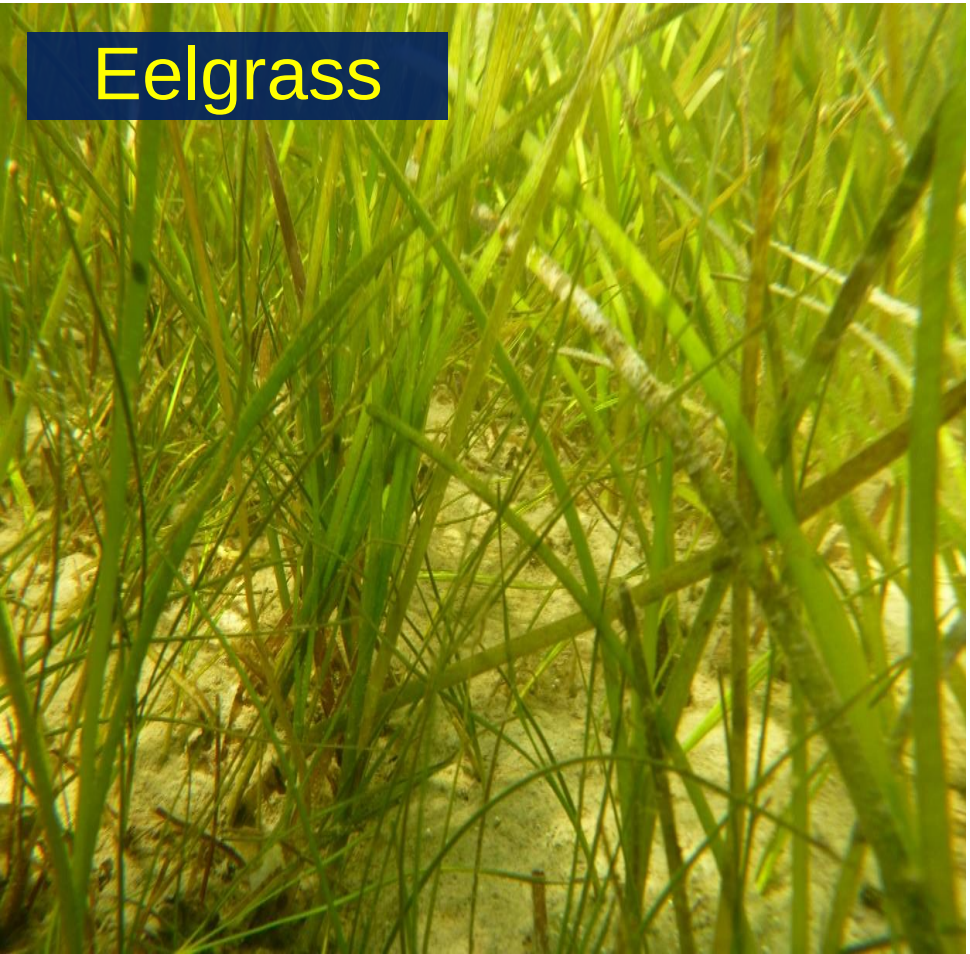

Oligohaline Zone
Coverage in Hectares
0
2000
4000
6000
1980
1985
1990
1995
2000
2005
2010
2015


Mesohaline Zone
Coverage in Hectares
0
5000
10000
15000
20000
1980
1985
1990
1995
2000
2005
2010
2015

hot


Polyhaline Zone
Coverage in Hectares
0
2000
4000
6000
8000
10000
1980
1985
1990
1995
2000
2005
2010
2015

