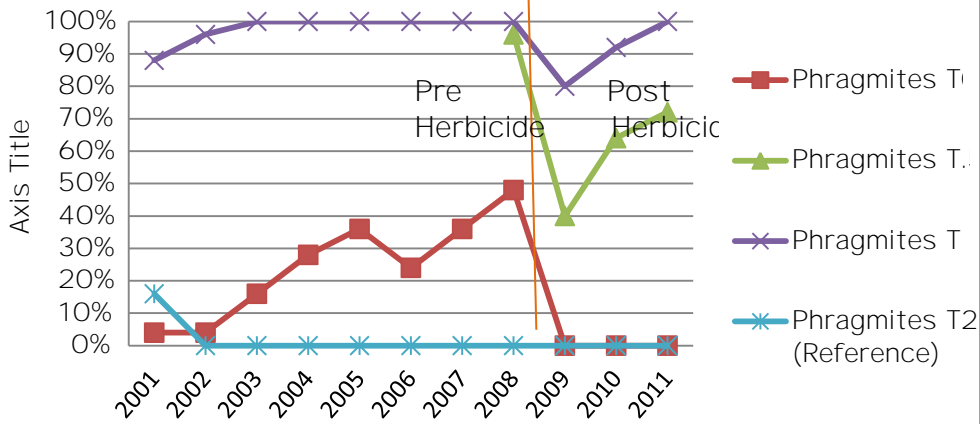
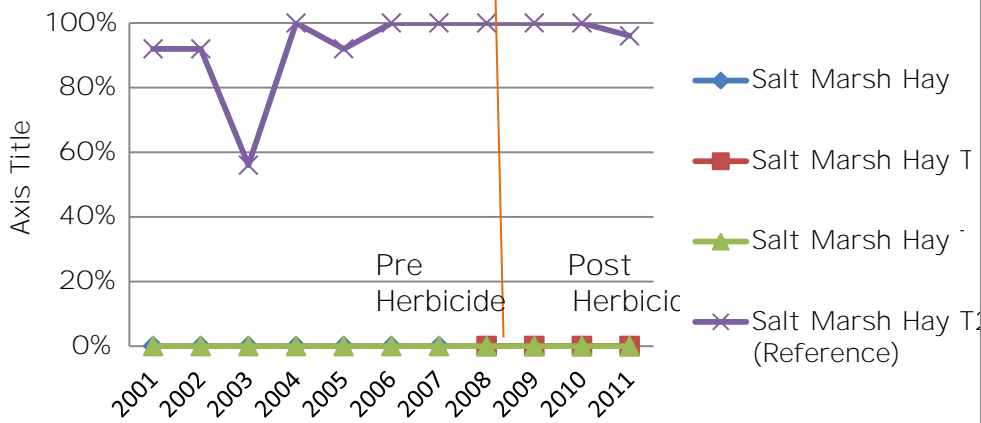


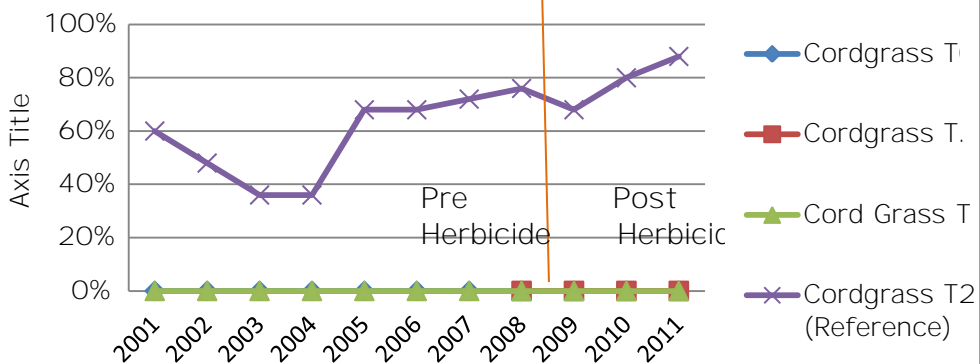
Phragmites australis PRNWR North Pool and Reference



