

Assateague Island National Seashore Alien Plant Management Program Report 2009



Figure 1: *Vitex rotundifolia* located for the first time at ASIS on the North End

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Introduction

During 2009 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*, *Ligustrum vulgare*, *Lythrum salicaria*, *Miscanthus sinensis*, *Morus alba*, *Pennisetum alopecuroides*, *Phragmites australis*, *Pinus thunbergiana*, *Rosa multiflora*, *Rosa wichuriana*, and *Vitex rotundifolia*. 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* and *A. altissima* infestations in the developed areas of the park and in the vicinity of Green Run in the backcountry. The alien plant species infestations that were treated by the APMP during 2009 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 2009 and those sites found to be inactive during each of the past three years were labeled inactive.

Methods

ASIS Alien Plant Management Program Design 2009

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 2009 APMP activities. Additionally, a *Phragmites* database was created to store and manage data associated with the ASIS *Phragmites* Control Project. During FY09 the ASIS APMP continued to expand its management of *P. australis* with prescribed fire, large scale aerial treatments and began ground spraying applications to treat the previously mapped infestations associated with this monitoring and management project. The grand size and complexity of this ambitious project continued to require a lead biological technician position and with the departure of the project's first leader a new leader was recruited and 2 seasonal employees were hired to assist them. The permanent biological technician and the term lead biological technician shared the coordination of all *P. australis* monitoring and management activities during this reporting period.

Data Management

The ASIS APMP database and the ASIS *Phragmites* Control Project databases document and track the development and treatment success of each targeted alien plant infestation. Multiple infestations are grouped into sites for record keeping and reporting purposes. Beginning in 2008, a site code was used to group the infestations so that they could be referred to more generally. This practice has been found to be a burden that did not help to more readily identify the areas of infestation on the island. Two new systems for relating infestation locations with their position on the island are under review to replace the previous system. For the purposes of continuity the same sites will be used for this report, but will be reassessed in 2010. The APMP database sites are listed in Table: 4.

The ASIS *Phragmites* Control Project uses a system to describe its sites that divides portions of the island by using roadscars and placenames to identify the location of their treatments. Any infestations that are found on State of Maryland land will have their site description called MD State land. These codes will annual treatments within the newly designated sites to be discreetly identified, suiting the individual needs of the project, as they were not able to do so previously.

Safety Precautions

A non-toxic marker dye has been used in herbicide mixtures at ASIS 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/inintro.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® TM PDA GPS, the Trimble® Pro XTTM and Trimble® XHTM GPS and a Garmin® GPS map76CSTM handheld unit. These units vary between sub-meter (Trimble® Pro XTTM or Pro XHTM) and multi-meter (Juno ST, Garmin®Map76CSTM) 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 each year. Additionally, these visual estimates are compared with the amount of area treated (which, with the exception of *L. japonica* in 2009 was equal to the known extent of the remaining population for each infestation) these actions enable accurate estimates for GPRA reporting purposes. Essentially all species that have been targeted by these efforts since 2004 are at manageable levels with the exception of *L. japonica* and *P. australis*. Other species which are on the ASIS watchout list for treatment (ie. *Sporobolus indicus*) list are not at these manageable levels and will be assessed in 2010 and treatment will begin on these species next year.

Results

A summary of the ASIS APMP accomplishments during 2009 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 FY09 the NCR EPMT visited for a week during which they helped 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. The sites used by the APMP are found in Table: 4 for reference.

Ailanthus altissima:

During 2009 one *A. altissima* sites was treated; AIAL_Site_04. AIAL_Sites_01,02,03 and 05 were found to be inactive . Treatments of this site were conducted in April with the help of the NCR EPMT. The remaining saplings were treated at AIAL_Site_04 with a foliar spray application of a 3% 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 2010.

Alnus glutinosa:

ALGL_Site_01 was found to inactive during rare plant searches in July of 2009 and required no further treatment.

Artemisia stelleriana:

ARST_Site_01 and ARST_Site_02 were visited in August of 2009 during Seabeach Amaranth searches and were found to be inactive and required no further treatment.

Carex kobomugi:

Thirteen sites remained active in 2008 and so they were revisited to meet their treatment needs in 2009; only 9 of the 13 required treatment. The following sites remained active: CAKO_Site_13, CAKO_Site_17, CAKO_Site_20, CAKO_Site_39, CAKO_Site_40, CAKO_Site_42 and (3) new sites were discovered near CAKO_Site_20 all were treated during September 2008 after Piping Plover nesting season with a foliar spray application of 3% glyphosate herbicide solution of Glyphomate41™ in water.

Clematis terniflora:

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. The entire CLTE_Site_01 was treated in September with a foliar spray application of 3% triclopyr solution of Garlon 3A in water. New seedlings continue to emerge and further treatments and monitoring of this site will occur during 2010.

Elaeagnus umbellata:

Many hundreds of seedlings have emerged at the Headquarters are following the treatment of large mature trees there at ELUM_Site_01 these seedlings were treated with a 3% triclopyr solution of Garlon 3A™ in water and to a lesser extent a basal bark application of a 25% triclopyr herbicide solution of Garlon4™ in diesel fuel which was used on a few larger trees that were found to have been previously untreated. Monitoring, conducted during treatment of *L. japonica* during April of 2009, revealed that ELUM_Site_02 was not active in 2009 and this site will continue to be monitored in 2010.

