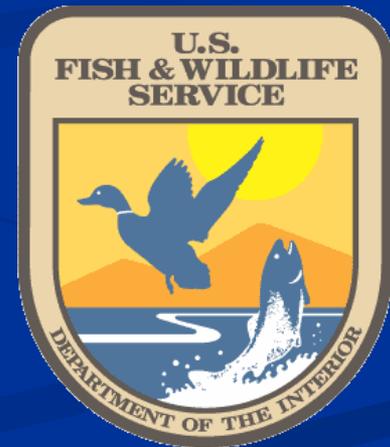
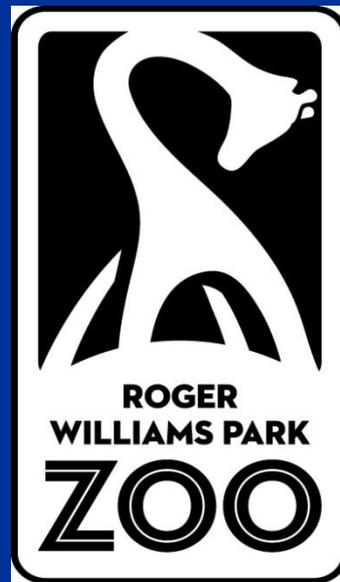


# American Burying Beetle Conservation Efforts in the Eastern Portion of its Range



# American burying beetle

*(Nicrophorus americanus)*





# Recovery Plan

Listed by the USFWS as Federally Endangered Species in 1989

- Monitor wild populations
- Maintain captive populations
- Initiate and continue a pilot reintroduction effort (Penikese Island, MA)
- Prioritize areas and conduct surveys for additional populations
- Conduct additional reintroductions and manage new populations

# Block Island, Rhode Island

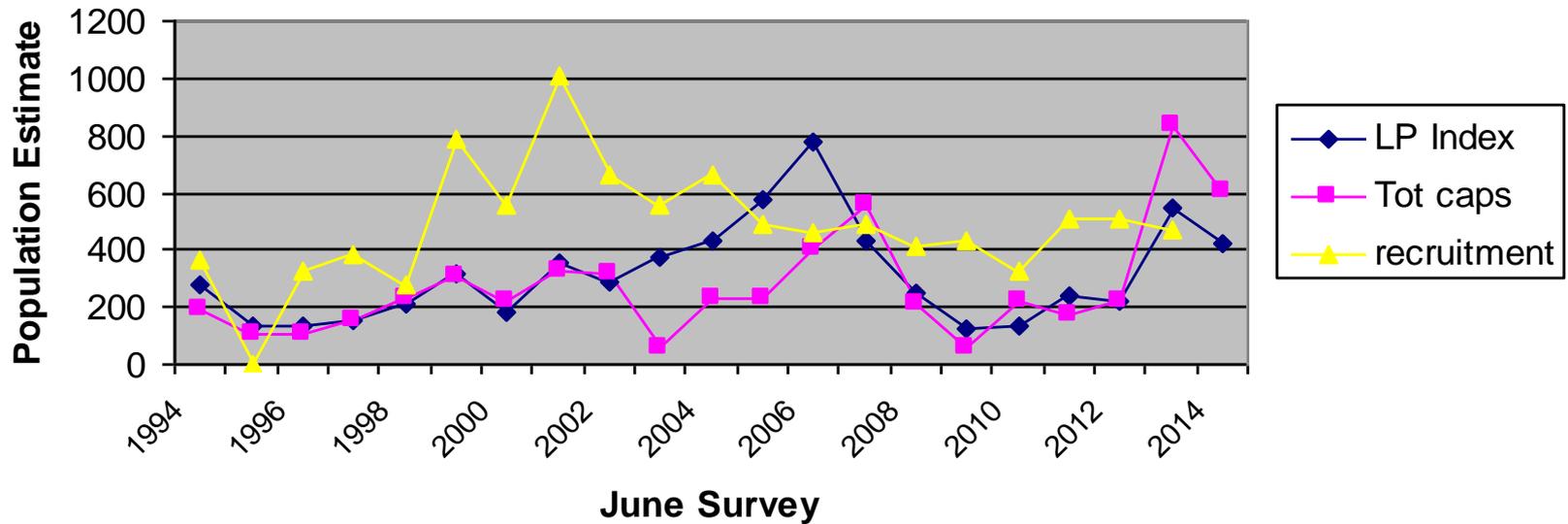


# Block Island Population Monitoring

- Monitoring occurs June 23-26
- Three trapping nights produce 149 trap-nights of effort at 3 monitoring sites
- Carrion provisioning is used as method to enhance recruitment
- Level of carrion provisioning appears to be directly correlated with annual recruitment
- Fall surveys are conducted to determine F1 population size and inform winter survival

# Block Island Population

## American Burying Beetle trend



# Estimated Overwinter Survival on Block Island

	Fall population estimate	Summer population estimate	% survival
Winter 01-02	2312	284	12
Winter 02-03	2775	374	13
Winter 03-04	2271	435	19
Winter 04-05	1213	577	48
Winter 05-06	1783	777	43
Winter 06-07	2326	429	18
Winter 07-08	1870	279	15
Winter 08-09	1296	99	8
Winter 09-10	958	151	16
Winter 10-11	1072	138	13
Winter 11-12	1234	232	19
Winter 12-13	1757	496	28
Winter 13-14	1793	411	23
<b>Average Survival</b>	<b>-</b>	<b>-</b>	<b>21</b>