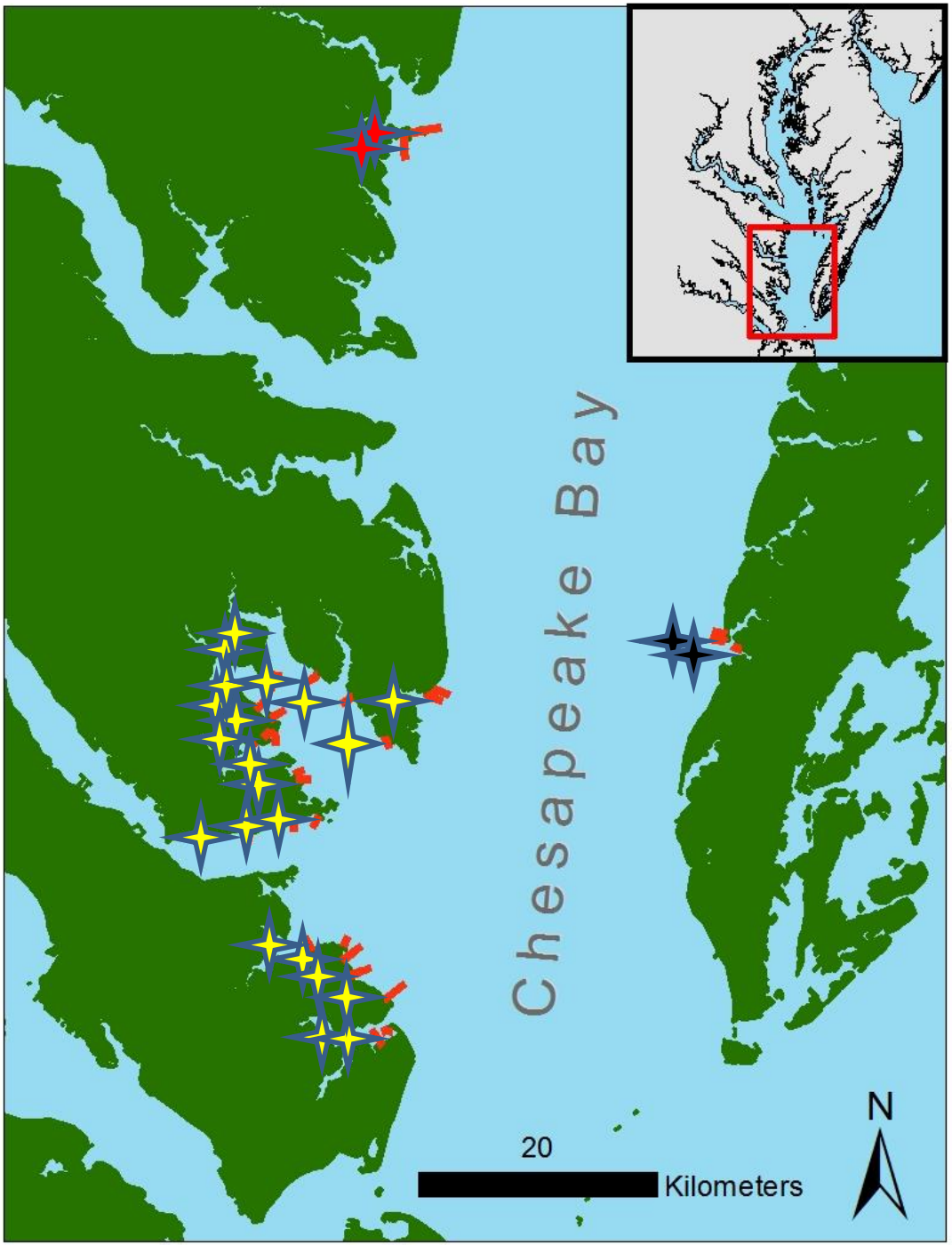
Will the relative abundances of Eelgrass and Widgeongrass change as the Chesapeake Bay warms?

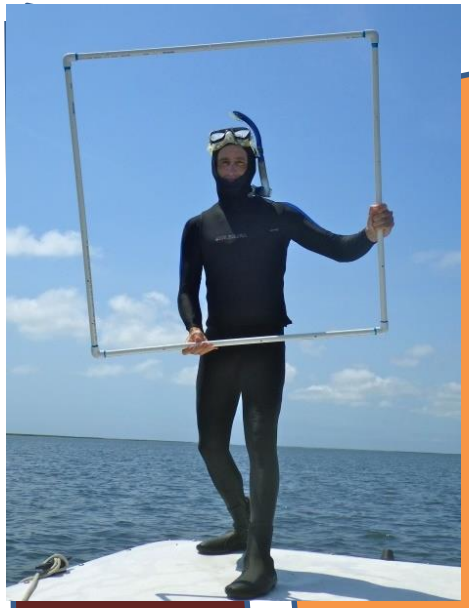


25 sites, mostly in the southwest portion of the Chesapeake Bay

- 2 on Eastern Shore
- 2 north of Rappahannock

SAV QUEST!

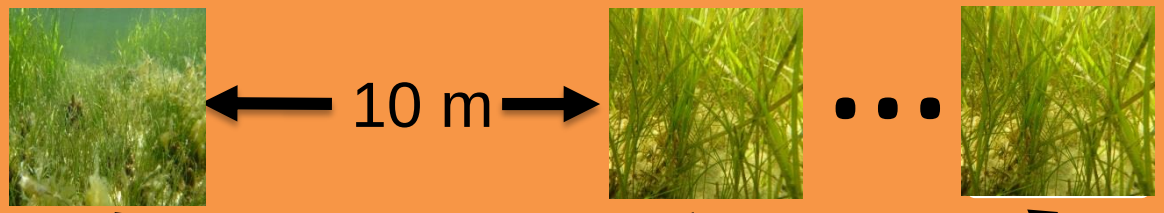




2008 – 2015
10580 observations!