Eragrostis curvula:

E. curvula infestations have been treated since 2005 and again to a lesser extent than ever previously, during September 2009 ASIS continued to treat isolated *E. curvula* infestations within ERCU_Site_01. The 4 previous years of treatments had significantly diminished *E. curvula* occurrences on the island. Cutting was not done in 2009 because *E. curvula* occurrences were comparatively small and virtually no large tussocks were present. The *E. curvula* occurrences present during 2009 were likely recruits from a well developed the seed bank that was established along many of ASIS' paved roads during previous years. During 2009, 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 in May of 2009, while treating PITH_Site_01 and found to be inactive.

Ligustrum vulgare

A large quantity (500 m²) of mature shrubs were located in the vegetated buffer that borders the Sinepuxent Bay on our Headquarters property. They were treated in May with a 50% triclopyr solution of Garlon 3A™ in water on cut stumps immediately after being cut with hand saws near the ground level.

Lonicera japonica:

The NCR EPMT assisted with the treatment of 7 acres of *L. japonica* infestations at LOJA_Site_1 and LOJA_Site_02 during April and May of 2008. Because the entire peninsula at the Bayside campground is known to be infested, the team (including ASIS biotech) made an entire sweep of the peninsula to thoroughly treat the infestations with 5 workers over a 2 day period. An additional day was spent at LOJA_Site_02 which had not been treated previously beyond the roadside with foliar applications. The previous work conducted at LOJA_Site_02 was conducted in early spring and cut stump treatments were favored then because there was snow on the ground. The area at LOJA_Site_02 was found to be heavily infested and so the team made a great impact on the backcountry population of *L. japonica* as a result of this action in 2009.

LOJA_Site_01- This site was found to be active and required treatment during the April of 2010 with the help of the NCR EPMT, who helped to treat the site with a foliar application of a 2% solution of Accord.

LOJA_Site_02- Was the primary target of ASIS and NCR EPMT in 2009 when 7 acres of infested area were treated with a foliar application of a 2% solution of Accord.

LOJA_Site_03- Located in the Assateague State Park is very infested and had not been treated to date.

LOJA_Site_04- Located north of the Shell Rd by the Duck blind trail was found to be active in June of 2009 while deploying Seabeach Amaranth cages and will require treatment in 2010.

LOJA_Site_05- Was found to be inactive during Seabeach Amaranth searches in August of 2009 and did not require treatment.

LOJA_Site_06- In May of 2009 monitoring of LOJA_Site_06 revealed that some *L. japonica* infestations remained active. It was treated mechanically by cutting the stumps to effectively lower the growing portion to the ground because we were not equipped with herbicide during the monitoring. Stumps were cut to kill the upper portion, reducing the seed dispersal completely, but temporarily and we will return to treat the growing lower portions of LOJA151,150,125,124,123,122,121,120,119, 118,117,116,115 in 2010.

LOJA_Site_07- Received treatment along the length of the Sinepuxent Bay vegetation buffer along the shoreline near the site of the new Visitor Center while spraying for *M. sinensis*. The plants were treated using a 3% glyphosate herbicide solution of Rodeo™, or Glyphomate41™ in water.

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.

Miscanthus sinensis:

All of the 5 known sites of *M. sinensis* were treated in 2008 and were not monitored in 2009 because they have shown that they need years to become substantially active following treatment(s) at their sites. Further monitoring and treatment of this species will be required in 2010 at all of the known *M. sinensis* sites. Additional treatments did occur at the Headquarters area where large plants were found along the Sinepuxent Bay vegetation buffer along the shoreline near the site of the new Visitor Center. These plants were treated with a foliar application of a 3% glyphosate herbicide solution of Rodeo™, or Glyphomate41™ in water.

Morus alba:

A single sapling, found at MOAL_Site_01, was treated with a basal bark application of a 25% triclopyr herbicide solution of Garlon4™ in diesel fuel. Other trees that had been treated there in the previous years' were inactive and did not require retreatment. The new *M. alba* infestation (MOAL_0006) that was discovered at MOAL_Site_02 was found to be dead in April of 2009.

Pennisetum alopecuroides:

This species, originally discovered in During September 2007, an infestation of *P. alopecuroides*, measuring approximately 100 m², was discovered near park headquarters. The purple-colored inflorescence of this species is very distinctive and in September of 2009 thousands of plants were seen over many acres of land bordering the NPS Headquarters, as well as throughout the ASIS Headquarters land. These plants were treated with a foliar application of a foliar application of a 3% glyphosate herbicide solution of Rodeo™, or Glyphomate41™ in water late in the season when they were already flowering. The source of this invasive plant was located on the golf course which borders the southern portion of the State of Maryland land that contains the Ratcliff House. This plant was intentionally planted at the golf course as an ornamental and it has successfully escaped its plantings and proven to be extremely invasive in both open and shaded habitats. The golf course was notified and we will continue to spray the infestations found on Federal lands in 2010.