# Moving Forward

- Continue surveying unchanged
- Continue additional trapping at other Block Island locations as needs and opportunities develop
- Continue carrion provisioning and brood checks at current levels
- Continue to mark fall individuals to obtain overwinter survival and population estimates
- Standardize release protocols range-wide (provisioned or not, flew or placed upon release, location of release)

# Conservation Efforts



# Penikese Island, MA



# Penikese Island Results

- Last record for an ABB on PI was 1947
- Surveys conducted in 1989 and 1990 confirmed its absence
- Reintroductions took place for 4 years 1990-1993
- This experimental population determined it was possible to release captive reared and wild translocated beetles successfully and their progeny could successfully reproduce on naturally available carrion
- Post-release monitoring efforts confirmed an ABB presence on PI from 1991-2001 but documented the survival of only modest numbers
- With no intervention the population died out by 2003

# Roger Williams Park Zoo

## American Burying Beetle Project History

- RWPZ received its first colony in 1994 to breed and supply beetles for a new USFWS reintroduction effort on Nantucket Is. MA.
- Since 1994 RWPZ has produced over 5000 beetles
- 2800 beetles released on Nantucket from 1995-2006
- 2006 *N.americanus* became the first insect to be given Species Survival Plan (SSP) status by the Association of Zoos and Aquariums (AZA)
- 2006-Present: Continue to annually monitor and provision the reintroduced population

# American burying beetle Species Survival Plan (SSP)

## Goals

- Standardize husbandry and field techniques range wide
- Initiate and conduct *ex-situ* research initiatives looking into the natural history, conservation, biology, and physiology of *N. americanus*
- Continue to maintain genetically diverse captive populations (Studbook)
- Continue to supply captive reared ABB's for USFWS approved reintroduction efforts
- Initiate and conduct surveys to look for additional populations or monitor existing populations
- Develop and distribute a strong universal conservation education component













# Roger Williams Park Zoo

## 21-Year Captive ABB Summary

■ Total larvae produced:	6671
■ <b>Total beetles eclosed:</b>	<b>5131</b>
■ Total males:	2629
■ Total females:	2486
■ <b>Larvae success rate:</b>	<b>77%</b>
■ Adults eclosed from wild larvae:	193
■ Avg. days from brood start to wander:	17 days
■ Avg. days b/n wander & eclose:	43.95 days
■ Avg. days between eclosures:	3.9 days
■ Avg. brood duration:	74 days

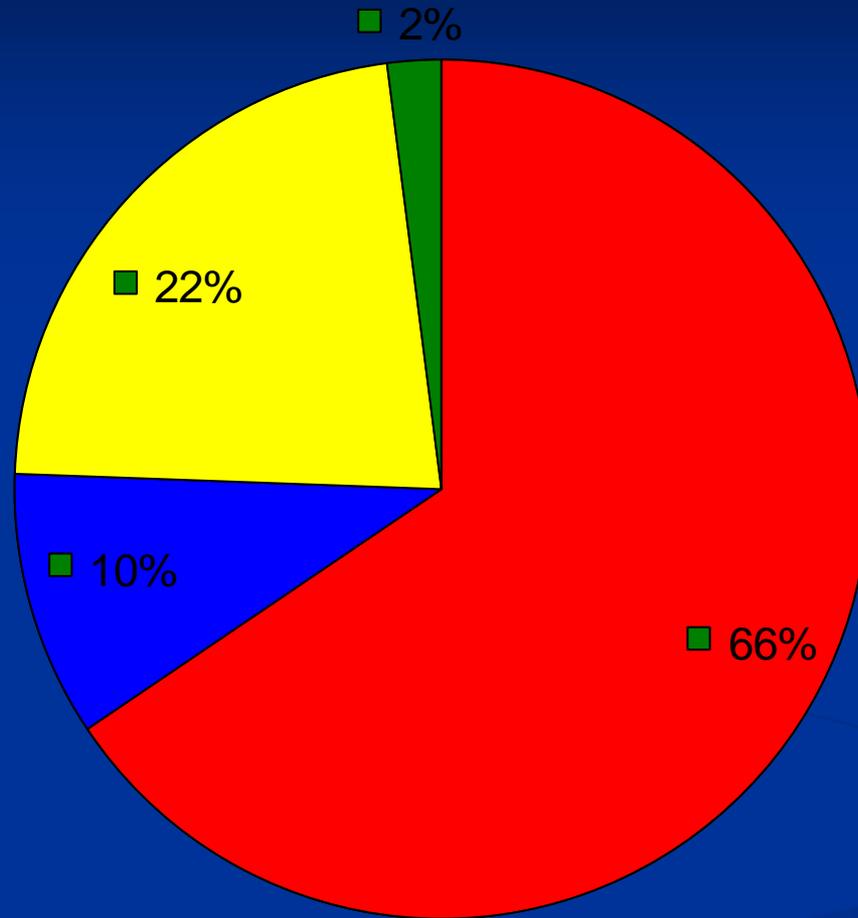
# Captive Rearing Allows Researchers:

- The opportunity to view behaviors not commonly seen in the wild
- To provide specimens for the collection of genetic material
- An ability to gain a physiological profile for this species
- To provide the numbers of beetles needed for reintroduction efforts