GRASS BED

TRANSECT



SHORELINE

OFFSHORE EDGE

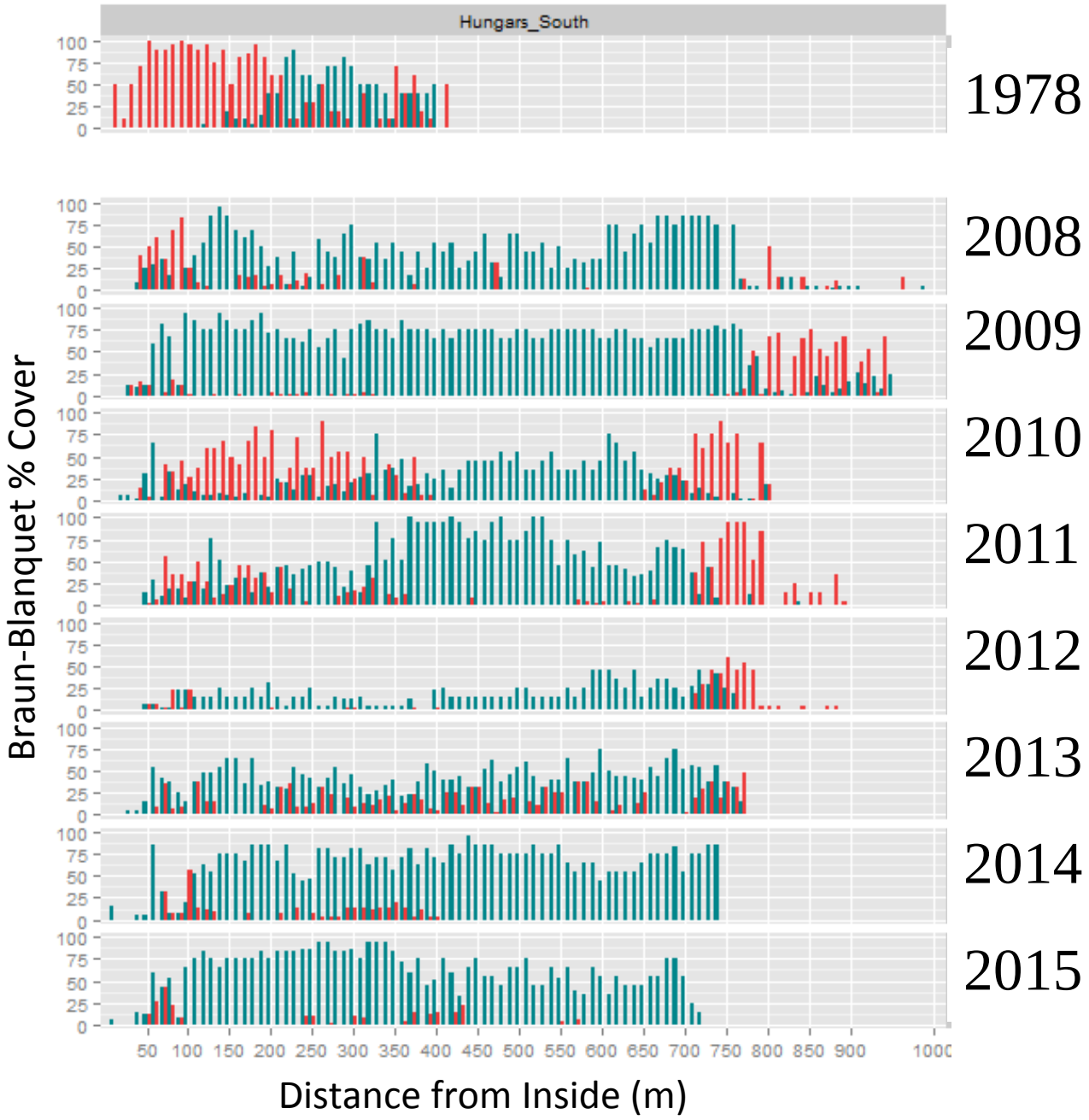
1m²

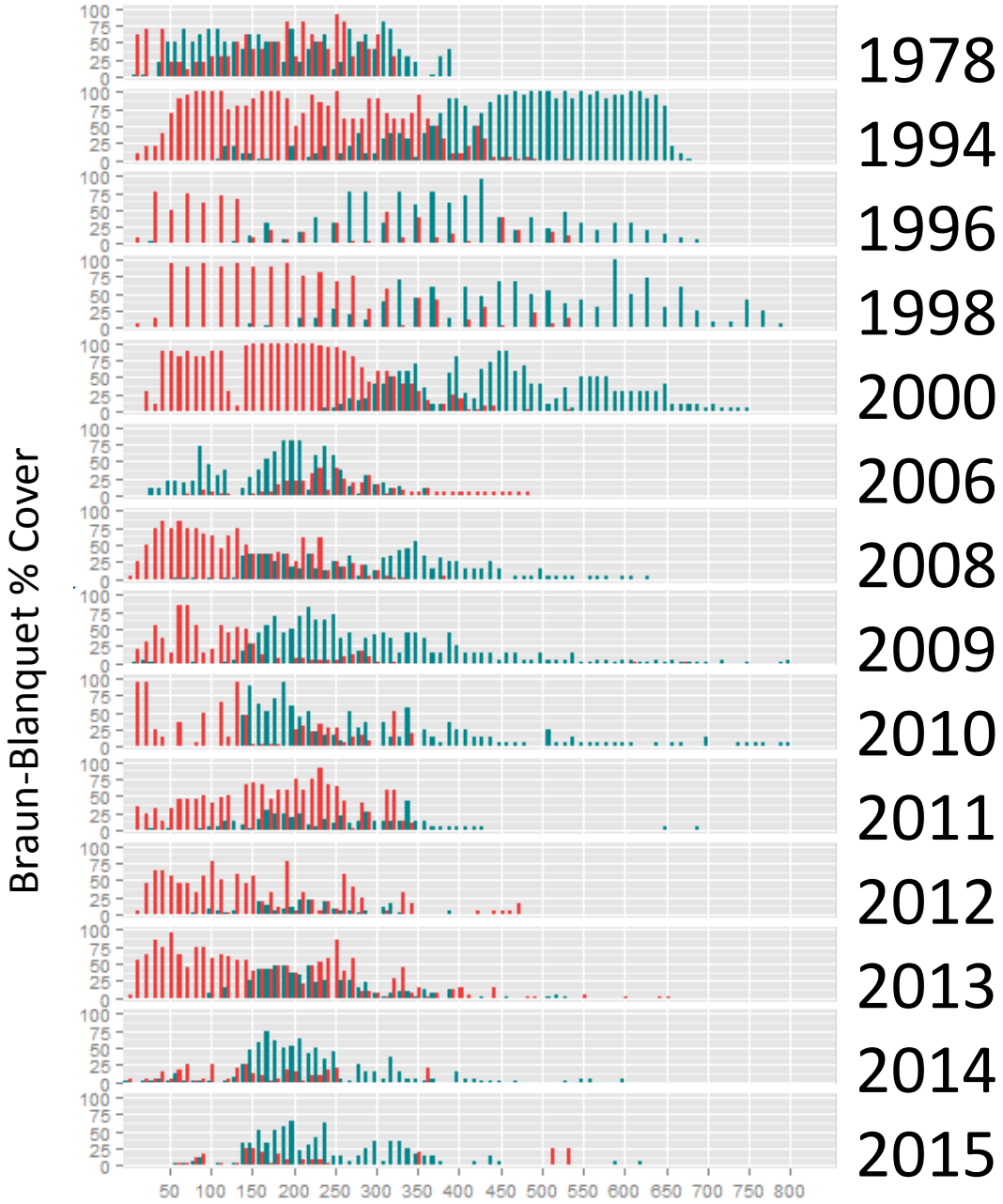
Transects – 200-1800 m

Back River Shoal Transect

Eelgrass

Widgeongrass


Hungars_South
1978
2008
2009
2010
2011
2012
2013
2014
2015
Braun-Blanquet % Cover
Distance from Inside (m)
Hungars South Transect
Eelgrass
Widgeongrass



Brown's Bay Transect

Eelgrass

Widgeongrass

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- Large regional changes
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- Multiple users