Phragmites australis:

SEE PHRAGMITES REPORT SECTION

Pinus thunbergiana:

Because seedlings continue to emerge at this site it was revisited in May of 2009 and 11 saplings were pulled from the ground. Return visits in 2010 will occur as a result of its ongoing activity there at PITH_Site_01.

Rosa multiflora:

A handful of plants were encountered at ROMU_Site_02 in 2009. They were treated either with a basal bark application of a 25% Triclopyr solution of Garlon 4 in Diesel, or with a foliar spray of 3% Triclopyr herbicide solution of Garlon 3A in water. No activity was observed at the ROMU_Site_01 following the previous years' treatments, but the site will be investigated again in 2010 when the NCR EPMT return to treat LOJA_Site_01 and LOJA_Site_2 again.

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. The extent of its proliferation was further understood in 2009 when it was seen to be well established throughout the Headquarters and border State of Maryland land.

During 2009 two treatment methods were utilized to control the infestations at ROWI_Site_01 during May and June of 2009.

These treatments were:

1. A foliar application of a 3% glyphosate herbicide solution of Glyphomate41™ in water was used to treat infestations throughout the ASIS Headquarters area and the adjacent State of Maryland owned land.

2. A foliar application of a 3% triclopyr herbicide solution of Garlon3A™ in water was used to treat infestations throughout the ASIS Headquarters area and the adjacent State of Maryland owned land.

These 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. Both 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 2010.

Vitex rotundifolia:

This species was discovered during the Seabeach Amaranth searches in August of 2009. After attending a conference on Invasive species at Georgian Court University prior to the Seabeach Amaranth searches the biological technician was able to recognize the new threat to our island. The specimen was photographed in the field (See Figure:1) and entered into the APMP database. Additionally, the infestation was documented with Kevin Heffernan of the Virginia Department of Conservation and Recreation, with Betsy Brabson of the Beach Vitex Task force and also with Joe Scalf of the Nature Conservancy. The discovery of Beach Vitex on ASIS has led to the quarantine of the species throughout Virginia after Edwin L. Rosenberg Manager, Environmental Services Division Department of Planning & Community Development in Norfolk, VA worked to have our discovery serve as justification for their quarantine. The plant was treated in September of 2009 with a 25% solution of Imazapyr herbicide in water that was applied to small incisions soon after circular pieces of cambium were removed from the adaxial surface of the stems, along their length, at several intervals no closer than 10 cm.

Table 1: 2009 ASIS APMP Alien Plant Species Infestation and Treatment Information

Year	Species	Active Sites 2009	Estimated Infestation 2009 (m ²)	Active Sites 2009	% Treated 2009	Treatment Month(s)	Product	Product Amount (liters) ASIS	Product Amount (liters) EPMT	% Conc.	Active Ingredient	Solvent
2009	<i>Ailanthus altissima</i>	1	410	1	100	April	Garlon 3A*	0.150	N/A	3	Triclopyr	Water
	<i>Alnus glutinosa</i>	0	0	0	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	<i>Artemisia stelleriana</i>	2	300	2	100	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	<i>Carex kobomugi</i>	9	1660	9	25	Sept.	Glyphomate 41*****	1.680	N/A	3	Glyphosate	Water
	<i>Clematis terniflora</i>	1	5000	1	None	Sept.	Garlon 3A*	0.700	N/A	3	Triclopyr	Water
	<i>Elaeagnus umbellata</i>	2	10000	1	80	May, Sept., Oct.	Garlon 3A*, Garlon 4**	1.571, 0.150	N/A	3, 50	Triclopyr	Water
	<i>Eragrostis curvula</i>	1	5000	1	100	Sept.	Rodeo***, Glyphomate 41*****	0.270, 0.600	N/A	3	Glyphosate	Water
	<i>Hedera helix</i>	0	0	0	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	<i>Ligustrum vulgare</i>	1	500	1	90	May	Garlon 3A*	0.280	N/A	50	Triclopyr	Water
	<i>Lonicera japonica</i>	7	23715	7	50	April, May, July, Sept	Accord*****	N/A,	7.098	2	Glyphosate	Water
							Glyphomate 41*****	2.02,	N/A	3	Glyphosate	Water
							Garlon 3A*	0.198	N/A	3	Triclopyr	Water
	<i>Lythrum salicaria</i>	0	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	<i>Miscanthus sinensis</i>	5	1040	5	100	Sept., Oct.	Rodeo***, Glyphomate 41*****	0.460	N/A	3	Glyphosate	Water
	<i>Morus alba</i>	1	0	2	100	May	Garlon 4**	0.001	N/A	50	Triclopyr	Water
	<i>Penisetum alopecuroides</i>	1	0	1	None	Sept., Oct.	Rodeo***	0.700	N/A	3	Glyphosate	Water
	<i>Pinus thunbergiana</i>	1	50	1	100	May	N/A	N/A	N/A	N/A	N/A	N/A
	<i>Rosa multiflora</i>	1	1510	2	100	May, Sept.	Garlon 3A*, Garlon 4**, Glyphomate 41*****	0.050, 0.012, 0.330	N/A	100, 25, 3	Triclopyr, Triclopyr, Glyphosate	Water, Diesel, Water
							Garlon 3A*, Garlon 4**, Glyphomate 41*****	0.720, 0.058, 0.100	N/A	3, 25, 2	Glyphosate, Triclopyr, Glyphosate	Water, Diesel, Water
							Habitat****	0.005	N/A	25	Imazapyr	Water
	<i>Vitex rotundifolia</i>	1	3	1	100	Sept.	Habitat****	0.005	N/A	25	Imazapyr	Water