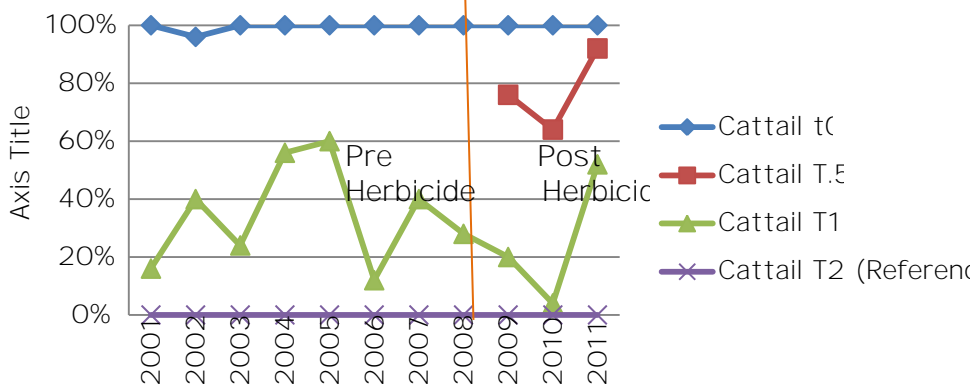
Salt Marsh Hay (*Spartina patens*) PRNWR North Pool and Reference



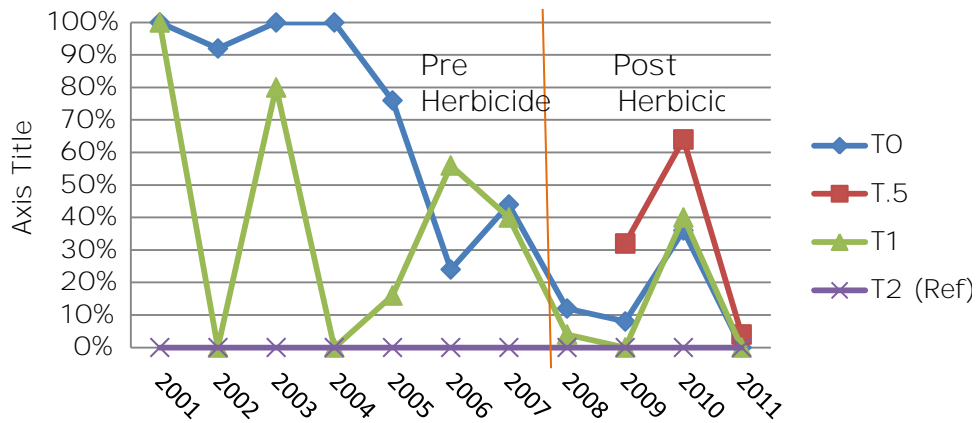
Saltmarsh Cordgrass (*Spartina alterniflora*) PRNWR North Pool and Reference



Cattail (*Typhus*) on PRNWR North Pool and Reference



Purple Loosestrife (*Lythrum salicaria*) on PRNWR North Pool and Reference



	Year	Phragmites T0	Phragmites T.5	Phragmites T1	Phragmites T2 (Reference)
Mowed	2001	4%		88%	16%
	2002	4%		96%	0%
	2003	16%		100%	0%
	2004	28%		100%	0%
	2005	36%		100%	0%
	2006	24%		100%	0%
	2007	36%		100%	0%
Herbicided	2008	48%	96%	100%	0%
Mowed	2009	0%	40%	80%	0%
	2010	0%	64%	92%	0%
	2011	0%	72%	100%	0%

	Year	Salt Marsh Hay t0	Salt Marsh Hay T.5	Salt Marsh Hay T1	Salt Marsh Hay T2 (Reference)
Mowed	2001	0%		0%	92%
	2002	0%		0%	92%
	2003	0%		0%	56%
	2004	0%		0%	100%
	2005	0%		0%	92%
	2006	0%		0%	100%
	2007	0%		0%	100%
Herbicided	2008	0%	0%	0%	100%
Mowed	2009	0%	0%	0%	100%
	2010	0%	0%	0%	100%
	2011	0%	0%	0%	96%

