

Assateague Island National Seashore Alien Plant Management Program 2008 Report



Jonathan Chase, Biological Technician
Micah Ryder, Biological Technician
Mark Sturm, Ecologist

Division of Resource Management

Assateague Island National Seashore
7206 National Seashore
Berlin, MD 21811
(410) 641-1443
October 2008

Assateague Island National Seashore Alien Plant Management Program 2008 Report

Introduction

During 2008 Assateague Island National Seashore's (ASIS) alien plant management program (APMP) worked to monitor and control infestations of: *Ailanthus altissima*, *Alnus glutinosa*, *Artemisia stelleriana*, *Carex kobomugi*, *Clematis terniflora*, *Elaeagnus umbellata*, *Eragrostis curvula*, *Hedera helix*, *Lonicera japonica*, *Lythrum salicaria*, *Miscanthus sinensis*, *Morus alba*, *Pennisetum alopecuroides*, *Phragmites australis*, *Pinus thunbergiana*, *Rosa multiflora* and *Rosa wichuriana*. During the APMP's implementation, ASIS received some much appreciated assistance from the National Capitol Region's Exotic Plant Management Team (NCR EPMT) who helped treat *L. japonica* infestations in the developed areas of the park. The alien plant species infestations that were treated by the APMP during 2008 occurred in the park as well as around the park's headquarters area and on adjacent lands to the south, where the park has a limited cooperative agreement with the State of Maryland Department of Natural Resources. Previously documented and treated infestation sites were monitored during 2008 and those sites found to be inactive during each of the past three years were labeled inactive.

Methods:

ASIS Alien Plant Management Program Design 2008:

The APMP follows the alien species guidelines found at the NPS inventory and monitoring website (<http://science.nature.nps.gov/im/monitor/index.cfm>) and employs the North American Weed Management Association (NAWMA) standards. The APMP also refers to the Bureau of Land Management's (BLM) Technical Reference 1730-1: Measuring and Monitoring Plant Populations and the Nature Conservancy Weed Handbook for guidance on monitoring and treating targeted alien plant populations. The ASIS APMP database was updated to include 2008 AMPM activities.

During FY08 the ASIS APMP was expanded to include a large scale *P. australis* infestation monitoring and management project. Due to the size and complexity of this ambitious project a new term lead biological technician position was created. The incumbent in this position coordinated all *P. australis* monitoring and management activities during this reporting period.

Data Management

The ASIS APMP database documents and tracks the development and treatment success of each targeted alien plant infestation. Multiple infestations are grouped into sites for record keeping and reporting purposes. A site code is composed of an epithet that is generated by taking the first 2 letters of the plant's genus followed by the first two letters its species name (ie. *Elaeagnus umbellata* becomes ELUM) followed by "Site_" and a number to designate different site locations (ie. ELUM_Site_01). A separate code is used for individual infestations within a particular site. The individual infestation code uses the same species abbreviation naming convention that is used to generate a site code followed simply by the sequential number of the infestation (ie. ELUM_0001). These site and infestation code conventions facilitate the orderly arrangement and correct parsing of information in the database. These codes allow for the addition of new information and enable annual treatments within sites to be discreetly identified.

Safety Precautions

A non-toxic marker dye has been used in herbicide mixtures since 2004. The dye assures that proper coverage of the herbicide is administered on the foliage of targeted species. It also assures applicator safety by making visible possible contamination of his/her protective clothing. Proper protective equipment (PPE) was always employed during APMP treatment activities. Employee safety is important to ASIS, especially when working with potentially hazardous materials, therefore making sure that all

equipment was in good working order and all permits were current has been adopted as standard operating procedure by the ASIS APMP. The lead technicians responsible for coordinating and implementing the APMP are certified pesticide applicators in the State of Maryland who are therefore permitted to conduct and oversee the herbicide treatments described in this report.

Alien Plant Inventory and Monitoring

The criteria used to determine a plant species' status as an alien invasive are:

1. The species has been identified in a previous APMP report as an invasive alien species of management concern.
2. The species is included on the Maryland Department of Natural Resources Wildlife & Heritage Services' list of invasive non-native plants (<http://www.dnr.state.md.us/wildlife/invtro.asp>)
3. The species is considered to be potentially invasive by the NPS Natural Resource Program Center's Invasive Plant Program and its level of abundance at ASIS has been found to warrant management consideration.

Island searches for invasive alien plants were conducted in 2008 and various different Global Positioning System (GPS) units were used to record data. These included the Trimble® Juno ST™ PDA GPS, the Trimble® Pro XT™ and Trimble® XH™ GPS and a Garmin® GPS map76CS™ handheld unit. These units vary between sub-meter (Trimble® Pro XT™ or Pro XH™) and multi-meter (Juno ST, Garmin® Map76CS™) accuracy and therefore consideration should be given to what GPS unit was used to record APMP spatial data. Whenever possible the perimeter of larger alien plant infestations were mapped, however some infestations were too difficult to circumnavigate and were therefore documented using point data. The descriptive data recorded for each infestation includes: species, abundance (sparse, moderate, or heavy), length (longest axis, m), width (shortest axis, m), height (m), # individuals, phenology and comments. These data were visually estimated in order to increase monitoring efficiency.

Results

A summary of the ASIS APMP accomplishments during 2008 follows. This summary includes ASIS APMP monitoring and treatment activities as well as those conducted with the assistance of the NCR EPMT and Summit Helicopters, Inc. During FY08 the NCR EPMT visited ASIS twice for a week each time during which they helped monitor and treat *L. japonica* infestations. Treatment data are presented by species in Table 1 and the time associated with these treatments are presented in Table 2, while treatment and monitoring information are presented by site in Table 3.

Ailanthus altissima:

During 2008 two *A. altissima* sites were treated; AIAL_Site_04 and AIAL_Site_05. Treatments of these sites were conducted in June and July. Thirty-nine saplings were treated at AIAL_Site_04 with a foliar spray application of a 3% triloptyr herbicide solution of Garlon3™. One sapling was treated at AIAL_Site_05 with a 50% triloptyr herbicide solution of Garlon3™ in water. AIAL_Site_04 was originally infested by mature trees that had produced a substantial seed bank therefore additional treatments are expected to be required during 2009.

Alnus glutinosa:

In April of 2006, a single *A. glutinosa* tree at ALGL_Site_01 was treated. Follow-up monitoring by 2007 and 2008 revealed that the tree had died and no additional wild recruits were present. One more year of follow-up monitoring of this site is required after which it is expected that this infestation will be considered to be fully controlled.

Artemisia stelleriana:

During June 2008 a small infestation of *A. stelleriana* (ARST_Site_01) was treated with a foliar application of 3% glyphosate solution of Glyphomate41™ in water. 2008 monitoring of ARST_Site_02 revealed that the 2007 treatments had been very successful with just a few remnant occurrences found. These few individuals were mechanically treated by hand pulling during 2008.

Carex kobomugi:

Today's limited number of CAKO occurrences on ASIS is attributable to the early detection and rapid response management actions taken for this species beginning in 1999. During 2008, seven of sixteen active *C. kobomugi* sites were monitored and four sites were treated. CAKO_Site_0021, _0036, _0039 and _0042 were all treated during July 2008 with a 3% glyphosate herbicide solution of Glyphomate41™. Due to their occurrence within piping plover habitat the remaining three *C. kobomugi* sites that are known to be active were not treated during 2008. Therefore, it will be necessary to plan 2009 treatments of CAKO_Site_0013, _0040 and _0043. The last of these (CAKO_Site_043), is a new infestation discovered in 2008. Finally, CAKO_Site_0027 and _0035, which had been treated in 2006, were monitored in 2008 and no *C. kobomugi* occurrences were observed.