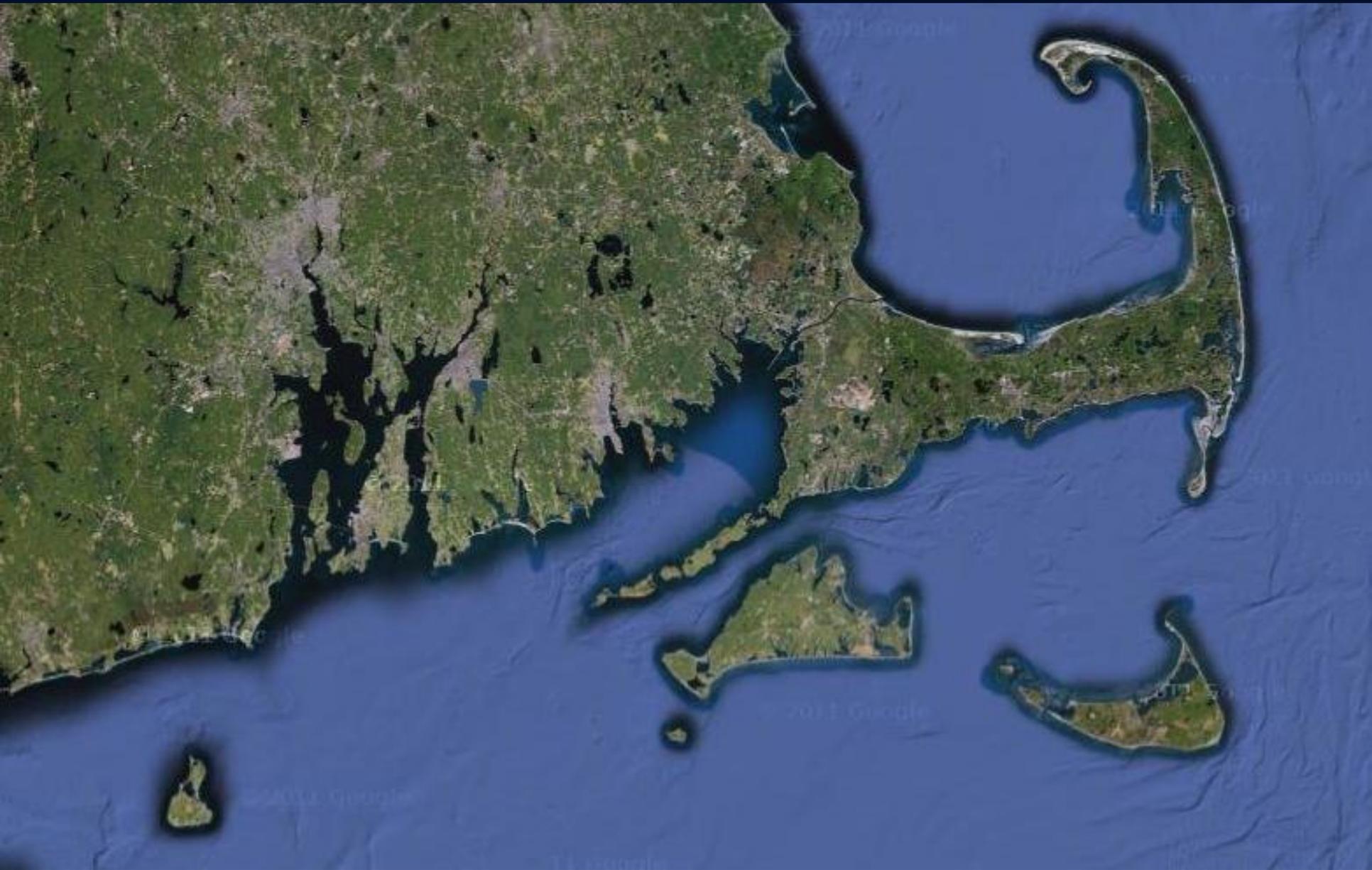
# Zoo and Staff Benefits

- Direct involvement in endangered species conservation
- Emphasis on a local species
- Hands on experience in breeding
- Collaboration with other agencies and institutions
- Opportunities for lab and field research
- Can provide funding match for Federal grants

# Total Cost Breakdown



Breeding  
Food  
Housing  
Field



- The last wild American burying beetle (ABB, *Nicrophorus americanus* Oliver (1790)) on Nantucket Island, Massachusetts was recorded in 1926.
- Extensive trapping surveys in 1992 and 1993 were unsuccessful in catching any *N. americanus* on Nantucket.
- Reintroductions began in the summer of 1994 and continued at various levels through 2006; to date, a total of 2,923 beetles have been released on Nantucket.



**Release Sites**  
**1995-2006**







# Over 2800 ABB's Released from 1994 to 2006



























# Numbers of ABB's Released

Year	Number of Beetles	Number of Broods
1994	48	26
1995	130	76
1996	19	12
1997	122	68
1998	38	31
1999	193	106
2000	250	125
<b>2001</b>	<b>386</b>	<b>193</b>
<b>2002</b>	<b>637</b>	<b>319</b>
<b>2003</b>	<b>322</b>	<b>161</b>
<b>2004</b>	<b>423</b>	<b>214</b>
<b>2005</b>	<b>324</b>	<b>162</b>
2006	31	21
<b>Total</b>	<b>2,923</b>	<b>1,514</b>

# Monitoring Goals

- 1994 – 2006
  - Conduct annual reintroductions and Confirm continued ABB presence on Nantucket
- 2007 -- 2010:
  - Discontinue reintroductions
  - Catch and provision as many ABBs as possible
  - Trap over entire known range
  - Collect baseline morphology and abiotic data
- 2011-- 2014
  - Significantly cut down on carrion provisioning (25 pairs)
  - Continue trapping for abundance and distribution
  - Continue to collect morphology and abiotic data