* Garlon 3A™ (62719-37)

** Garlon 4™ (62719-40)

*** Rodeo™ (62719-324)

****Habitat® (241-426)

*****Glyphomate41™(2217847)

*****Accord (62719-324)

Table 2: 2009 ASIS APMP Alien Plant Species Treatment (Rx) Time Log

Year	Species	Month(s)	Rx (*)	Worker(s)		Hours		Total Rx Hours
				ASIS	EPMT	ASIS	EPMT	
2009	<i>Ailanthus altissima</i>	April	FS	1	4	5	5	25
	<i>Alnus glutinosa</i>	N/A	N/A	1		2		2
	<i>Artemisia stelleriana</i>	N/A	N/A	1		2		2
	<i>Carex kobomugi</i>	Sept.	FS	1		30		30
	<i>Clematis terniflora</i>	Sept.	FS	1		20		20
	<i>Elaeagnus umbellata</i>	May, Sept., Oct.	CS, FS	1		40		40
	<i>Eragrostis curvula</i>	Sept.	FS	1		10		10
	<i>Hedera helix</i>	N/A	N/A	1		3		3
	<i>Ligustrum vulgare</i>	May	CS			3		0
	<i>Lonicera japonica</i>	April, May, July, Sept	CS, FS	1	4	40	40	200
	<i>Lythrum salicaria</i>	N/A	N/A	1		2		2
	<i>Miscanthus sinensis</i>	Sept., Oct.	FS	1		10		10
	<i>Morus alba</i>	May	CS	1		3		3
	<i>Penisetum alopecuroides</i>	Sept., Oct.	FS	1		20		20
	<i>Pinus thunbergiana</i>	May	Manual	1		6		6
	<i>Rosa multiflora</i>	May, Sept.	CS, FS	1		30		30
	<i>Rosa wichuriana</i>	May	CS, FS	1		30		30
	<i>Vitex rotundifolia</i>	Sept.	HS	1		30		30
Hours=								463

* (BB) Basal Bark
 (F) Foliar Spray
 (CS) Cut Stump
 (HS) Hack and Squirt

Table 3: 2009 ASIS APMP Treatment Information by Infestation Site and Anticipated Monitoring and Treatment Needs for 2010.