Clematis terniflora:

During June 2008 CLTE_Site_01 was monitored and found to be very active. Several new vines with large amounts of seed had emerged above the canopy of shrubs. The size of the infestation had expanded with new vines being found as much as one hundred meters from the center of the original infestation. The reoccurrence of *C. terniflora* at CLTE_Site_01 is likely the result of an abundant seed bank that was established by the original infestation over many years. New seedlings are expected to continue to emerge and further treatments and monitoring of this site will occur during 2009.

Elaeagnus umbellata:

During February 2008 sixty-nine new *E. umbellata* trees at ELUM_Site_01 were treated with a 25% triloxy herbicide solution of Garlon4™ in diesel fuel. As a result of this treatment's success rate it continues to be the preferred treatment method for this species when individuals occur sufficiently distant from water sources. Monitoring revealed that ELUM_Site_02 was not active in 2008 and this site will continue to be monitored in 2009.

Eragrostis curvula:

E. curvula infestations have been treated since 2005 and during June, July and August 2008 ASIS continued to treat isolated *E. curvula* infestations within ERCU_Site_01. The three previous years of cutting and follow-up spraying had significantly diminished *E. curvula* occurrences on the island. Cutting was not done in 2008 because *E. curvula* occurrences were comparatively small and virtually no large tussocks were present. The *E. curvula* occurrences present during 2008 were likely recruits from a well developed seed bank that was established along many of ASIS' paved roads during previous years. During 2008, all observed *E. curvula* occurrences at ERCU_Site_01 were treated with a foliar application of a 3% glyphosate herbicide solution of Rodeo™, or Glyphomate41™ in water.

Hedera helix:

The single *H. helix* plant discovered and treated at HEHE_Site_01 during 2006 was monitored during June 2008 and found to be inactive.

Lonicera japonica:

In April of 2008 post treatment monitoring of LOJA_Site_06 revealed that some *L. japonica* infestations remained active. Unfortunately, there was insufficient time to treat these infestations during 2008 therefore these infestations will require retreatment by ASIS personnel in 2009. Other monitoring of treated *L. japonica* infestations revealed encouraging results, however tall vines remain problematic because it is difficult to spray the tallest infestations. Therefore many tall *L. japonica* vines were treated with the more labor intensive cut stump treatments in 2008. Also, because many *L. japonica* infestations have proven difficult to treat due to the species' frequent tendency to be interwoven among a dense array of non-target species, it is anticipated that successful control of this species will continue to be an ongoing component of the ASIS APMP for years to come.

The NCR EPMT assisted with the treatment of fifty-two *L. japonica* infestations at LOJA_Site_2 during April and May of 2008. Thirty-two of these infestations were newly discovered, twelve were retreatments and eight had previously been documented but had not yet been treated. ASIS personnel treated additional *L. japonica* infestations in May, June and July at LOJA_Site_05 and _07.

Two chemical treatment methods were employed during 2008. One was a Cut Stump Treatment using a 100% solution of Rodeo™ herbicide. The second was a Foliar Spray Treatment using a 3% solution of Rodeo™ herbicide in water.

Lythrum salicaria:

No occurrence of *L. salicaria* has been observed at LYSA_Site_01 for more than three years. As a result after 2008 this site will no longer be monitored.

Miscanthus sinensis:

2008 monitoring of the *M. sinensis* infestation at MISI_Site_01 revealed widespread recruitment of new individuals despite treatments that occurred during 2004. Many of these plants likely emerged from the site's existing seedbank. In addition during 2008 a new infestation of *M. sinensis* was discovered on the north end of ASIS, MISI_Site_05. All five *M. sinensis* sites were active during 2008 and during June all five sites were treated with a foliar application of a 3% glyphosate herbicide solution of Glyphomate41™ in water. Further monitoring and treatment of this species will be required in 2009 at all of the known *M. sinensis* sites.

Morus alba:

Monitoring during 2008 revealed that the *M. alba* infestations at MOAL_Site_01 had been treated and controlled, however a new *M. alba* infestation (MOAL_0006) was discovered at MOAL_Site_02. This infestation was treated in May by frilling the bark at the base of the tree and treating it with a 50% triolopyr herbicide solution of Garlon3™. In addition, the construction of a new parking lot of the Sinepuxent Ranger Station removed and paved over the MOAL_0005 infestation at MOAL_Site_2. The other previously active trees at this site will be monitored during 2009, while the MOAL_0005 infestation at MOAL_Site_2 will be considered eradicated.

Pennisetum alopecuroides:

During September 2007, an infestation of *P. alopecuroides*, measuring approximately 100 m², was discovered near park headquarters. Despite not having been treated previously, the species was not rediscovered during monitoring of the area in June and September of 2008. Perhaps this was due to an increase in the mowing of the fields where this infestation occurred. Nonetheless, PEAL_Site_01 will continue to be monitored, and treated as needed, during 2009.

Phragmites australis:

During 2008 a project was developed and implemented to map and treat infestations of *P. Australis* occurring on the island as part of a three year management program. For the 2008 field season

operations consisted of aerial and ground based mapping of infestations, aerial spraying of infestations, and monitoring and documenting the effects of aerial spraying. Aerial mapping was completed during two days of helicopter surveys and a total of 534 acres of *P. australis* infestations were mapped. Aerial spraying of 185 acres of selected infestations was completed using Habitat® herbicide at a rate of 64 ounces/acre and a concentration of 5% (applied in water mix of 10 gallons/acre) for a total applied volume of 92.5 gallons of Habitat®. Monitoring protocols were implemented to document changes in vegetative composition within treated areas over time. Given the increased, landscape level, monitoring and treatment scale of recent management activities regarding this species, a more thorough description of all completed *P. australis* project activities during 2008 is presented beginning on page 9 of this report.

Pinus thunbergiana:

During June 2008, (4) *P. thunbergiana* saplings were treated at PITH_Site_01. Because *P. thunbergiana* does not regenerate after being cut close to the ground, a hand saw was used to mechanically treat each sapling. ASIS personnel will monitor this site during 2009 since it appears that recruitment of new saplings is still occurring.

Rosa multiflora:

ROMU_Site_01, _02, and _03 were monitored during April 2008. ROMU_Site_02 and ROMU_Site_03 were inactive. Nine new infestations (ROMU_0055 thru _0063) were discovered at ROMU_Site_01 that required additional treatments and one previously treated infestation required retreatment. In April 2008 ASIS and NCR EPMT treated one sizable plant, ROMU_0057, with a foliar application of 3% glyphosate herbicide solution of Rodeo™ in water. Then later in May, ASIS personnel conducted cut stump treatments on the remaining newly discovered plants with a 75% triclopyr herbicide solution of Garlon3™ in water. The fact that only one of the fifty-four treated *R. multiflora* infestations required retreatment in 2008 indicates high efficacy of the foliar treatment methods previously utilized. Despite these findings, whenever possible the cut stump method is preferred for treating *R. multiflora* infestations rather than foliar spraying because there is less damage incurred on non-target vegetation. The foliar application method is only being utilized at ASIS when access to the stump of the targeted ROMU infestation is prohibitive.

Rosa wichuriana:

The ASIS headquarters area was landscaped with *R. wichuriana* in 1979, a species that is now considered invasive by the National Park Service. Since its introduction, *R. wichuriana* has expanded and become widespread throughout the surrounding headquarters area.