1994 - 2005



# Trapping Effort Expands

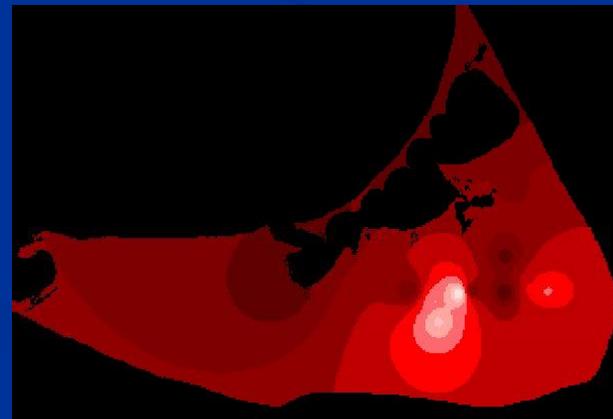
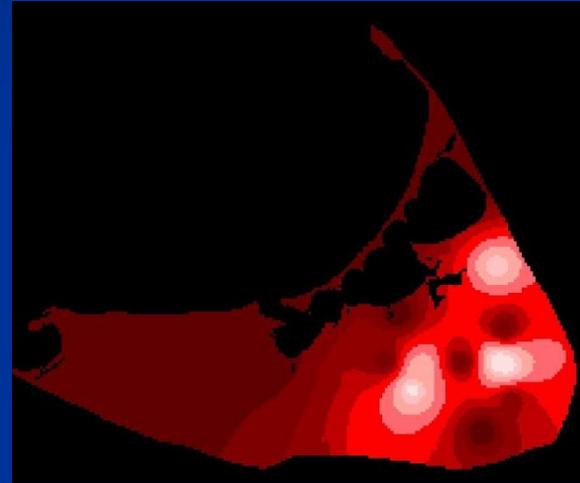
2006



2007



2008



**2009, 2010,  
2011, 2012**



We have captured  
ABBs at all these sites.