Species	Infestation Site	2009 Size	2009 Monitor / (Re)treat	2010 Monitor	Last Year Present	Monitoring / Treatment Responsibility
<i>Ailanthus altissima</i>	AIAL_Site_01	0m ²	Yes/No	No	2006	ASIS
	AIAL_Site_02	0m ²	No/No	No	2005	ASIS
	AIAL_Site_03	0m ²	No/No	No	2004	ASIS
	AIAL_Site_04	410m ²	Yes/Yes	Yes	2007	ASIS
	AIAL_Site_05	0m ²	Yes/Yes	Yes	2007	ASIS
<i>Alnus glutinosa</i>	ALGL_Site_01	0m ²	Yes/No	No	2006	ASIS
<i>Artemisia stelleriana</i>	ARST_Site_01	300m ²	Yes/Yes	Yes	2008	ASIS
	ARST_Site_02	10m ²	Yes/Yes	Yes	2008	ASIS
<i>Carex kobomugi</i>	CAKO_Site_13	10m ²	Yes/No	Yes	2006	ASIS
	CAKO_Site_14	0m ²	Yes/No	Yes	2006	ASIS
	CAKO_Site_17	30m ²	Yes/Yes	Yes	2009	ASIS
	CAKO_Site_19	0m ²	Yes/No	No	2004	ASIS
	CAKO_Site_20	950m ²	Yes/Yes	Yes	2009	ASIS
	CAKO_Site_22	0m ²	Yes/No	No	2006	ASIS
	CAKO_Site_27	0m ²	Yes/No	No	2006	ASIS
	CAKO_Site_30	0m ²	Yes/No	No	2003	ASIS
	CAKO_Site_31	0m ²	Yes/No	No	2003	ASIS
	CAKO_Site_32	0m ²	Yes/No	No	2003	ASIS
	CAKO_Site_35	0m ²	Yes/No	No	2005	ASIS
	CAKO_Site_36	0m ²	Yes/No	Yes	2008	ASIS
	CAKO_Site_39	0m ²	Yes/No	Yes	2008	ASIS
	CAKO_Site_40	400m ²	Yes/Yes	Yes	2009	ASIS
	CAKO_Site_42	2000m ²	Yes/Yes	Yes	2009	ASIS
	CAKO_Site_43	0m ²	Yes/No	Yes	2008	ASIS
<i>Clematis temiflora</i>	CLTE_Site_01	5000m ²	Yes/Yes	Yes	2009	ASIS
<i>Elaeagnus umbellata</i>	ELUM_Site_01	10000m ²	Yes/Yes	Yes	2009	ASIS
	ELUM_Site_02	0m ²	Yes/No	Yes	2006	ASIS
<i>Eragrostis curvula</i>	ERCU_Site_01	5000m ²	Yes/Yes	Yes	2009	ASIS
<i>Hedera helix</i>	HEHE_Site_01	0m ²	Yes/No	No	2006	ASIS
<i>Ligustrum vulgare</i>	LIVU_Site_01	500m ²	Yes/Yes	Yes	2009	ASIS
<i>Lonicera japonica</i>	LOJA_Site_01	5580m ²	Yes/Yes	Yes	2009	EPMT/ASIS
	LOJA_Site_02	23950m ²	Yes/Yes	Yes	2009	EPMT/ASIS
	LOJA_Site_03	State Park	No/No	No	2009	State Park
	LOJA_Site_04	750m ²	Yes/Yes	Yes	2009	EPMT/ASIS
	LOJA_Site_05	0m ²	Yes/Yes	Yes	2009	ASIS
	LOJA_Site_06	30m ²	Yes/Yes	Yes	2009	EPMT/ASIS
	LOJA_Site_07	5200m ²	Yes/Yes	Yes	2009	EPMT/ASIS
<i>Lythrum salicaria</i>	LYSA_Site_01	0m ²	No/No	No	2002	ASIS
<i>Miscanthus sinensis</i>	MISI_Site_01	1000m ²	No/No	Yes	2008	ASIS
	MISI_Site_02	10m ²	No/No	Yes	2008	ASIS
	MISI_Site_03	10m ²	No/No	Yes	2008	ASIS
	MISI_Site_04	10m ²	No/No	Yes	2008	ASIS
	MISI_Site_05	10m ²	No/No	Yes	2008	ASIS
<i>Morus alba</i>	MOAL_Site_01	10m ²	Yes/Yes	Yes	2009	ASIS
	MOAL_Site_02	120m ²	Yes/No	Yes	2008	ASIS
<i>Pennisetum alopecuroides</i>	PEAL_Site_01	100m ²	Yes/Yes	Yes	2009	ASIS
<i>Pinus thunbergiana</i>	PITH_Site_01	50m ²	Yes/Yes	Yes	2008	ASIS
<i>Rosa multiflora</i>	ROMU_Site_01	200m ²	Yes/No	Yes	2008	ASIS
	ROMU_Site_02	10m ²	Yes/Yes	Yes	2009	ASIS
	ROMU_Site_03	1300m ²	Yes/No	Yes	2007	ASIS
<i>Rosa wichuriana</i>	ROWI_Site_01	1ac	Yes/Yes	Yes	2009	ASIS

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

Table: 4

APMP Site Index

ID	Site	Northing	Easting	Species	Site Description
1	AIAL_Site_01	4241834.53	491440.705	<i>Ailanthus altissima</i>	A discreet location the epicenter of which is indicated by the coordinates
2	AIAL_Site_02	4241800.17	491414.457	<i>Ailanthus altissima</i>	A discreet location the epicenter of which is indicated by the coordinates
3	AIAL_Site_03	4215809.74	481379.407	<i>Ailanthus altissima</i>	A discreet location the epicenter of which is indicated by the coordinates
4	AIAL_Site_04	4215049.33	481260.11	<i>Ailanthus altissima</i>	This site is a 100 meter radius surrounding the footprint of the Paradise Hotel site which is situated north of and across the water from the Green Run inholding and just south of the road leading to the Valentine's inholding
5	AIAL_Site_05	4209607.33	478053.147	<i>Ailanthus altissima</i>	A discreet location the epicenter of which is indicated by the coordinates
6	ALGL_Site_01	4241153	491106	<i>Alnus glutinosa</i>	A discreet location the epicenter of which is indicated by the coordinates
7	ARST_Site_01	4236363	489500	<i>Artemisia stelleriana</i>	This site is a 100 meter radius surrounding the epicenter point near Km 5.75 on the North End of ASIS
8	ARST_Site_02	4226024	485848	<i>Artemisia stelleriana</i>	A discreet location the epicenter of which is indicated by the coordinates
9	CAKO_Site_01	4241654.3	491796.849	<i>Carex kobomugi</i>	A discreet location the epicenter of which is indicated by the coordinates
10	CAKO_Site_02	4238487.34	490186.94	<i>Carex kobomugi</i>	A discreet location the epicenter of which is indicated by the coordinates
11	CAKO_Site_03	4237589.45	489897.012	<i>Carex kobomugi</i>	A discreet location the epicenter of which is indicated by the coordinates
12	CAKO_Site_04	4237503.21	489793.603	<i>Carex kobomugi</i>	A discreet location the epicenter of which is indicated by the coordinates
13	CAKO_Site_05	4237424.69	489824.121	<i>Carex kobomugi</i>	A discreet location the epicenter of which is indicated by the coordinates