During 2008 four treatment methods were utilized to control the infestations at ROWI_Site_01. These treatments were:

1. In February, a basal bark application of 25% triclopyr herbicide solution of Garlon4™ in diesel fuel was applied to a large plant found during the treatment of *Elaeagnus umbellata* in the near vicinity.
2. In May, a 75% triclopyr herbicide solution of Garlon3A™ in water was utilized during cut stump treatments in the vegetated buffer that lies between Route 611 and the Park Headquarters housing area.
3. In June, a foliar application of a 3% glyphosate herbicide solution of Glyphomate41™ in water was used to treat infestations along the eastern side of the ASIS Maintenance Division pole barn.
4. In July a foliar application of a 3% triclopyr herbicide solution of Garlon3A™ in water was used on *R. wichuriana* infestations in the vegetated islands that lie in the center of the ASIS Headquarters housing area.

These various treatment methods were the results of APMP species management activities that targeted other species in the near vicinity of *R. wichuriana* occurrences. The methods used were the best

universal treatment for the other alien, invasive species being targeted. All methods used were successful at controlling the treated *R. wichuriana* infestations, although the emergence of new *R. wichuriana* recruits will require continued monitoring and treatment at ROWI_Site_01 during 2009.

Literature Cited:

Elzinga, Caryl L. PhD, Salzer, Daniel W., Willoughby, John W. Measuring and Monitoring Plant Populations, BLM Technical Reference 1730-1, BLM National Business Center Denver, CO.

North American Weed Management Association (NAWMA) <http://www.nawma.org/>

Swearingen, Jil, Chair, Alien Plant Working Group, 4598 MacArthur Blvd., NW, Washington, DC 20007. Weeds Gone Wild Alien Plant Invaders of Natural Areas, <http://www.nps.gov/plants/alien/index.htm>

The Nature Conservancy's Weed Information Management System v. 3.0 (WIMS 3), The Nature Conservancy 2005. Contact: Barry Meyers- University of California, Davis. Web Address: <http://tncweeds.ucdavis.edu/wims.html>

Tu, M., Hurd, C., & J.M. Randall, 2001. Weed Control Methods Handbook, The Nature Conservancy, <http://tncweeds.ucdavis.edu>, Version: April 2001.

Tables

Table 1: 2008 ASIS APMP Alien Plant Species Infestation Monitoring and Treatment Information

Species	Active Sites 2008	Estimated Infestation 2008 (m ²)	% Treated	Treatment Month(s)	Product	ASIS Product Amount (liters)	EPMT Product Amount (liters)	% Conc.	Active Ingredient	Solvent	Treatment Team
<i>Ailanthus altissima</i>	2	410	100	Jun, Jul	Garlon 3A*	0.100	N/A	50, 3	Triclopyr	Water	ASIS
<i>Alnus glutinosa</i>	0	0	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ASIS
<i>Artemisia stelleriana</i>	2	300	100	Jun	Glyphomate41™*****	0.015	N/A	3	Glyphosate	Water	ASIS
<i>Carex kobomugi</i>	16	1660	25	Jul	Glyphomate41™*****	0.218	N/A	3	Glyphosate	Water	ASIS
<i>Clematis terniflora</i>	1	5000	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ASIS
<i>Elaeagnus umbellata</i>	1	10000	80	Feb	Garlon 4**	0.750	N/A	25	Triclopyr	Diesel	ASIS
<i>Eragrostis curvula</i>	1	5000	100	May, Jun, Jul	Glyphomate41™*****	0.975	N/A	3	Glyphosate	Water	ASIS
<i>Hedera helix</i>	0	0	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ASIS
<i>Lonicera japonica</i>	7	237 x 10 ²	25	Apr	Rodeo***	N/A	9.030	3	Glyphosate	Water	EPMT
				May	Garlon 3A*	0.075	N/A	75	Triclopyr	Water	
				Jun	Glyphomate41™*****	0.158	N/A	3	Glyphosate	Water	
				Jul	Garlon 3A*	0.070	N/A	3	Triclopyr	Water	
<i>Lythrum salicaria</i>	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ASIS
<i>Miscanthus sinensis</i>	5	1040	100	Jun	Glyphomate41™*****	0.018	N/A	3	Glyphosate	Water	ASIS
<i>Morus alba</i>	1	0	100	May	Garlon 3A*	0.002	N/A	75	Triclopyr	Water	ASIS
<i>Penisetum alopecuroides</i>	0	0	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ASIS
<i>Phragmites australis</i>		216 x 10 ⁴	35	Aug, Sep	Habitat****	350.150	N/A	5	Imazapyr	Water	ASIS/Summit Helicopters
<i>Pinus thunbergiana</i>	1	50	100	Jun	N/A	N/A	N/A	N/A	N/A	N/A	ASIS
<i>Rosa multiflora</i>	1	1510	100	Apr	Rodeo***	N/A	0.150	3	Glyphosate	Water	EPMT
				May	Garlon 3A*	0.035	N/A	75	Triclopyr	Water	ASIS
<i>Rosa wichuriana</i>	1	1300	100	Feb	Garlon 4* *	0.030	N/A	25	Triclopyr	Diesel	ASIS
				May	Garlon 3A*	0.030	N/A	75	Triclopyr	Water	ASIS
				Jun	Glyphomate41™*****	0.150	N/A	3	Glyphosate	Water	ASIS
				Jul	Garlon 3A*	0.070	N/A	3	Triclopyr	Water	ASIS

* Garlon 3A™ (62719-37)

** Garlon 4™ (62719-40)

*** Rodeo™ (62719-324)

****Habitat® (241-426)

***** Glyphomate41™ (2217-847)

Table 2: 2008 ASIS APMP Alien Plant Species Treatment (Rx) Time Log

Table 2: 2008 ASIS APMP Alien Plant Species Treatment (Rx) Time Log								
Species	Month(s)	Rx (*)	Worker(s)		Hours		Summit	Total Hours
			ASIS	EPMT	ASIS	EPMT		
<i>Ailanthus altissima</i>	Jun, Jul	FS	1	N/A	32	N/A	N/A	32
<i>Artemisia stelleriana</i>	Jun	FS, MR	1	N/A	8	N/A	N/A	8
<i>Carex kobomugi</i>	Jul	FS	2	N/A	20	N/A	N/A	20
<i>Elaeagnus umbellata</i>	Feb	BB	1	N/A	20	N/A	N/A	20
<i>Eragrostis curvula</i>	May, Jun, Jul	FS	2	N/A	40	N/A	N/A	40
<i>Lonicera japonica</i>	Apr, May, Jun, Jul	CS, FS	1	2	80	160	N/A	240
<i>Miscanthus sinensis</i>	Jun	FS	1	N/A	10	N/A	N/A	10
<i>Morus alba</i>	May	HS	1	N/A	3	N/A	N/A	3
<i>Phragmites australis</i>	May, Jun, Jul, Aug, Sep	FS	3	N/A	1280	N/A	320	1600
<i>Pinus thunbergiana</i>	Jun	MR	2	N/A	10	N/A	N/A	10
<i>Rosa multiflora</i>	Apr, May	CS, FS	1	N/A	30	N/A	N/A	30
<i>Rosa wichuriana</i>	Feb, May, Jun, Jul	CS, FS	2	N/A	30	N/A	N/A	30
Total Hours =								2043

* BB = Basal Bark, FS = Foliar Spray, CS = Cut Stump, HS = Hack and Squirt, MR = Mechanical Removal

Table 3: 2008 ASIS APMP Treatment Information by Infestation Site and Anticipated Monitoring and Treatment Needs for 2009.