	Year	Cordgrass T0	Cordgrass T.5	Cord Grass T1	Cordgrass T2 (Reference)
Mowed	2001	0%		0%	60%
	2002	0%		0%	48%
	2003	0%		0%	36%
	2004	0%		0%	36%
	2005	0%		0%	68%
	2006	0%		0%	68%
	2007	0%		0%	72%
Herbicided	2008	0%	0%	0%	76%
Mowed	2009	0%	0%	0%	68%
	2010	0%	0%	0%	80%
	2011	0%	0%	0%	88%

	Year	Cattail t0	Cattail T.5	Cattail T1	Cattail T2 (Reference)	
Mowed	2001		100%		16%	0%
	2002		96%		40%	0%
	2003		100%		24%	0%
	2004		100%		56%	0%
	2005		100%		60%	0%
	2006		100%		12%	0%
	2007		100%		40%	0%
Herbicated	2008		100%		28%	0%
Mowed	2009		100%	76%	20%	0%
	2010		100%	64%	4%	0%
	2011		100%	92%	52%	0%

	Year	Purple Loosestife				
		T0	T.5	T1	T2 (Ref)	
Mowed	2001		100%		100%	0%
	2002		92%		0%	0%
	2003		100%		80%	0%
	2004		100%		0%	0%
	2005		76%		16%	0%
	2006		24%		56%	0%
	2007		44%		40%	0%
Herbicated	2008		12%		4%	0%
Mowed	2009		8%	32%	0%	0%
	2010		36%	64%	40%	0%
	2011		0%	4%	0%	0%

Massachusetts Audubon Society, Endicott Center
 Long Range Phragmites Study
 Location: Parker River National Wildlife Refuge, Plum Island, Newburyport

Transect 0 is upstream and perpendicular to station 3? On the boardwalk
 2009 Duff, NECC, & Sparhawk
 2010 Duff & Kate w/ Sparhawk
 2005 Duff & Rose (25 cm of standing water!)

Tide gates open 2001 and 2002 and
 June-July 2003. Gates closed 2004 and 2005

Transect 0
 Observers and dates
 2001 LD, Halloran 10/24/01
 2002 Newbury Elementary Gr. 6, Nichols 10/30/06 Duff. Cattail looked dead at this time
 2004 Duff & Gr. 6 Newbury 10/22/04
 11/1/07 Duff # of intervals

SPECIES
 Herbicided fall '08
 PRNWR 1

1 METER SEGMENTS

upland end 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 marsh end present in %

Species	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	present in	%	
Phragmites <i>Phragmites australis</i>	2001																						1				1	4%	
	2002																						1					1	4%
	2003																						1	1		1	1	4	16%
	2004																					1	1	1	1	1	1	7	28%
	2005	1	1																		1	1	1	1	1	1	1	9	36%
	2006	1																			1	1	1			1	1	6	24%
	2007	1																		1	1	1	1	1	1	1	1	9	36%
	2008	1	1				1				1									1	1	1	1	1	1	1	1	12	48%
	2009																											0	0%
	2010																											0	0%
	2011																											0	0%
	2012																											0	0%
Cattail <i>Typha angustifolia</i>	2001	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25	100%	
	2002	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	24	96%	
	2003	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25	100%	
	2004	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25	100%	
	2005	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25	100%	
	2006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25	100%	
	2007	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25	100%	
	2008	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25	100%	
	2009	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25	100%	
	2010	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25	100%	
	2011	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25	100%	
	2012																										0	0%	
Aster <i>Aster sp?</i>	2001																										0	0%	
	2002					1											1	1	1								4	16%	
	2003		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			1	21	84%	
	2004																										0	0%	
	2005																										0	0%	
	2006																										0	0%	
	2007																										0	0%	
	2008																										0	0%	
	2009																										0	0%	
	2010																										0	0%	
	2011																										0	0%	
	Unidentified	2001																										0	0%
2002		1	1	1																			1	1	1	1	10	40%	
2003			1	1	1	1	1																				4	16%	
2004																				1							1	4%	
2005																											0	0%	
Purple Loosestrife <i>Lythrum salicaria</i>	2001	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25	100%	
	2002	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	23	92%	
	2003	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25	100%	
	2004	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25	100%	
	2005	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	19	76%	
	2006																						1			1	6	24%	
	2007	1	1	1			1													1	1	1	1	1	1	1	11	44%	
	2008										1	1	1							1	1	1	1	1	1	1	3	12%	
	2009																							1	1	1	2	8%	
	2010	1			1						1			1			1	1			1	1	1	1	1	1	9	36%	
	2011																										0	0%	