14	CAKO_Site_06	4237420.31	489843.72	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
15	CAKO_Site_07	4237418.78	489825.838	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
16	CAKO_Site_08	4237404.25	489838.584	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
17	CAKO_Site_09	4237402.46	489824.002	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
18	CAKO_Site_10	4237393.88	489843.434	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
19	CAKO_Site_11	4237038.72	489716.852	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
20	CAKO_Site_12	4236193.94	489394.673	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
21	CAKO_Site_13	4236172.74	489412.293	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
22	CAKO_Site_14	4236122.62	489409.388	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
23	CAKO_Site_15	4225646.83	485760.173	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
24	CAKO_Site_16	4225036.72	485594.369	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
25	CAKO_Site_17	4222490.58	484802.887	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
26	CAKO_Site_18	4222447.27	484789.414	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
27	CAKO_Site_19	4224429.91	485407.857	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
28	CAKO_Site_20	4222426.52	484820.465	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
29	CAKO_Site_21	4216381.41	482792.642	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates

30	CAKO_Site_22	4216369.56	482801.59	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
31	CAKO_Site_23	4216366.84	482811.723	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
32	CAKO_Site_24	4216360.9	482827.904	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
33	CAKO_Site_25	4216355.56	482852.706	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
34	CAKO_Site_26	4215252.21	482321.121	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
35	CAKO_Site_27	4214320.64	481780.718	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
36	CAKO_Site_28	4210394.26	479583.625	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
37	CAKO_Site_29	4209967.61	479281.398	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
38	CAKO_Site_30	4190275.49	466183.226	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
39	CAKO_Site_31	4190178.28	466247.721	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
40	CAKO_Site_32	4190024.99	466371.801	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
41	CAKO_Site_33	4237291.86	489768.093	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
42	CAKO_Site_34	4237423.58	489822.931	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
43	CAKO_Site_35	4234703	488914	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
44	CAKO_Site_36	4222525	484789	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
45	CAKO_Site_37	4232004	487963	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates

46	CAKO_Site_38	4189534.55	466500.811	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
47	CAKO_Site_39	4234972	488774	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
48	CAKO_Site_40	4236012	489150	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
49	CAKO_Site_41	4208812.02	478513.002	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
50	CAKO_Site_42	4216380.22	482799.881	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
51	CLTE_Site_01	4229108.07	485365.57	Clematis terniflora	A discreet location the epicenter of which is indicated by the coordinates
52	ELUM_Site_01	4233449	486272	Elaeagnus umbellata	The combined State and Federal lands surrounding the Headquarters building on the mainland
53	ELUM_Site_02	4229032.8	485466.279	Elaeagnus umbellata	The entire developed area from the northern park boundary to the OSV entrance
54	ERCU_Site_01	4229434.15	486764.163	Eragrostis curvula	The entire developed area from the northern park boundary to the OSV entrance
55	HEHE_Site_01	4209043	478638	Hedera helix	A discreet location the epicenter of which is indicated by the coordinates
56	LIVU_Site_01	4233241	486478	Ligustrum vulgare	Sinepuxent Vegetation Buffer at ASIS Headquarters
57	LOJA_Site_01	4215262.93	481374.674	Lonicera japonica	Is a series of infestations located along the access road to Valentines cabin.
58	LOJA_Site_02	4228589.79	486483.992	Lonicera japonica	Originally located within the Bayside Campground peninsula, was expanded during 2007 to include ASIS' entire developed area.
59	LOJA_Site_03	4231224	487325	Lonicera japonica	Located along Bayberry Drive within Assateague State Park.
60	LOJA_Site_04	4232258.99	487948.99	Lonicera japonica	Located along the Shell Road and the trail leading to the handicapped accessible duck blind.

61	LOJA_Site_05	4241732	491652	Lonicera japonica	This site is a single infestation discovered near the Ocean City inlet on top of the high dunes there.
62	LOJA_Site_06	4225065	485380	Lonicera japonica	Is located within shrub and forested areas between km 17 and 20.
63	LOJA_Site_07	4233405	486447	Lonicera japonica	Is located on the mainland within the ASIS headquarters area Federal land only.
64	LYSA_Site_01	4227399	486228	Lythrum salicaria	A discreet location the epicenter of which is indicated by the coordinates
65	MISI_Site_01	4241656.63	491485.68	Miscanthus sinensis	A discreet location the epicenter of which is indicated by the coordinates
66	MISI_Site_02	4240156	490579	Miscanthus sinensis	A discreet location the epicenter of which is indicated by the coordinates
67	MISI_Site_03	4239777	490387	Miscanthus sinensis	A discreet location the epicenter of which is indicated by the coordinates
68	MISI_Site_04	4225014	484363	Miscanthus sinensis	A discreet location the epicenter of which is indicated by the coordinates
69	MISI_Site_05	4240009	490500	Miscanthus sinensis	A discreet location the epicenter of which is indicated by the coordinates
70	MOAL_Site_01	4233425	486455	Morus alba	The combined State and Federal lands surrounding the Headquarters building on the mainland
71	MOAL_Site_02	4227399	486228	Morus alba	A discreet location the epicenter of which is indicated by the coordinates
72	PEAL_Site_01	4233296	486521	Penisetum alopecuroides	A discreet location the epicenter of which is indicated by the coordinates
73	PITH_Site_01	4209046	478675	Pinus thunbergiana	This site is a 100 meter radius surrounding the Clements inholding located in MD near the MD/ VA State Line
74	ROMU_Site_01	4228841	485870	Rosa multiflora	The entire peninsula where the Bayside Campground resides on the island and including the Boneyard maintenance staging area

75	ROMU_Site_02	4233583	486209	Rosa multiflora	Is located on the mainland within the ASIS headquarters area Federal land only.
76	ROMU_Site_03	4209058	478625	Rosa multiflora	A discreet location the epicenter of which is indicated by the coordinates just to the west of the Clements inholding located in MD near the MD/ VA State Line
77	ROWI_Site_01	4233405	486447	Rosa wichuriana	The combined State and Federal lands surrounding the Headquarters building on the mainland
78	VIRO_Site_01	4236409	489519	Vitex rotundifolia	Is located on the North end of the island and represents a single plant's location.