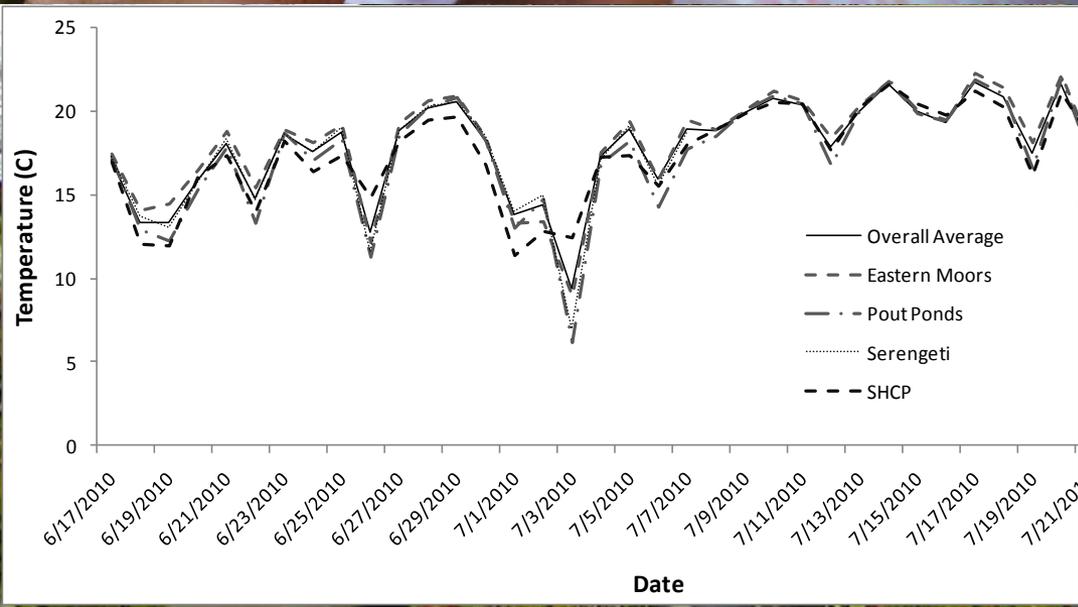
# Current trapping grid started in 2013

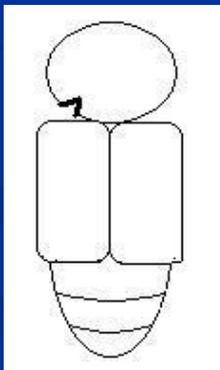
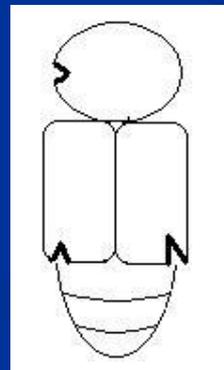
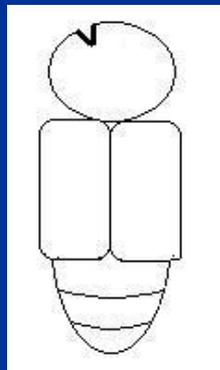
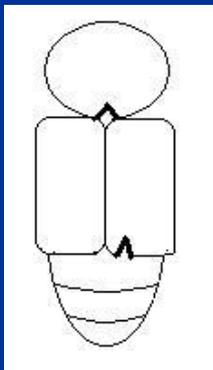
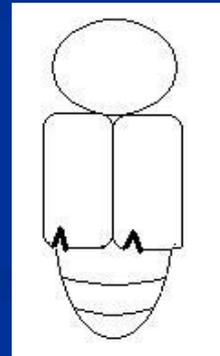
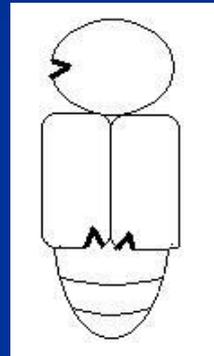
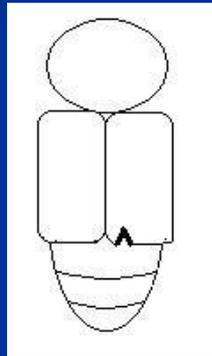
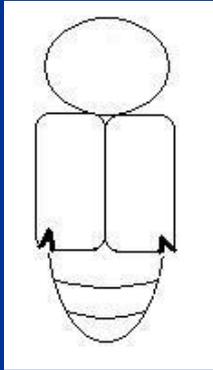
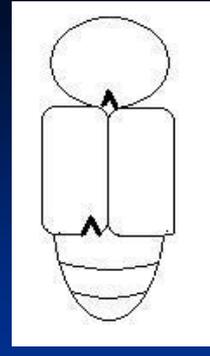
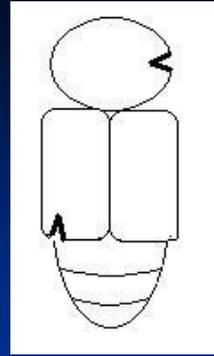
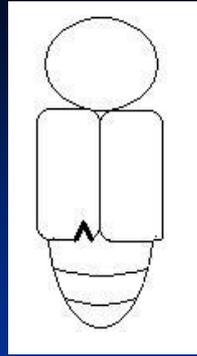
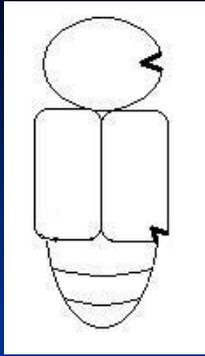




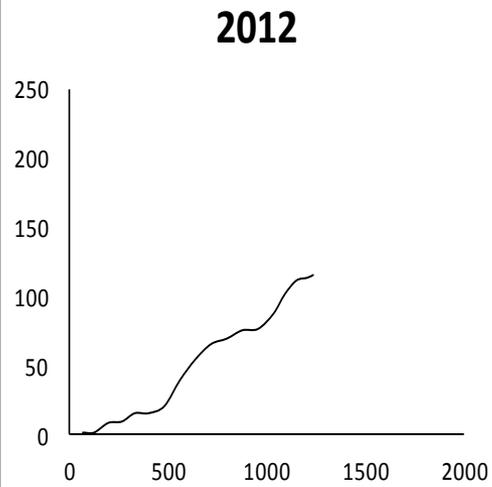
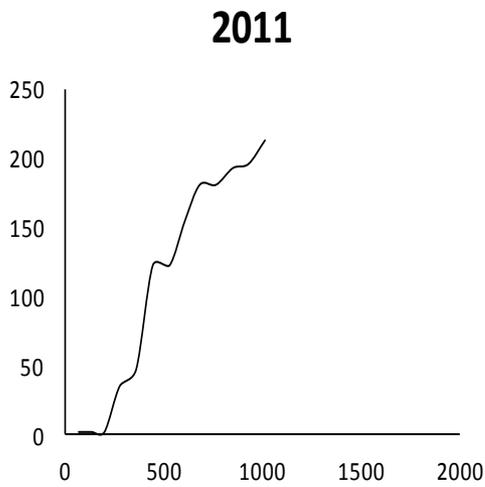
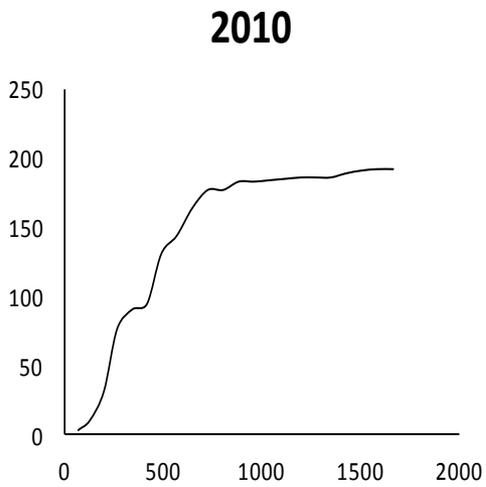
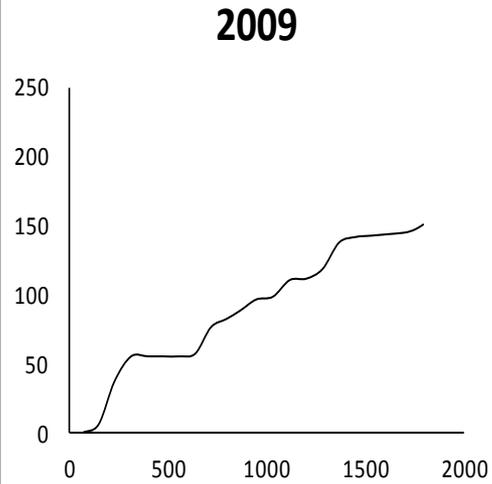
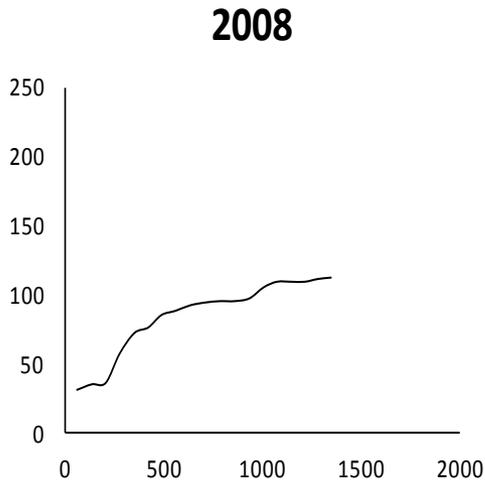
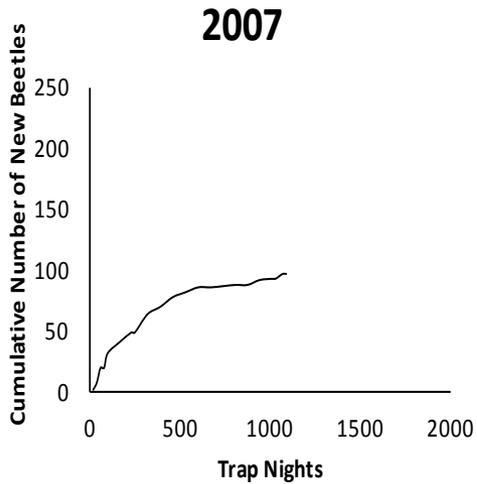