Aquaculture versus critical habitats

Hard clam culture

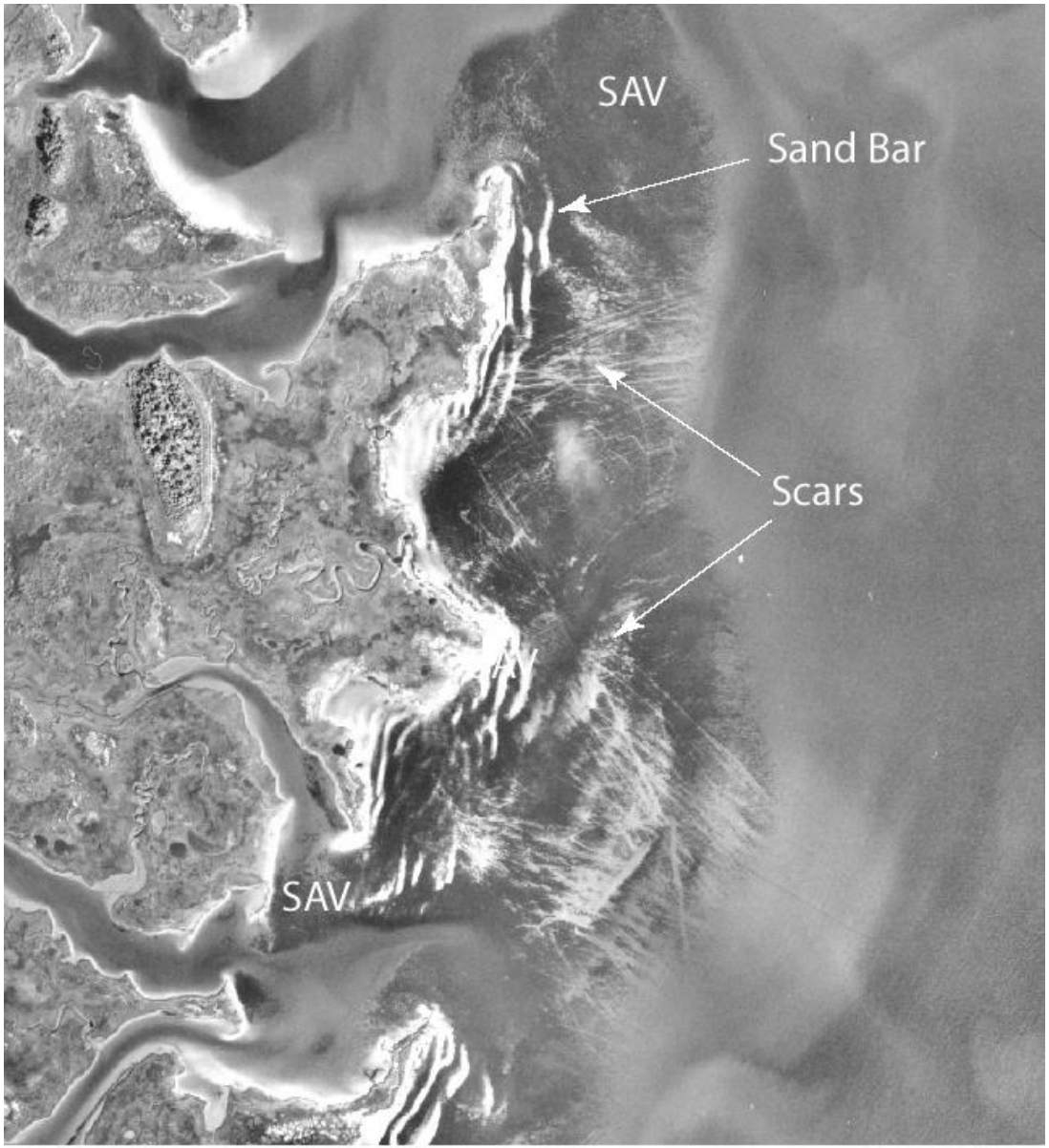
Eelgrass

State laws keep aquaculture structures off SAV beds

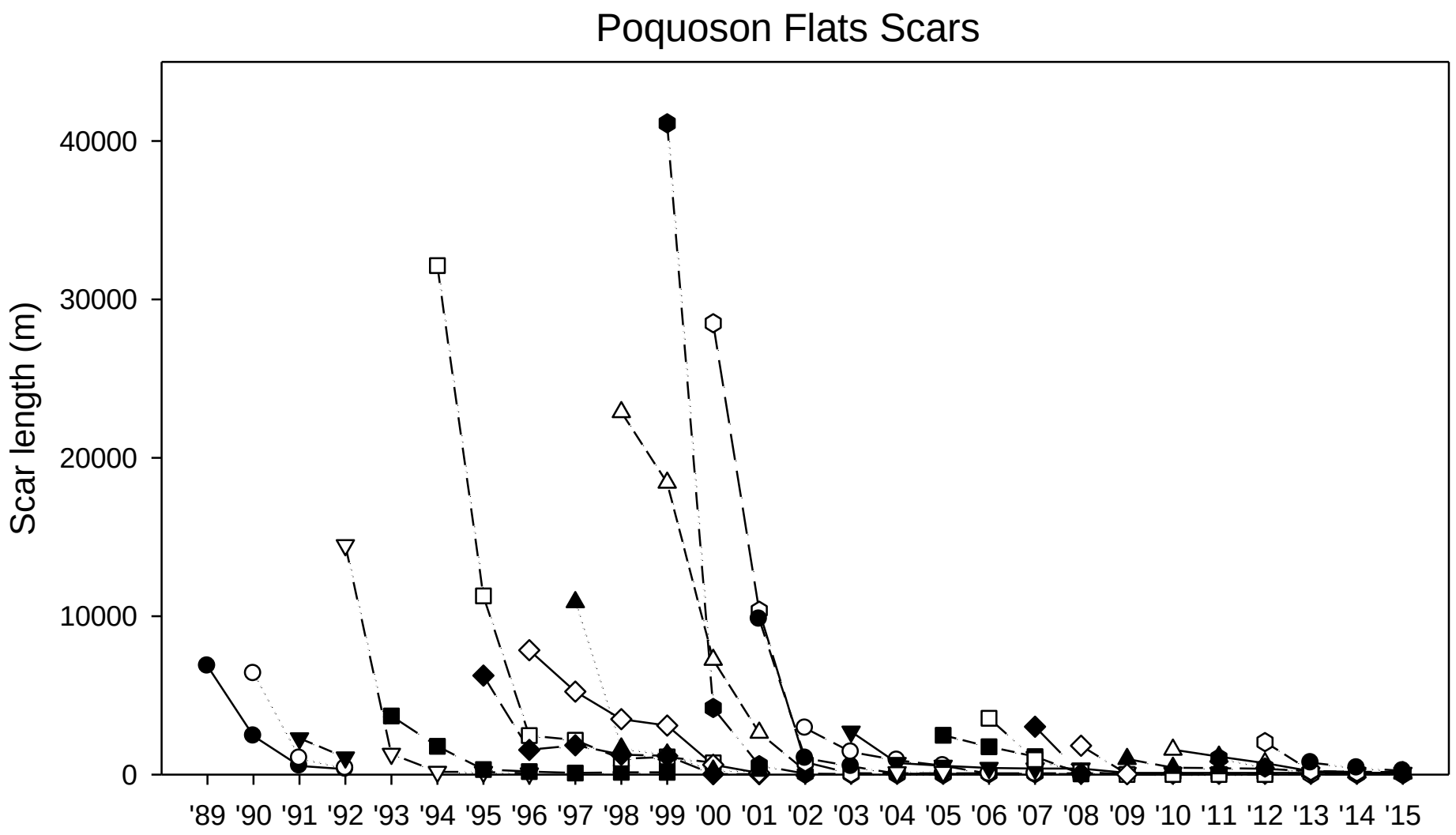
- **VMRC 4 VAC 20335-10** (Jan. 1998) – On-bottom shellfish aquaculture activities requiring structures are now prohibited from being placed on existing SAV

- **Md. NATURAL RESOURCES Code Ann. § 4-11A-01 (2015) - SAV Protection Zone. -- "SAV Protection Zone"** means an area of submerged aquatic vegetation as mapped in aerial surveys by the Virginia Institute of Marine Sciences in 1 or more of the 5 years preceding the designation of an Aquaculture Enterprise Zone or an application for a lease under this subtitle.