**Assateague Island National Seashore
Phragmites australis Monitoring and Management Project
2009 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. This valuable and unique resource is being degraded and functionally altered by the invasion of *P. australis* and through the development of dense infestations.

P. australis is an aggressive invader that spreads from established infestations by sending out rhizome and root runners thereby creating a thick mat of rhizome which may extend down several feet in depth. *P. australis* spreads to new sites via three routes; through seeds dispersed by wind and water, through 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, displaces and outcompetes native wetland and terrestrial vegetation, changes marsh hydrology, alters wildlife habitat, and increases wildfire potential.

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 that today vast areas of once diverse native forest, shrub and marsh communities have been replaced with dense monocultures of itself. 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 an ambitious multi-year *P. australis* monitoring and management project. This was the first large scale project of its kind to be conducted at ASIS. 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. During FY 09 the remaining infestations that were mapped and not aurally sprayed from FY08 were treated.

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.: the *Phragmites australis* Project Implementation and Flight Plan, the Flight Following Plan and the Safety Plan) were produced and ultimately approved by the Park's acting superintendent (Ted Morlock) as well as by National and Regional National Park Service (NPS) aviation program managers. The *Phragmites australis* Project Implementation and Flight Plan 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 Meg Gallagher, NPS Eastern Regional Aviation Manager, 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. Ted and his staff also provided assistance with planned parking lot closures during the project. Don Savedge came to ASIS to act as the helicopter manager. In this capacity he verified documents, ensured aircraft safety measures were followed, and monitored flight progress. Cristina Esposito (ASIS bio tech) worked as the project manager during the project. In this capacity she provided flight following and data collection support from the ground. Additionally, various park staff from other divisions (Administration, Interpretation, Resource Management and Maintenance) assisted with the planning of the project. 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. ASIS Resource Management staff assisted with flight following and project preparation.

Prior to conducting planned flight activities ASIS staff (C. Esposito) received basic helicopter crew member training.

Treatment of Infestations: Aerial

For FY09, the project was comprised of the selection of the remaining previously mapped infestations and aerial spraying of these infestations. In total, 260 acres of *P. australis* infestations were selected for aerial spraying. Shapefiles were created of these areas and sent to the contracting helicopter company to load into their navigational equipment for the coordination of the spray operation.

Aerial spraying was done using a Jet Ranger helicopter equipped with a 50 ft wide spray boom and a 100 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 on 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. At this application rate, 64 ounces/acre, a total of 130 gallons of Habitat® herbicide was applied in the treatment of 260 acres of infestations.

The treatment of the selected infestations was scheduled for the last week of August (24th-28th) to accommodate for changing weather conditions. Thanks to the assistance of many ASIS park staff, the spraying of the selected infestations went according to plan. After aerial spraying was finished, 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. The total treated acreage breakdown for habitat types and density is shown in Table 3. Table 4 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 3: 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	77.3	55.4	0.0	132.7	51%
Marsh	0.0	3	1.8	4.8	1.9%
Forest	4.2	0.0	3	7.2	2.8%
Shrub/Marsh	115.4	0.0	0.0	115.4	44.3%
Shrub/Forest	0.0	0.0	0.0	0.0	0.0%
Total	196.9	58.4	4.8	260.1	100.0%
% of Total	76%	22%	2%	100.0%	

Table 4: 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	4.4	1.8	6.2	2.4%
Developed Area (km 13-16)	0.0	2.4	0.0	2.4	0.9%
km 16-22	162.9	35	2.9	200.8	77.2%
km 22-27	4.2	7.7	0.0	11.9	4.6%
km 27-32	17.6	8.9	0.0	26.5	10.2%
km 32-36	12.3	0.0	0.0	12.3	4.7%
Total	197	58.4	4.7	260.1	100.0%

Treatment of Infestations: Ground

The effective control of Phragmites, particularly larger well-established stands, is likely to require multiple treatments using a combination of methods including ground spraying with herbicide. The use of herbicide treatments is recommended as the primary control method and the first step towards effective control for *P. australis*. By applying herbicide to actively growing green foliage and flower plumes of the target plants after full leaf elongation and up to first killing frost, it is believed to produce the most effective way to control *P. australis*.

During FY09 *P. australis* was not only sprayed aerially, it was also sprayed from the ground. With the assistance of two seasonal crew members, the Phragmites team was able to spray smaller infested areas that were not able to be sprayed aerially. Most of these infestations were discovered in the developed area of the park and were less than half an acre. In order to ground spray the infestations several different types of equipment were used according to the density of the proposed treated area. Backpack sprayers were mainly used in infestations that ranged from 0-60% density while a 150 gallon skid sprayer was used in 60-100% density areas. In areas ranging from 40-80% density, a combination of the equipments was used in order to maximize time and effort.