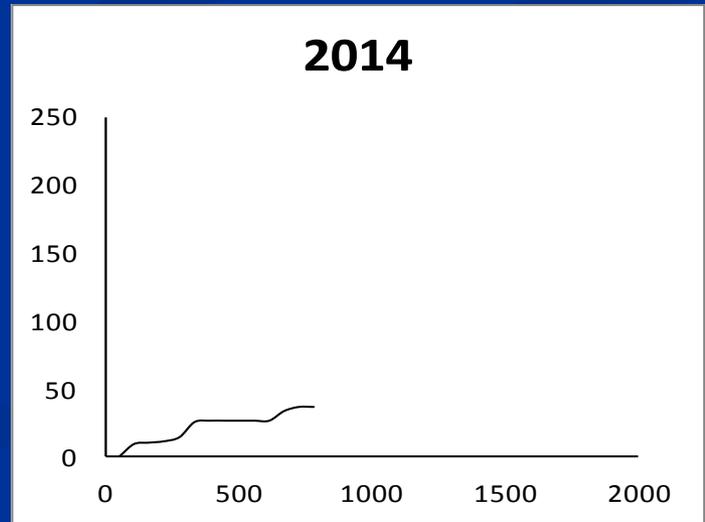
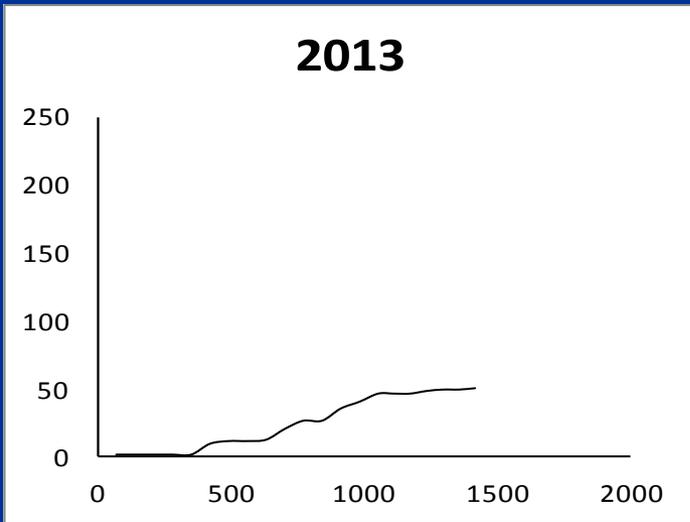
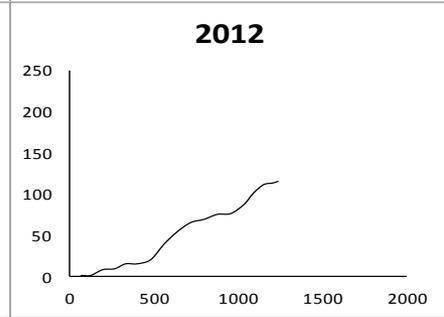
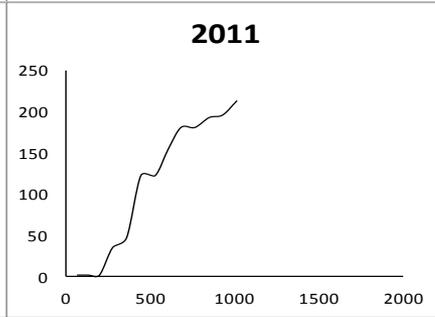
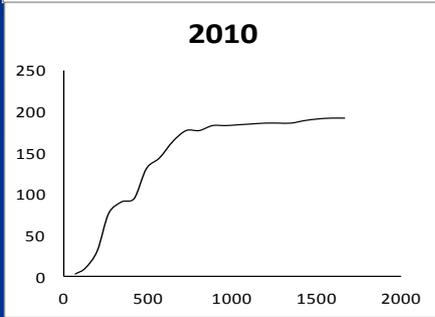
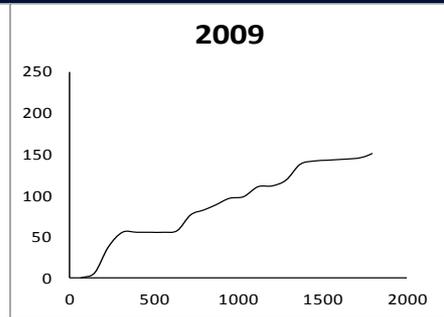
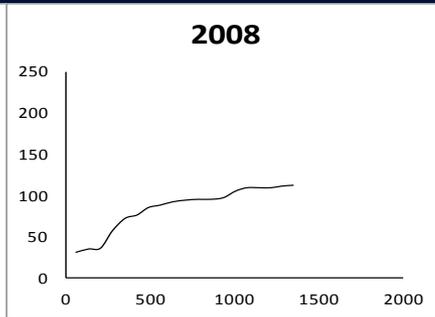
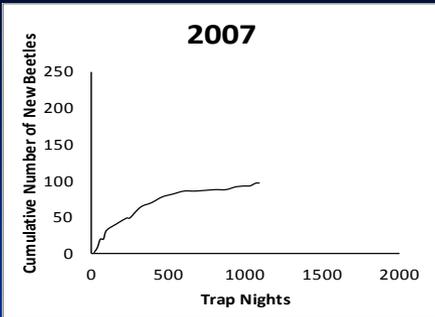