Massachusetts Audubon Society, Endicott Center, Long Range *Phragmites* Study

Location: PRNWR

Transect .5

MOWED 10/01

Observers and dates

Aerial herbicide used fall 2008

2008 data collected by Northern Essex Com. Coll Fall 2009.

2011 Duff and Sparhawk teacher

Fall 2009 is first year following herbicide 2009 data Duff and NECC and Sparhawk 2010 Duff & Kate w/ Sparhawk

SPECIES	Year	1 METER SEGMENTS																									# of intervals present in	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25		
<i>Phragmites</i>	2008	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	24	96%
<i>Phragmites australis</i>	2009	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	10	40%
is immature (no tassel)	2010	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16	64%
Herbicided fall '08	2011	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	17	68%
	2012																										0	0%
Cattail	2009	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	19	76%
<i>Typha angustifolia</i>	2010	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16	64%
	2011	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	23	92%
	2012																										0	0%
Unknown leafy plant square stem	2009															1											1	4%
	2010																										0	0%
	2011																										0	0%
	2012																										0	0%
Purple Loosestrife	2009	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	8	32%
<i>Lythrum salicaria</i>	2010	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16	64%
	2011																										1	4%
	2012																										0	0%
<i>Orach</i>	2010																										1	4%
	2011																										0	0%
	2012																										0	0%
<i>Hemp</i>	2010																										1	4%
	2011																										0	0%
	2012																										0	0%
Fireweed (Pilewort)	2010																										4	16%
<i>Erechtites hieracifolia</i>	2011																										0	0%
smart weed	2010																										1	4%
<i>polygonum punctatum</i>	2011																										0	0%
Salt Marsh Sedge	2010																										5	20%
<i>Carex paleacea</i>	2011																										0	0%
<i>vine</i>	2010																										2	8%
	2011																										0	0%
Open Water	2011																										1	4%
	2012																										0	0%
<i>Beggars Tick</i>	2010																										4	16%
<i>Bidens Tripartita</i>	2011																										0	0%

*Location:

Transect 1, Upstream restricted, North Pool

Location: Parker River National Wildlife Refuge, Plum Island, Newburyport

MOWED 10/01

**Tide gates open 2001 and 2002 and
 June-July 2003. Gates closed 2004 and 2005**

Observers and dates

2001 10/4 + 10/5/01 ADR, Sue Brown, John Hallor
 2002 Newbury Elementary Gr. 6

2003 Oullette & Gr. 6

2004 Duff & Gr. 6

2006 Nicholoso 10/23

08 Duff & NECC

08 Duff & Newbury & f

2010 Duff & Kate

SPECIES

Herbicide fall '08

mowed in 2009

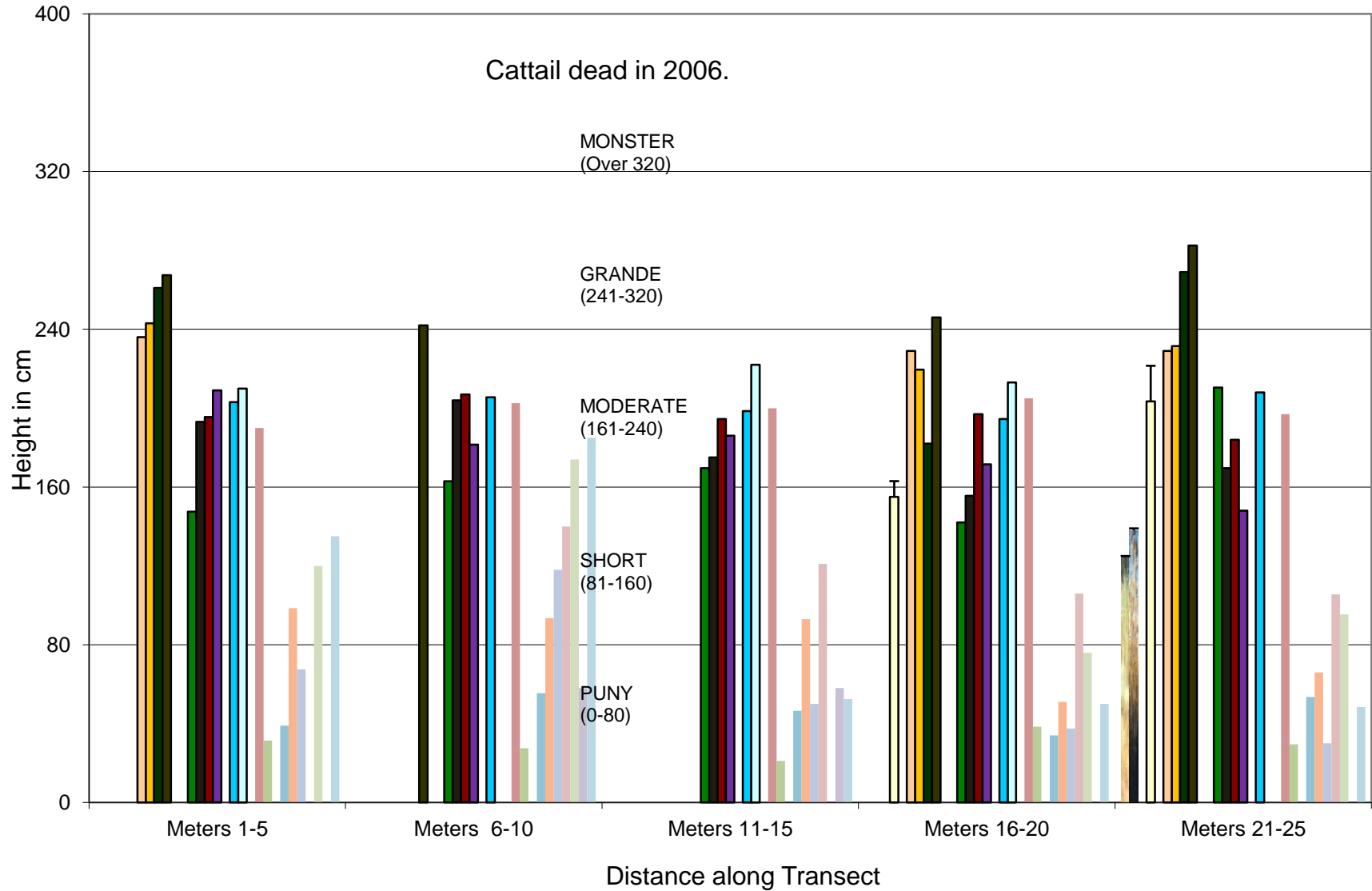
1 METER SEGMENTS

07 Nichoso
 marsh end # of intervals present in %

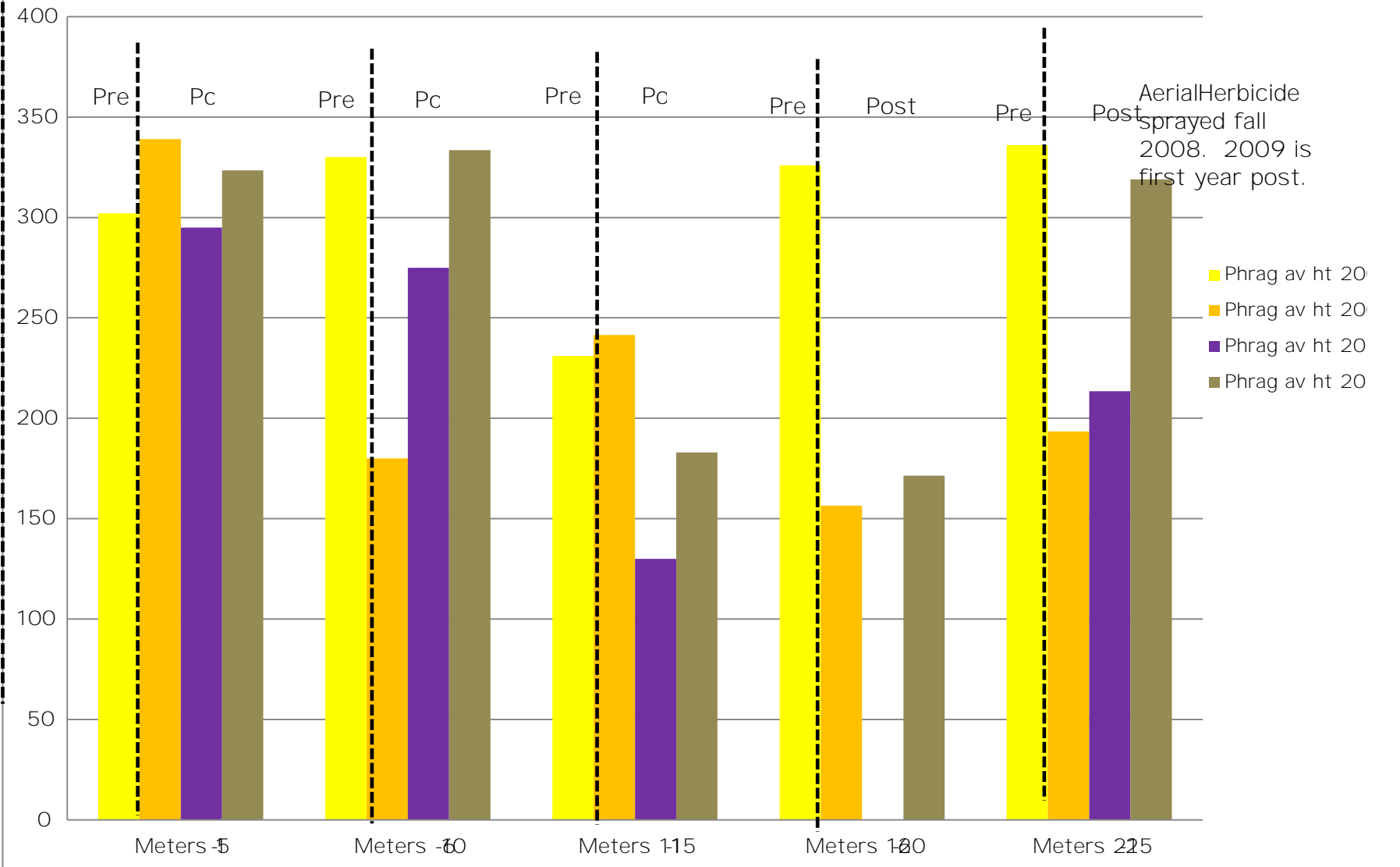
Species	Year	1 METER SEGMENTS																									# of intervals present in	%	Notes
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25			
Phragmites <i>Phragmites australis</i>	2001	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	22	88%	Beavers near in '01
	2002	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	24	96%	
	2003	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25	100%	
	2004	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25	100%	
	2005	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25	100%	
	2006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25	100%	Phragmites was crazy
	2007	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25	100%	looking; like spike grass
	2008	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25	100%	growing from the stem
	Herbicide fall '08																												
	2009	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	20	80%	
	2010	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	23	92%	
	2011	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	24	96%	
2012																										0	0%		
Cattail <i>Typha angustifolia</i>	2001																									4	16%	of a phragmites. Like	
	2002																										10	40%	roots turned into leave
	2003																										6	24%	after the water droppe
	2004																										14	56%	
	2005																										15	60%	
	d=dried out/dead?																												
	2006	d	d	d	d	d	d	d	d	d	d	d	d	d													3	12%	
	2007																										10	40%	
	2008																										7	28%	
	2009																										5	20%	
	2010																										2	8%	
	2011																										13	52%	
2012																										0	0%		
Olney Three Square <i>Scirpus americanus</i>	2001																									0	0%		
	2002																										2	8%	
	2003	Not recorded																									0	0%	
	2004																										0	0%	
	2005																										1	4%	
	2006																										0	0%	
	2007																										2	8%	
	2008																										0	0%	
Orach <i>Atriplex patula</i>	2001																									0	0%		
	2002																										4	16%	
	2003	Not recorded																									0	0%	
	2004																										0	0%	
	2005																										0	0%	
	2006																										0	0%	
	2007																										0	0%	
	2008																										0	0%	
	2009																										0	0%	
	2010																										0	0%	
	2011																										0	0%	