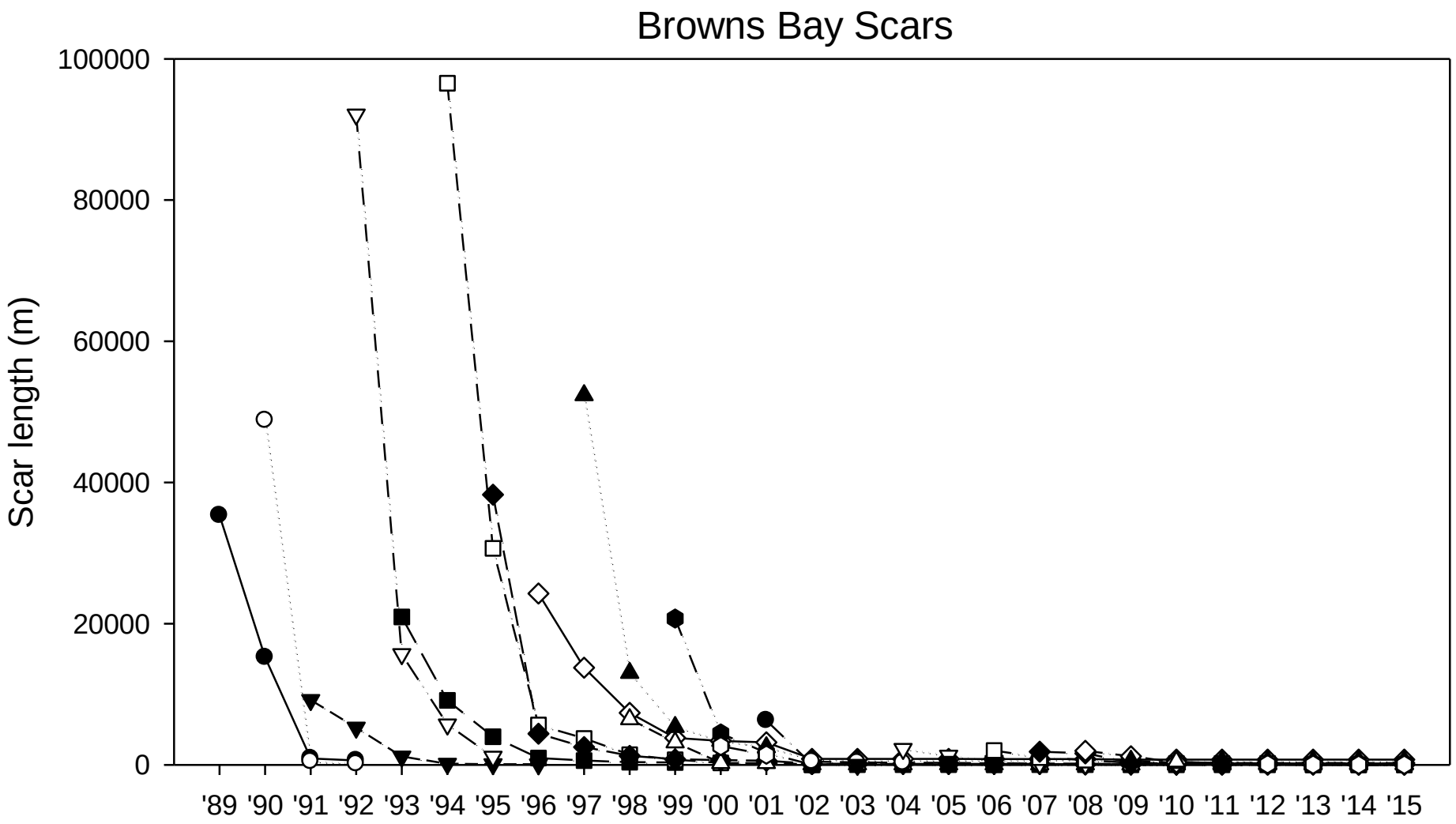
Extensive Scarring in Brown's Bay - 1997



Aerial photograph from VIMS monitoring showing extensive scarring in grassbed in Browns Bay located in the Mobjack Bay