- Starting in 2011, we halted our efforts to provision all captured beetles and began provisioning only 25 pairs to mimic provisioning levels on Block Island.
- This was done to determine how self sustaining the population might be
- Determine if there is enough naturally available Carrion to sustain the population
- Allow better comparisons with Block Island.



## Total early-summer trap nights and *N. americanus* captures with trap rates since 2004

Year	Total trap nights	Trap Area Km <sup>2</sup>	Total number of wild <i>N. americanus</i>	ABBs/trap night	ABB/Area
2004	360	6.3	33	0.092	5.2
2005	480	6.3	38	0.079	6.0
2006	640	8.3	50	0.078	6.0
2007	1022	19.5	97	0.095	5.0
2008	1348	19.5	112	0.083	5.7
2009	1791	19.5	150	0.083	7.7
2010	1,663	19.5	191	0.115	9.8
2011	1,011	19.5	212	0.210	11
2012	1,237	19.5	115	0.093	5.9
2013	1,386	26.7	52	0.038	1.9
2014	778	22.7	36	0.046	1.6

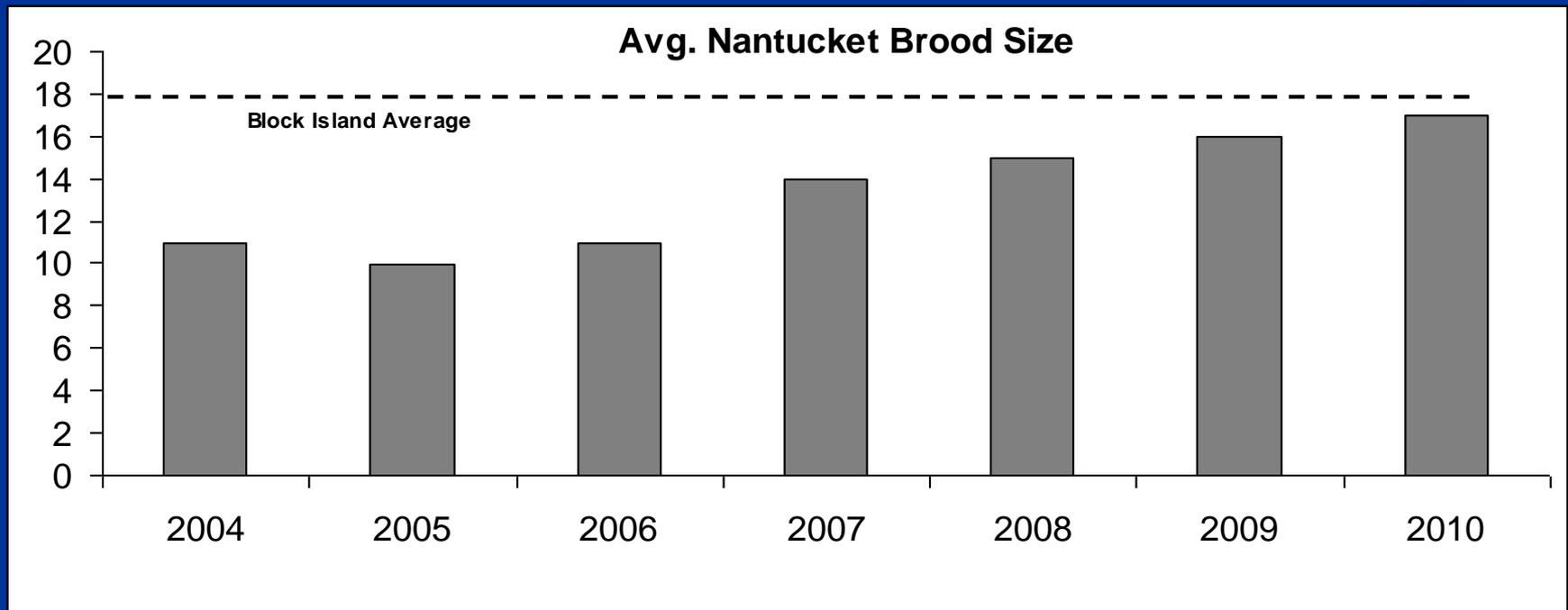
# Provisioning data and F1 population estimations for all provisioning sites from 2004-2014

\*Denotes years where some proportion of the broods were captive reared beetles.