SPECIES	upland end	1 METER SEGMENT #																									present in	%
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25		
Phragmites	2001	1	1	1	1	1																					4	16%
<i>Phragmites australis</i>	2002	DEAD																									0	0%
	2003	DEAD																									0	0%
	2004																										0	0%
	'2005																										0	0%
	'2006																										0	0%
	2007																										0	0%
	2008																										0	0%
	2009																										0	0%
	2010																										0	0%
	2011																										0	0%
Saltmarsh Cordgrass <i>Spartina alterniflora</i> (short form)	2001				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15	60%	
	2002		1	1				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	12	48%	
	2003	1						1	1					1	1				1	1		1	1			9	36%	
	2004					1	1							1	1				1	1		1	1	1	1	9	36%	
	'2005					1	1		1	1				1	1	1	1	1	1	1	1	1	1	1	1	17	68%	
	'2006	1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	17	68%	
	2007	1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	18	72%	
	2008				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	19	76%	
	2009					1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	17	68%	
	2010		1			1	1	1				1	1	1	1	1	1	1	1	1	1	1	1	1	1	20	80%	
	2011																									0	0%	
Saltmarsh Hay <i>Spartina patens</i>	2001		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	23	92%	
	2002		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	23	92%	
	2003	1	1	1	1			1	1					1	1				1	1		1	1			14	56%	
	2004	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25	####	
	'2005	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	23	92%	
	'2006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25	####	
	2007	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25	####	
	2008	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25	####	
	2009	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25	####	
	2010	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25	####	
	2011																									0	0%	
Black Grass <i>Juncus gerardii</i>	2001		1	1			1																			3	12%	
	2002		1	1									1	1	1	1	1									5	20%	
	2003		1	1																						2	8%	
	'2004		1	1																						2	8%	
	'2005																									0	0%	
	'2006	1																								1	4%	
	2007																				1	1		1		3	12%	
	2008																					1				0	0%	
	2009																									0	0%	
	2010																									0	0%	
	2011																									0	0%	
Glasswort <i>Salicornia europaea</i>	2001			1	1		1	1	1	1		1						1	1	1						11	44%	
	2002			1													1						1	1	1	4	16%	
	2003	1		1			1					1					1			1	1		1	1	1	9	36%	
	2004	1		1	1		1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	18	72%	
	2005	1		1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21	84%	
	'2006																									0	0%	
	2007			1			1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16	64%	
	2008									1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	56%	
	2009																									0	0%	
	2010			1								1			1				1							4	16%	
	2011																									0	0%	