Species	Infestation Site	2008 Infestation Size (m ²)	2008 Monitor / 2009 (Re)treat	2009 Monitor	Last Year Present	Monitoring / Treatment Team
<i>Ailanthus altissima</i>	AIAL_Site_01	0	Yes/No	No	2006	ASIS
	AIAL_Site_02	0	Yes/No	No	2005	ASIS
	AIAL_Site_03	0	Yes/No	Yes	2004	ASIS
	AIAL_Site_04	400	Yes/Yes	Yes	2007	ASIS
	AIAL_Site_05	10	Yes/Yes	Yes	2007	ASIS
<i>Alnus glutinosa</i>	ALGL_Site_01	0	Yes/No	Yes	2006	ASIS
<i>Artemisia stelleriana</i>	ARST_Site_01	250	Yes/Yes	Yes	2008	ASIS
	ARST_Site_02	50	Yes/Yes	Yes	2008	ASIS
<i>Carex kobomugi</i>	CAKO_Site_13	10	No/No	Yes	2006	ASIS
	CAKO_Site_14	0	No/No	Yes	2006	ASIS
	CAKO_Site_17	900	No/No	Yes	2006	ASIS
	CAKO_Site_19	0	No/No	Yes	2004	ASIS
	CAKO_Site_21	0	Yes/Yes	Yes	2008	ASIS
	CAKO_Site_22	100	No/No	Yes	2006	ASIS
	CAKO_Site_27	0	Yes/No	Yes	2006	ASIS
	CAKO_Site_30	0	Yes/No	Yes	2003	ASIS
	CAKO_Site_31	0	No/No	Yes	2003	ASIS
	CAKO_Site_32	0	No/No	Yes	2003	ASIS
	CAKO_Site_35	0	Yes/No	Yes	2005	ASIS
	CAKO_Site_36	100	Yes/Yes	Yes	2008	ASIS
	CAKO_Site_39	100	Yes/Yes	Yes	2008	ASIS
	CAKO_Site_40	100	No/No	Yes	2006	ASIS
	CAKO_Site_42	250	Yes/Yes	Yes	2007	ASIS
	CAKO_Site_43	100	Yes/No	Yes	2008	ASIS
<i>Clematis terniflora</i>	CLTE_Site_01	5000	Yes/No	Yes	2008	ASIS
<i>Elaeagnus umbellata</i>	ELUM_Site_01	10000	Yes/Yes	Yes	2008	ASIS
	ELUM_Site_02	0	Yes/No	Yes	2006	ASIS
<i>Eragrostis curvula</i>	ERCU_Site_01	5000	Yes/Yes	Yes	2008	ASIS
<i>Hedera helix</i>	HEHE_Site_01	0	Yes/No	Yes	2006	ASIS
<i>Lonicera japonica</i>	LOJA_Site_01	5580	Yes/No	Yes	2008	EPMT/ASIS
	LOJA_Site_02	12000	Yes/Yes	Yes	2008	EPMT/ASIS
	LOJA_Site_03	State Park	No/No	Yes	2008	State Park
	LOJA_Site_04	375	Yes/No	Yes	2008	EPMT/ASIS
	LOJA_Site_05	10	Yes/Yes	Yes	2008	ASIS
	LOJA_Site_06	3150	Yes/No	Yes	2008	EPMT/ASIS
	LOJA_Site_07	2600	Yes/Yes	Yes	2008	EPMT/ASIS
<i>Lythrum salicaria</i>	LYSA_Site_01	0	Yes/No	No	2002	ASIS
<i>Miscanthus sinensis</i>	MISI_Site_01	1000	Yes/Yes	Yes	2008	ASIS
	MISI_Site_02	10	Yes/Yes	Yes	2008	ASIS
	MISI_Site_03	10	Yes/Yes	Yes	2008	ASIS
	MISI_Site_04	10	Yes/Yes	Yes	2008	ASIS
	MISI_Site_05	10	Yes/Yes	Yes	2008	ASIS
<i>Morus alba</i>	MOAL_Site_01	0	Yes/No	Yes	2007	ASIS
	MOAL_Site_02	0	Yes/Yes	Yes	2008	ASIS
<i>Pennisetum alopecuroides</i>	PEAL_Site_01	0	Yes/No	Yes	2007	ASIS
<i>Phragmites australis</i> *	PHAU_Site_01 to PHAU_Site_119	218x10 ⁴	Yes/Yes	Yes	2008	ASIS/Summit Helicopters
<i>Pinus thunbergiana</i>	PITH_Site_01	50	Yes/Yes	Yes	2008	ASIS
<i>Rosa multiflora</i>	ROMU_Site_01	200	Yes/Yes	Yes	2008	ASIS
	ROMU_Site_02	10	Yes/Yes	Yes	2008	ASIS
	ROMU_Site_03	1300	Yes/No	Yes	2007	ASIS
<i>Rosa wichuriana</i>	ROWI_Site_01	1300	Yes/Yes	Yes	2008	ASIS

* See text section for details about ASIS APMP's developing management of this abundant invasive alien species.

Assateague Island National Seashore
***Phragmites australis* Monitoring and Management Project**
2008 Exotics Report

The native coastal communities of Assateague Island National Seashore (ASIS) are threatened by the expansion of *Phragmites australis* (Phragmites or common reed) an invasive, alien plant species. Assateague Island contains the only intact natural barrier island ecosystem remaining in the state of Maryland. At the mid-Atlantic regional scale ASIS represents the largest contiguous expanse of native coastal communities that still collectively functions as an intact barrier island ecosystem. As such this valuable and unique resource is being degraded and functionally altered by the ongoing *P. australis* invasion.

P. australis is an aggressive invader that spreads quickly from established infestations by sending out rhizome and root runners, creating a thick rhizominous mat that often extends down several feet in depth. *P. australis* spreads to new sites via: seed dispersal by wind and water, the dispersal of pieces of rhizome carried in water, and through pieces of rhizome contained in dirt and mud tracked by vehicles and equipment. *P. australis* forms dense monotypic stands that displace and outcompete native wetland and terrestrial vegetation, change marsh hydrology, alter wildlife habitat, and increase wildfire potential. Recent research at ASIS (Sturm 2007) has revealed that grazing by deer and horses is accelerating *P. australis*' expansion throughout the island by stimulating a compensatory growth response wherein *P. australis* sends out additional runners and shoots in response to grazing pressure.

P. australis has gradually (over a period of years or decades) established an expansive foothold on Assateague Island in a variety of coastal habitats. Individual infestations of varying sizes occur throughout the island. Over time *P. australis* infestations have expanded to the point where today vast areas of once diverse native forest, shrub and marsh communities have been replaced by dense *P. australis* monocultures. Given the comparative rarity of undisturbed coastal communities present elsewhere throughout the region, the serious and continued threat posed by *P. australis* invasion, and the conservation mandate expressed by Congress in ASIS' founding legislation, the park has undertaken a large scale project to document and treat *P. australis* infestations in order to restore native coastal communities and ecosystem health.

Project Planning and Preparation

ASIS initiated this ambitious multi-year *P. australis* monitoring and management project in 2008. FY08 project activities were divided into two distinct phases. Phase I consisted of efforts to prepare for and conduct aerial and ground based mapping of infestations. Phase two involved the aerial spraying of a selection of the identified infestations and subsequent monitoring of the effects of these treatments. This was the first large scale project of its kind to be conducted at ASIS and due to the inherent complexity of project activities, (i.e. the use of helicopters and the aerial application of herbicide over a large area) certain mandatory planning documents (i.e.: ASIS's Aviation Management Plan and the *Phragmites australis* Project Implementation and Safety Plan) were produced and ultimately approved by the Park's superintendent (Scott Bentley) as well as by National and Regional National Park Service (NPS) aviation program managers. The *Phragmites australis* Project Implementation and Safety Plan included sections on aviation safety, flight-following, emergency response and a detailed flight plan. The formulation of these documents would not have been possible without the assistance of Justin DeForest, NPS Northeast Region Aircraft Management Coordinator, and Don Savedge, Shenandoah NP's Helicopter Manager. Both reviewed these planning documents and provided helpful comments during their development.