Year	Total # Broods	# Checked	# Unchecked	# Successful	% Success	Avg. Brood Size	# Larvae Counted	# Est. larvae	Total Est. Larvae
2004*	248	144	104	73	51	7	788	583	1371
2005*	238	91	147	45	49	6	448	720	1139
2006*	63	13	50	10	77	8	107	424	531
2007	57	16	41	13	81	14	200	465	665
2008	87	29	58	14	48	7	215	418	633
2009	104	37	67	26	70	11	416	750	1166
2010	153	58	95	25	43	7	445	694	1139
2011	25	8	17	5	63	10	82	171	272
2012	25	8	17	5	63	13	105	223	329
2013	25	10	15	3	30	5.3	53	81	134
2014	22	8	14	4	50	6	46	84	130
<b>TOTALS</b>	<b>1047</b>	<b>422</b>	<b>625</b>	<b>223</b>	<b>53</b>	<b>7.9</b>	<b>2806</b>	<b>4958</b>	<b>7326</b>

# Additional Measures of Success

- ABBs captive bred for reintroduction:
  - produce fewer larvae than wild Block Island beetles
  - are smaller than wild Block Island beetles
- However, on Nantucket, their offspring do well:





The number of teneral beetles marked one year and recaptured the following year  
for 2007 – 2014

Year of capture	Broods Provision	Number marked previous year	Number captured	Percent Recaptured
2007	57	82	12	14.6
2008	87	87	9	10.3
2009	104	112	21	18.8
2010	153	372	51	13.8
2011	25	434	63	14.5
2012	25	139	31	22.3
2013	25	77	15	19.5
2014	22	42	6	14.3
Total	498	1345	208	15.5

# 2015 Field Season

- Continue monitoring *N. americanus* population dynamics under reduced provisioning regime. If capture rates and total captures in additional low-provisioning years remain more similar to 2014 than pre-2012, consider returning to pre-2012 provisioning rates to ensure that the population does not continue to shrink
- Continue trapping using the grid arrangement.
- The possible dispersal of *N. americanus* across Eastern Nantucket will be more effectively assessed by such a trap arrangement, and uniform abundance of traps/site will allow for more robust comparisons of capture rates between locations. Five traps per site should be enough to monitor the population
- Test above ground trap designs suggested by the USFWS for use range wide (USFWS 2012)
- Consider tethering carrion in transects to determine effectiveness of just providing quail to maintain the population. Seeding the ABB range on Nantucket with vertebrate carcasses could be an efficient way of increasing the reproductive resource.
- Develop and implement a more robust method of measuring location and abundance of carrion on Nantucket

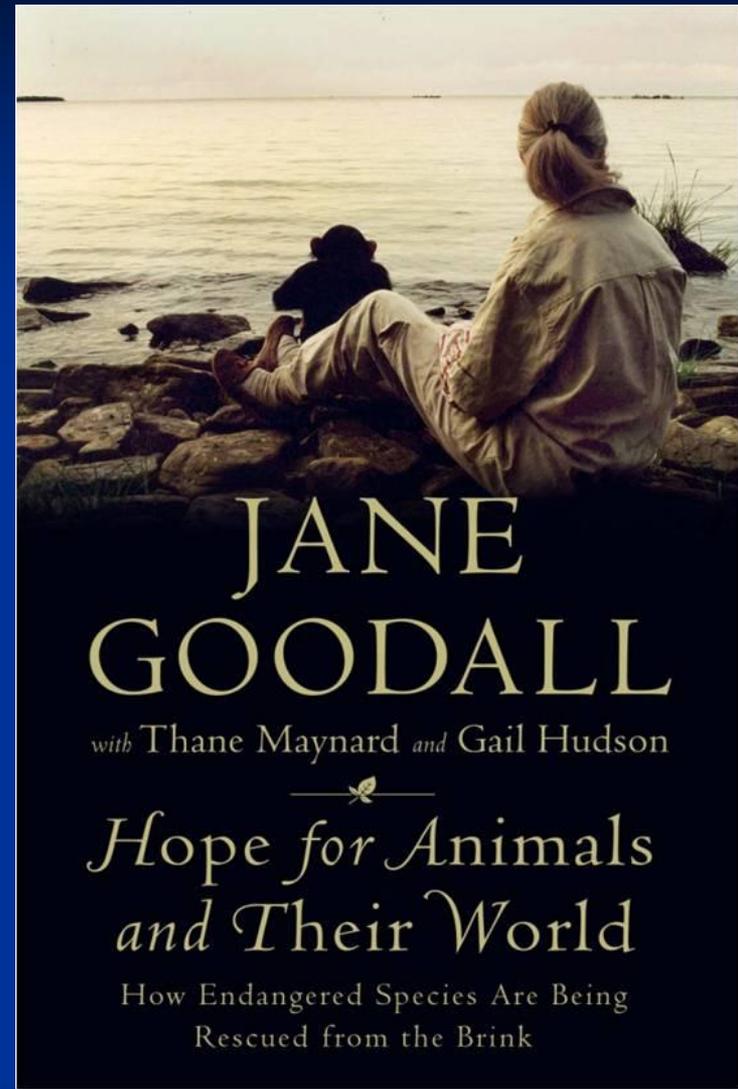


# The Take Away

- We have successfully established a healthy population of ABBs on Nantucket (numbers and distribution)
- This is a model for future mainland ABB reintroductions

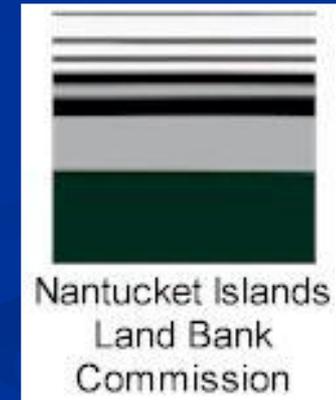


- Reducing carrion provisioning will be the critical point in the project
- The recovery goal is a self-sustaining population
- Will the population survive with little or no carrion supplement?



# Acknowledgments

- Michael Amaral (USFWS)
- Anthony Tur (USFWS)
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# THANK YOU