***Phragmites*, Cattail and Purple Loosestrife Heights, T 0,
Parker River National Wildlife Refuge 2002-2010**

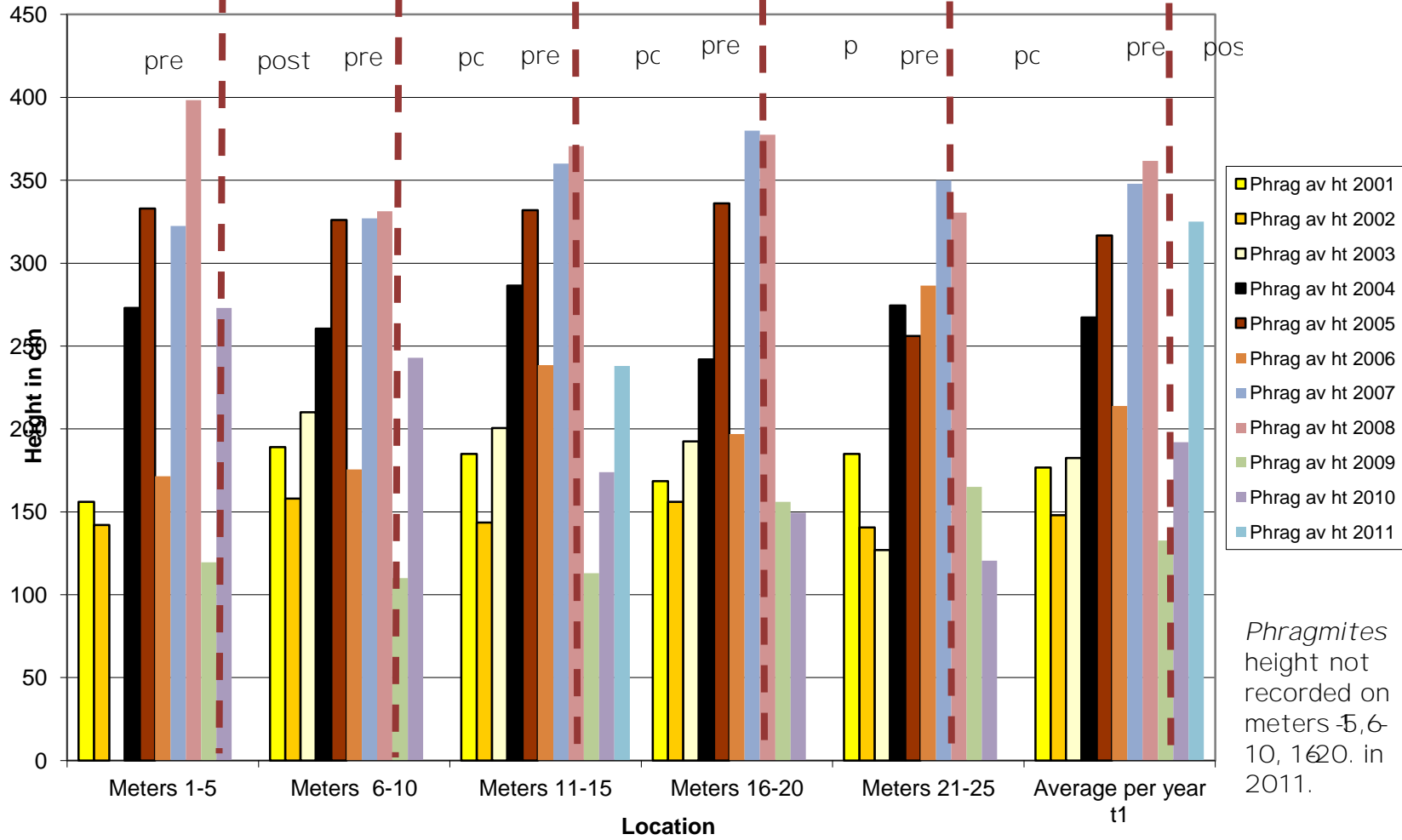


Phragmites Heights T .5 PRNWR



Transect 1 *Phragmites* Heights 2001-2011

Yellows= Tide gates opened. 2009 = post



Phragmites height not recorded on meters 5, 6, 10, 16, 20 in 2011.