ASIS Chief Ranger, Ted Morlock served as the park's Aviation Manager and was responsible for reviewing the project's planned aviation activities and making approval/disapproval recommendations to the park's superintendent. During both phase I and II of the project, Ted participated in planning meetings with the contractor, during which he worked to assure public and employee safety. Ted and his staff also provided assistance with planned road closures during phase II of the project. Don Savedge came to ASIS to act as the helicopter manager during phase I of the project. In this capacity he verified documents, ensured aircraft safety measures were followed, and monitored flight progress. Jonathan Chase (ASIS bio tech) served as flight manager during phase I and directed flight operations and data collection from the air. Micah Ryder (ASIS bio tech) worked as project manager during phases I and II of the project. In this capacity he provided flight following and data collection support from the ground and photography from the air. Additionally, various park staff from other divisions (Administration, Interpretation, Maintenance) participated in project planning meetings to provide feedback on the

areas selected for aerial treatment. ASIS Interpretative staff worked to help produce an informative site bulletin about the project to distribute to park visitors during aerial operations. ASIS administrative staff provided assistance with public outreach regarding planned project activities through press releases and via interaction with local media sources. Finally, emergency EMS personnel were on standby during phase I flight activities where helicopter operations involved NPS staff.

Prior to conducting planned flight activities ASIS staff (J. Chase, M. Ryder and T. Morlock) received helicopter crew member certifications. Furthermore, because flight operation involved considerable over water flight time J. Chase and T. Morlock also received emergency ditching survival training.

Phase I: Mapping of Infestations

During phase I, an aerial survey of *P. australis* infestations within the MD portion of ASIS was conducted. The aerial surveys took place during 7 hours of contracted flight time on 7/8/2008 and 3 hours of flight time on 7/9/2008. Using contractual services available to Department of Interior agencies through the National Business Center (NBC) an aircraft rental agreement (ARA) was established with Summit Helicopters of Cloverdale, Virginia to provide flight time for National Park Service (NPS) personnel to conduct aerial surveys of *P. australis* infestations.

The infestations were mapped using a combination of the on-board helicopter GPS system to record spatial data. In association with the spatial data, each *P. australis* infestation was assigned descriptive biological characteristics by the flight manager. The recorded descriptive characteristics of each infestation included a visual estimate of the percent of the area that was occupied by *P. australis* (0-40%, 41-60%, 61-80%, 81-100%), the type of habitat that was predominant throughout the area of the infestation (marsh, shrub or forest) and the spatial orientation of the infestation (linear or irregular area). During the survey, each infestation's biological characteristics along with it's unique identifying code were radioed by the flight manager to the project manager on the ground, who in turn recorded the data. Polygons depicting the spatial location and distribution of each mapped infestation collected by the helicopter's on-board GPS system were provided as individual shapefiles to the project manager. These files were combined into a master file and the associated biological characteristics were added for each infestation in ArcGIS. The resulting master shapefile of all mapped infestations was then ground-truthed and edited by the project manager to create a final data set of infestations to be considered for control using an aerial herbicide application (Figures 1 through 4). To augment the spatial data collected during the surveys, landscape level aerial photos were taken of *P. australis* infestations within a diversity of habitats across the entire extent of the island. These photos visually document the extent and level of infestation in various portions of the island.

Post analysis, editing, ground truthing and data correction of the aerially surveyed polygons resulted in a total of 119 individual infestations (each greater than ~½ acre in size) with a combined total of 533.7 *P. australis* infested acres. Table 4 presents the infested acreage broken down by *P. australis* stand density and habitat type. Figures 1 thru 4 are maps depicting the surveyed infestations occurring within the project area.

Table 4: Acreage of Aerially Mapped Infestations of *P. australis* by Habitat Type and Density Class

Habitat Type	0-40%	40-60%	60-80%	80-100%	Total Acres	% of Total
Shrub	30.3	181.8	113.9	2.4	328.3	61.5%
Marsh	0.0	6.8	10.2	3.2	20.2	3.8%
Forest	0.0	7.3	0.0	2.7	10.0	1.9%
Shrub/Marsh	2.8	122.6	0.0	0.0	125.4	23.5%
Shrub/Forest	0.1	7.5	42.1	0.0	49.7	9.3%
Total	33.1	326.1	166.2	8.2	533.7	100.0%
% of Total	6.2%	61.1%	31.1%	1.5%	100.0%	

The distribution of infestations throughout the project area was not uniform and areas of heavier and lighter infestations were found throughout the survey area. Mapped infestations occurred from the southern portion of the North End (northern 10 kilometers) of the island to the MD-VA state line in the south (located around island km 35.5), which is the southernmost extent of the project area. Aerial surveys were not conducted in Assateague Island State Park, roughly km 10-13, (infestations are present at high densities in the state park but were not mapped during

this project). Table 5 presents a breakdown of the infested acreage by section of island and density class.

Table 5: Acreage of Aerially Mapped Infestations of *P. australis* by Island Extent and Density Class

Island Extent	0-40%	40-60 %	60-80%	80-100%	Total Acres	% of Total
North End (km 0-9.5)	0.0	0.5	0.7	1.3	2.6	0.5%
Developed Area (km 13-16)	0.6	33.4	56.3	0.0	90.2	16.9%
km 16-22	10.7	205.4	35.2	5.8	257.0	48.2%
km 22-27	6.1	14.2	30.0	0.0	50.3	9.4%
km 27-32	5.0	32.7	21.4	1.1	60.2	11.3%
km 32-36	10.9	39.9	22.8	0.0	73.5	13.8%
Total	33.1	326.1	166.2	8.2	533.7	100.0%

Phase II: Treatment of Infestations

The infestations identified in phase I were prioritized based upon infestation density, infestation size and habitat type. Infestations were then selected for spraying and were subsequently treated during phase II. Individual infestations were selected for spraying using a set of parameters that accounted for the project's long and short-term goals. These included planned future project activities, logistical concerns, and other natural resource issues related to the locations of each individual infestation. In total, 226 acres of *P. australis* infestations were identified as potentially available for aerial spraying during FY08. Of these 226 acres, 185 acres were considered primary treatment areas and 41 acres were designated as backup treatment areas. It was necessary to select backup treatment areas because of the possibility that not all of the primary areas would be able to be sprayed. Shapefiles were created of both the primary and backup spray areas and were sent to the contractor (Summit Helicopters) to be loaded into their on-board navigational and mapping equipment.

Prior to the commencement of aerial spraying activities, ASIS consulted with the US Fish and Wildlife Service (USFWS), as required under Section 7 of the Endangered Species Act (ESA), regarding the potential for the planned spray activities to affect ESA listed species. As a result of this consultation an action plan was developed to take preventative measures to protect individual *Amaranthus pumilus* (seabeach amaranth) plants that occurred within the near vicinity of targeted *P. australis* infestations. This action plan called for any targeted infestation that had an *A. pumilus* plant within 50m to be removed from consideration for spraying. Furthermore, all *A. pumilus* plants that occurred within 51m to 100m of a targeted infestation were protected by placing a protective wire basket covered with clear plastic over the plant during spray activities. This eliminated any risk from overspray or drift to *A. pumilus* individuals because all *A. pumilus* plants that occurred further than 100m away from the targeted infestations were at no risk of exposure.

Similar consultations were conducted with the Maryland Department of Natural Resources' (MD DNR) Wildlife and Heritage Service (WHS) division during which WHS raised concerns regarding the conservation of several state listed species. The NPS took these concerns under advisement in selecting spray areas and during the planning and implementation of Phase II *P. australis* aerial spray activities. NPS staff conducted surveys for state listed species and took precautions as needed in order to assure that Phase II spray activities did not adversely affect populations of state species of conservation concern.