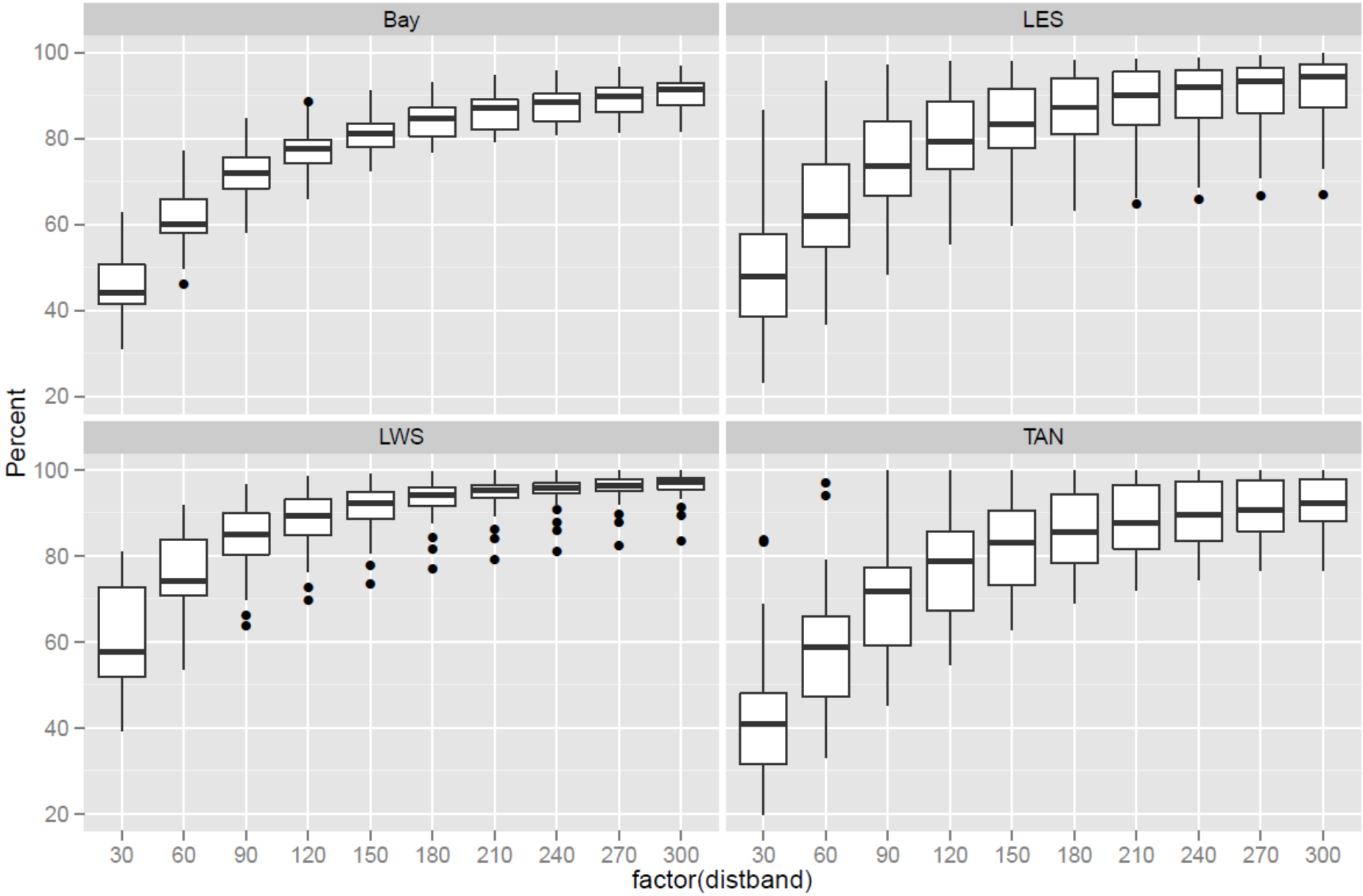


Each point represents how much propeller scaring we measured each year. Then we follow those scars in subsequent years.



Each point represents how much propeller scaring we measured each year. Then we follow those scars in subsequent years.

Submerged Aquatic Vegetation (SAV)
The Future Of The
Annual Baywide Monitoring



Percentage of new SAV growth each year by distance to existing SAV

The BIG Users of the SAV monitoring data

Government visits to SAV Interactive Map YTD (10/4/15)				
IP	**Agency**	**Total for Agency**	**City**	**Visits**
firewall.dnr.state.md.us	DNR	170	Annapolis	170
nab-w.usace.army.mil	USACE	115	Laurel	75
nao-w.usace.army.mil	USACE	115	Norfolk	27
nab-c.usace.army.mil	USACE	115	Fort Huachuca	13
fourthfloor.mde.state.md.us	MDE	52	Baltimore	52
aa.fws.gov	FWS	20	Denver	20
u-159-189-240-96.xr.usgs.gov	usgs.gov	10	Herndon	4
u-128-128-41-90.xr.usgs.gov	usgs.gov	10	Woods Hole	2
u-128-128-43-1.xr.usgs.gov	usgs.gov	10	Woods Hole	2
u-128-128-42-113.xr.usgs.gov	usgs.gov	10	Woods Hole	1
u-130-11-37-109.xr.usgs.gov	usgs.gov	10	Manassas	1
fp3.apg.army.mil	army.mil	9	Havre De Grace	3
cpcig-c.usace.army.mil	army.mil	9	Fort Huachuca	2
nao-c.usace.army.mil	army.mil	9	Fort Huachuca	2
apgr-atc-bluecoat.atc.army.mil	army.mil	9	Churchville	2
205-156-36-105.ssmcnet.noaa.gov	noaa.gov	7	Silver Spring	5
205-156-36-37.ssmcnet.noaa.gov	noaa.gov	7	Silver Spring	2
unassigned.epa.gov	epa	6	Unknown	6
ssanccfw.ssa.gov	ssa	5	Baltimore	5
dcgw-248.nps.gov	nps.gov	4	Washington	2
dcgw-250.nps.gov	nps.gov	4	Washington	2
gate1-jacksonville.nmci.navy.mil	nmci.navy.mil	3	Alexandria	1
gate2-norfolk.nmci.navy.mil	nmci.navy.mil	3	Norfolk	1
gate3-norfolk.nmci.navy.mil	nmci.navy.mil	3	Norfolk	1
sherman-ee.state.gov	sherman-ee.state.gov	2	Washington	2
sauron14.larc.nasa.gov	nasa.gov	2	Hampton	1
wcne-128-154-10-114.gsfc.nasa.gov	nasa.gov	2	Parksley	1
host2.alexandriava.gov	alexandriava	1	Unknown	1
mgadls.state.md.us	md.us	1	Arnold	1
pool124-172.pool.nsf.gov	pool.nsf.gov	1	Arlington	1
gate25-quantico.nmci.usmc.mil	usmc.mil	1	Virginia Beach	1
				409