The Aerial spraying was done using a Jet Ranger helicopter equipped with a 50 ft wide spray boom and a 60 gallon tank. The infestations were sprayed with a solution containing 64 ounces/acre of Habitat® herbicide and 48 ounces/acre of surfactant. This rate was within the recommended rate included in the product label, which states that control of *P. australis* is achieved using Habitat® at rates of 4 to 6 pints per acre. The solution was mixed in water to ensure the application of 10 gallons of spray mix per acre of infestation, which equaled an application concentration of 5% Habitat®. This application volume per acre was based upon current rates being used in other east coast *P. australis* management programs. The state of Virginia currently recommends this rate and volume to spray infestations, The Nature Conservancy and the USFWS use similar rates and a volume of 8-15 gallons per acre for control of infestations in Virginia's coastal barrier islands. At this application rate, 64 ounces/acre, a total of 92.5 gallons of Habitat® herbicide was applied in the treatment of 185 acres of infestations.

The treatment of the selected infestations was scheduled for August 25-29, 2008 however, due to a high pressure system that stalled over the region winds remained above 10 mph for much of the week, forcing the majority of spraying to be done on Friday the 29th and Saturday the 30th. After aerial spraying commenced, spatial data analysis was done to determine the actual areas that were treated, specifically; the spatial distribution of the spray swaths and the effective treated areas. For maps of the treated areas depicting the results of final spatial data analysis, refer to figures 1 to 4. The total treated acreage breakdown for habitat types and density is shown in Table 6. Table 7 documents the treated acreage as divided by spatial placement on the island and when compared with Table 2 shows a division of treatment effort in proportion to the overall island wide infestation level and spatial distribution.

Table 6: Acreage of Aerially Treated Infestations of *P. australis* by Habitat Type and Density Class

Habitat Type	40-60%	60-80%	80-100%	Total Acres	% of Total
Shrub	66.6	83.9	3.5	154.1	81.7%
Marsh	2.3	2.3	1.3	5.9	3.1%
Forest	0.0	0.1	0.0	0.1	0.0%
Shrub/Marsh	4.3	3.3	1.4	9.0	4.8%
Shrub/Forest	0.0	19.6	0.0	19.6	10.4%
Total	73.3	109.2	6.2	188.6	100.0%
% of Total	38.8%	57.9%	3.3%	100.0%	

Table 7: Acreage of Aerially Treated Infestations of *P. australis* by Island Extent and Density Class

Island Extent	40-60 %	60-80%	80-100%	Total Acres	% of Total
North End (km 0-9.5)	0.0	0.0	0.0	0.0	0.0%
Developed Area (km 13-16)	1.1	32.6	0.0	33.7	17.8%
km 16-22	48.6	9.8	4.9	63.3	33.6%
km 22-27	5.3	15.7	0.0	21.0	11.1%
km 27-32	4.5	25.7	1.3	31.5	16.7%
km 32-36	13.8	25.4	0.0	39.2	20.8%
Total	73.3	109.2	6.2	188.7	100.0%

Monitoring Efforts

Monitoring of treatment areas was initiated during 2008 and consisted of visual and quantitative measures of treatment effects. Photo-point monitoring stations were established to capture visual changes in vegetation composition directly related to the control of *P. australis* and subsequent revegetation by native species. A total of 12 photo-points were established at different infestation sites throughout the project area. The chosen photo-monitoring sites represent all of the dominant habitat types on the island infested by *P. australis* (shrub, marsh and forest) as well as transitional boundaries infested between these various habitat types.

In addition, to measure quantitative effects of treatment on *P. australis* stem densities and species diversity, permanent monitoring transects were established within four treated *P. australis* infestations. These four sites were chosen to represent each of the dominant habitat types and as representative of the spatial distribution on the landscape of the average treated infestation. Four 20 meter long transects were randomly placed within each site. Along each transect a 0.5 m x 0.5 m sampling quadrat was placed every 2 meters (total of 44 quadrats per permanent monitoring site). *P. australis* stem density and species presence data were collected from within each quadrat. Monitoring data will be collected from these sites for the duration of the *P. australis* management project, will capture vegetative changes at each site, and provide information to help guide future management and restoration efforts throughout the project area.

Project Effort

The time spent by ASIS staff to accomplish FY08 project goals was recorded during each project phase. Table 8 reports the total hours spent towards the completion of each aspect of the project by individual park employees for the period of May 1, 2008-October 3, 2008.

Table 8: NPS Staff Time Spent on Mapping, Treating, and Monitoring for *P. australis* Project

NPS Staff	Mapping Hours	Treatment Hours	Monitoring Hours	Total Hours
RM Bio Tech (2)	530	360	150	1020
RM Ecologist	160	80	10	250
LE Ranger	7	15	0	10
Total Hours	697	455	160	1312

Contracting, Purchasing, and Budget Management

To conduct the helicopter operations necessary to accomplish the aerial mapping and spraying portions of the project, a scope of work was written and put out to bid through NBC's Aviation Management Division. The bid included both phases of work; phase I covered the ARA for the mapping portion of the project, and phase II included the end use contract agreement for the aerial spraying portion of the project. Summit Helicopters Inc., based out of Cloverdale, Virginia, was the winning bidder for both phases of the project. All operational planning and data transfer for project logistics was coordinated directly with Summit Helicopters Inc. staff, including: Carl Milko, President; John Reed, Chief Pilot; Gary Schlickman, GIS Analyst; Ron Jackson, Pilot; and Barry, Lead Ground Support.

In support of the project objectives and goals, various equipment and supplies were procured during FY08. During years 2 and 3 (FY09 and FY10) ground control operations will increasingly become the focus of management actions, and necessary equipment was obtained. Listed below are the major purchases made with project funds during FY08.

Equipment List for Project Monitoring and Ground-Based Control Efforts:

- Ford F150 Pickup Truck
- Kawasaki Teryx 750cc Utility Vehicle
- High pressure (560 psi) 250 gallon Skid Sprayer
- High Pressure 5 gallon SP0 Backpack Sprayers
- Herbicide Application Personal Safety Supplies

Literature Cited

Sturm, M. 2007. Assessment of the effects of feral horses, sika deer and white-tailed deer on Assateague Island's forest and shrub habitats. National Park Service, Assateague Island National Seashore, Berlin, Maryland.

Phragmites australis Project Area Maps

Assateague Island National Seashore
Maryland and Virginia

National Park Service
U.S. Department of the Interior



ASIS Phragmites Project: Mapped and Treated Infestations- Northern Section

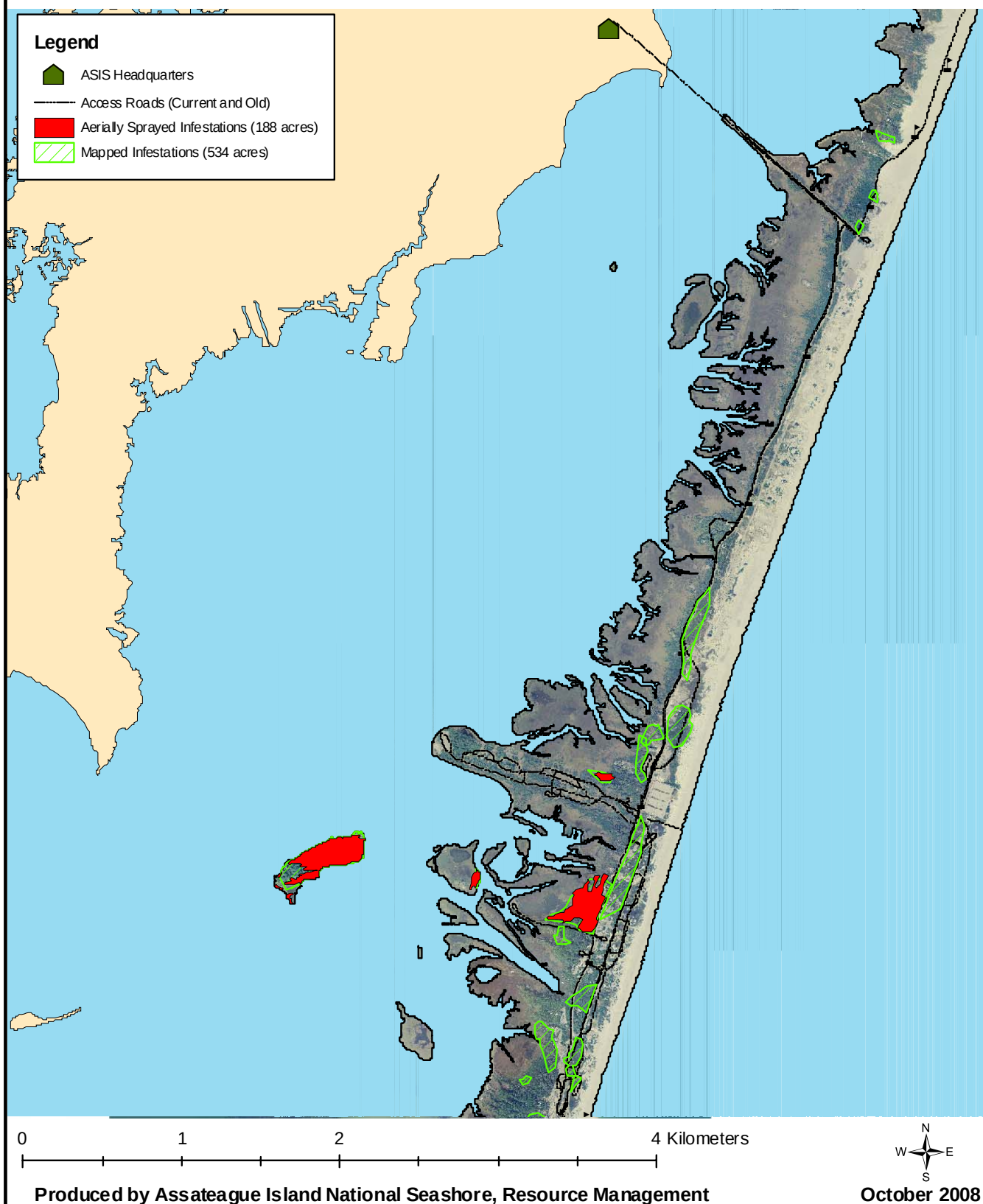


Figure 1: Mapped and Treated *P. australis* infestations occurring from kilometers 10-16

Phragmites australis Project Area Maps

Assateague Island National Seashore
Maryland and Virginia

National Park Service
U.S. Department of the Interior



ASIS *Phragmites* Project: Mapped and Treated Infestations- Mid Section 1

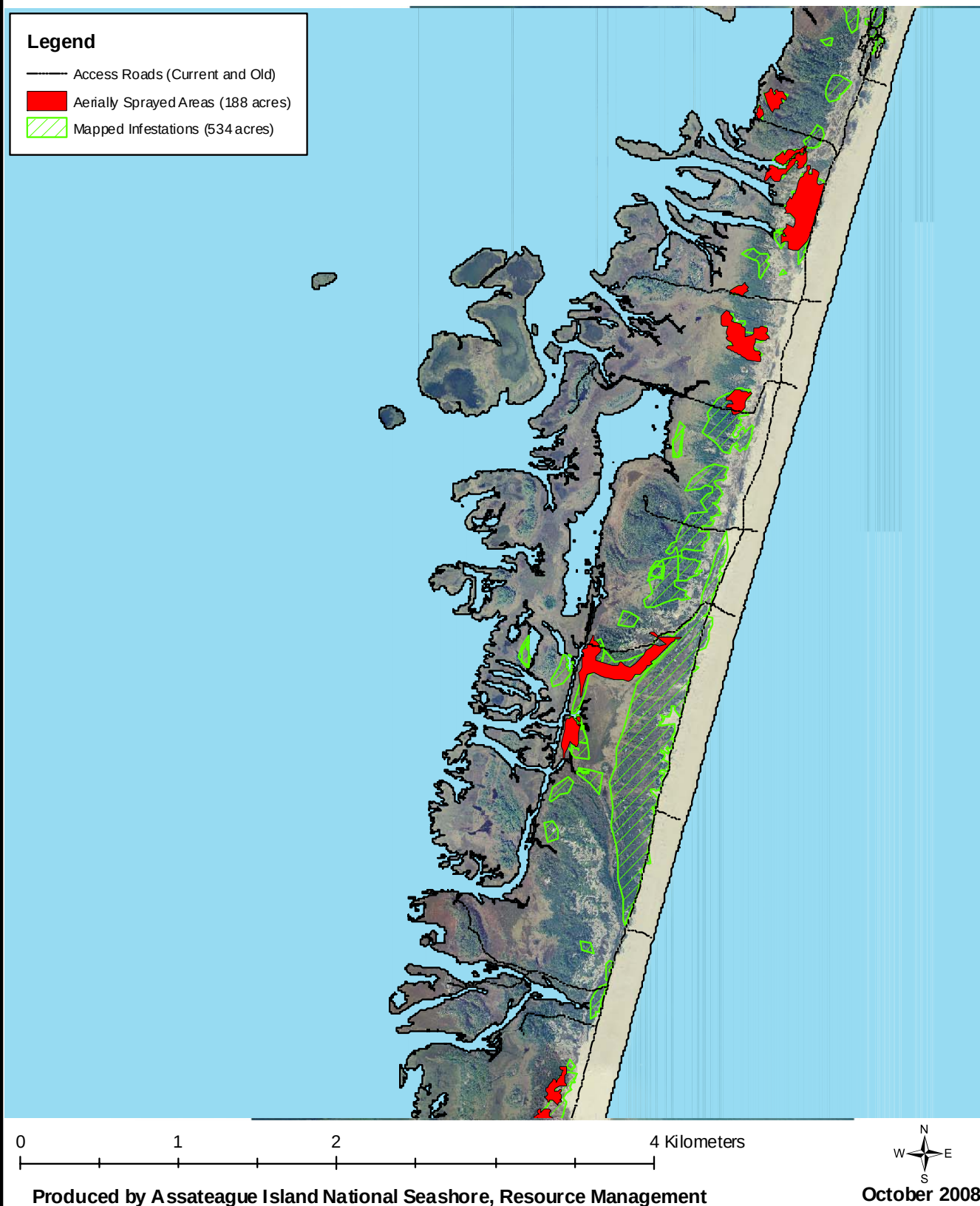


Figure 2: Mapped and Treated *P. australis* infestations occurring from kilometers 16-22

Phragmites australis Project Area Maps

Assateague Island National Seashore
Maryland and Virginia

National Park Service
U.S. Department of the Interior



ASIS Phragmites Project: Mapped and Treated Infestations- Mid Section 2

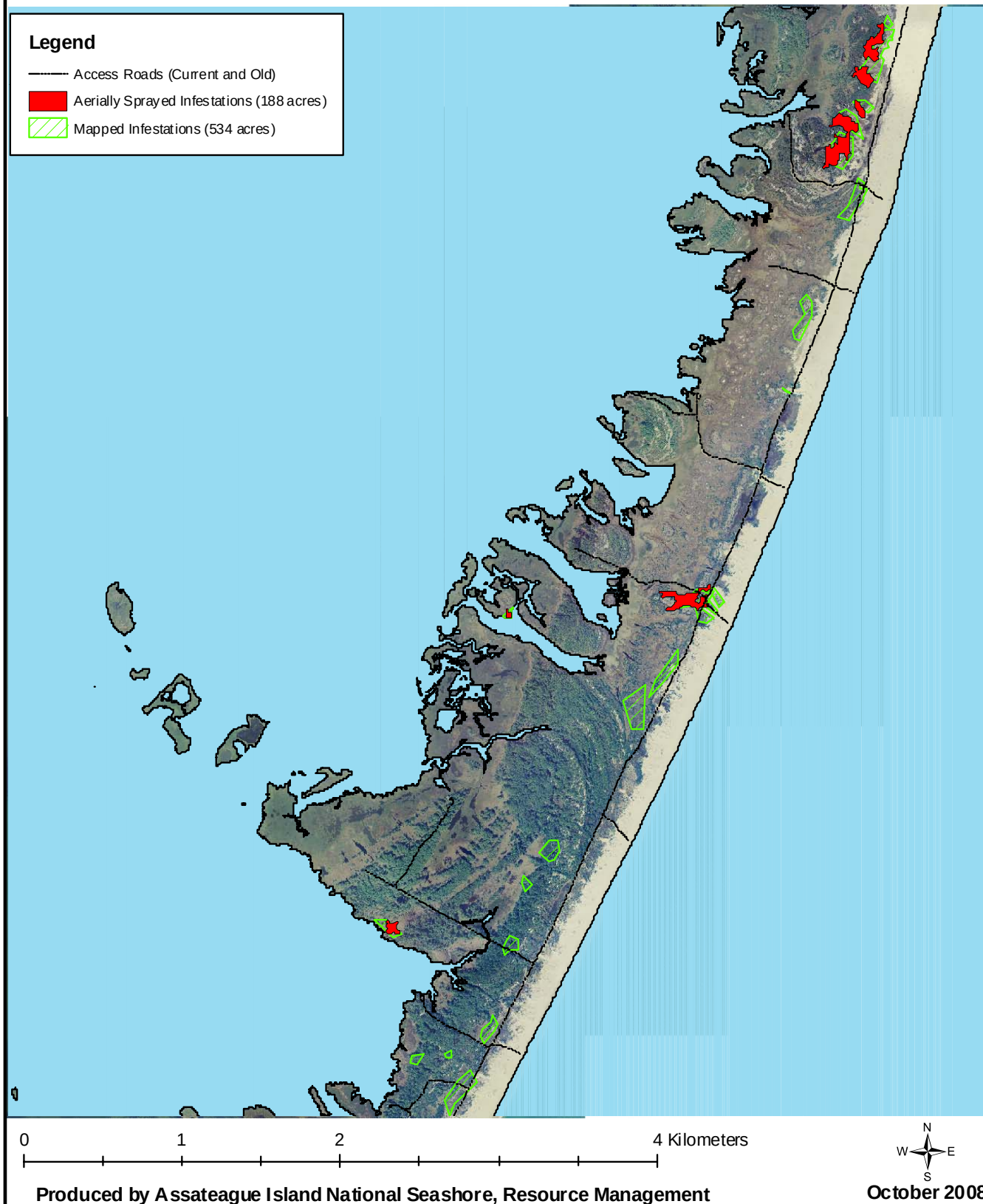


Figure 3: Mapped and Treated *P. australis* infestations occurring from kilometers 22-29

Phragmites australis Project Area Maps

Assateague Island National Seashore
Maryland and Virginia

National Park Service
U.S. Department of the Interior



ASIS Phragmites Project: Mapped and Treated Infestations- Southern Section

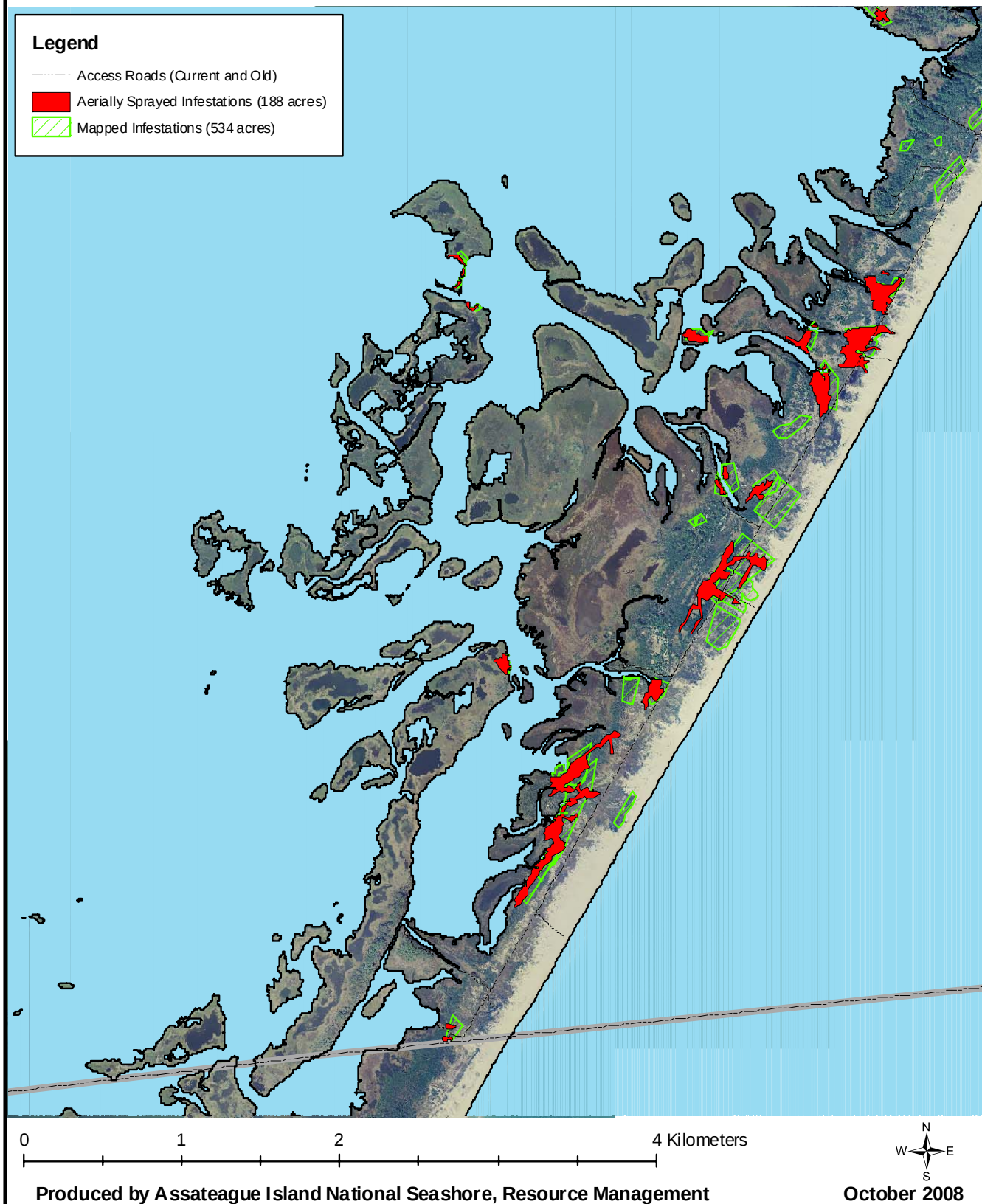


Figure 4: Mapped and Treated *P. australis* infestations occurring from kilometers 29-36