The infestations were mapped and sprayed with a solution containing 2% concentration of Habitat® herbicide and 0.5% of surfactant. The solution was mixed in water and sprayed on *P. australis* infestations starting from the crown of the plant and working down covering approximately 70% of the plant. At this application rate, 2% concentrate, a total of 12.3 gallons of Habitat® herbicide was applied in the treatment of 20.3 acres of infestations.

When applied to the foliage of actively growing plants, Imazapyr, the active ingredient in Habitat®, is rapidly absorbed and transported throughout the plant tissues. The herbicide kills the entire plant: leaves, stems, and rhizomes.

Along with using several types of equipment and spraying *P. australis*, the Phragmites team also created several GIS shapefiles, protocols and equipment lists to aid them in the ground spraying process. The team created two main shapefiles the Location ID shapefile and the data storage shapefile. The Location ID shapefile is extremely important because it lets park staff know in what area of the park the team is working in. The Location ID shapefile is a file that divides the entire island into smaller areas making it easier for park staff to know more exact were the team is spraying herbicide and were park personnel should stay out of. The shapefile was created using mainly trails, roads or natural openings as dividers for each Location ID unit. The main shapefile to store the data for ground spray was created in ArcMap and it is called Phrag_Infest_Ground_Spray_FY10. It stores all the data collected and maps the infestation using a polygon to show were the infestation is located on the island. This way any park staff can pin point every Phragmites infestation that has been ground sprayed in the park.

Table 5: Acreage of Aerially Treated 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	2.42	1.61	1.05	0.69	5.77	28.37%
Marsh	0.2	0.0	0.31	1.58	2.09	10.28%
Forest	0.75	1.68	0.61	0.41	3.45	16.96%
Shrub/Marsh	0.0	1.58	2.1	0.0	3.68	18.09%
Shrub/Forest	1.31	1.31	2.73	0.0	5.35	26.30%
Total	4.68	6.18	6.80	2.68	20.34	100.0%
% of Total	23.00%	30.40%	33.40%	13.20%	100.0%	

Prescription Burn

The resource management staff and Shenandoah National Park fire staff identified the use of prescribed fire as a viable management technique for *P. australis*. Prescribed burns were used as part of a management regime to control *P. australis* that threatened the unique natural resources of ASIS. The prescription burning provided an integral component in the restoration process by removing above-ground biomass in aerially sprayed infestations. Additionally, the prescription burns helped facilitate the restoration of these areas with native coastal vegetation by allowing light to reach the soil surface, increasing the opportunity for native seeds to germinate from the seed bank, and providing a flush of nutrients to further stimulate native plant growth.

In order for the prescription burn to take place, several important documents had to be created. The Fire Management Plan (FMP) is an appendix to the ASIS Resource Management Plan. Its primary purpose is to integrate fire management objectives with other resource management programs. The objectives of the Resources Management Plan, as related to fire management, allowed adjunctive opportunities for the preservation, restoration, maintenance, and protection of cultural and natural resources of the seashore. Activities described in the fire management plan are a part of the effort to maintain and, if necessary, restore natural ecosystem processes to the maximum extent practicable. Along with the FMP, the Assateague Island Annual Prescribed Fire Plan was created. This is an omnibus plan for lands within Assateague Island National Seashore (ASIS) that are to be treated with fire following the application of aerially applied herbicide in an effort to control *P. australis*.

During FY09 the first set of prescription burns were implemented at ASIS. They took place in mid March and took approximately two days, 3/12/09 and 3/21/09, to burn. Due to inclement weather the fire team had to leave and return later on. Six units were selected for the burns comprising of 197 acres spread out across the island. Within these units there were 85.5 acres of *P. australis* infestations that were aerially sprayed. After the prescription burns were completed, the Shenandoah Fire staff returned in September to monitor and survey the burn units and to see the effects the fire had on the ecosystems. They used transects to monitor the burn units. Four transects were established in each of the six units. Unfortunately, the transects in Unit 1 were not monitored due to the lack of time and difficulty of getting to them. The team used a similar protocol as the aerial spray permanent transect monitoring described in the next section.

Monitoring Efforts

Monitoring of the treatment areas was initiated during the summer of 2008 and will continue through and beyond the duration of the project. Monitoring efforts consisted of visual and quantitative measures of treatment effects. Photo-point monitoring stations have been 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 have been established at 12 different infestation sites across the project area. Sites were chosen that represented the dominant habitat types in which infestations occur (marsh, shrub/marsh border, mixed shrub/forest/marsh, and dune swale shrub).

Permanent monitoring transects have also been established within four infestation treatment sites, each representing one of the dominant habitat types where infestations occurred. Four transects were randomly placed within each site and data collection on *P. australis* stem densities and species

presence/absence will occur using .25 m x .25 m sampling quadrats every 2 meters along each transect. The long-term collection of data from these monitoring transects will capture changes in site vegetative composition and provide insights to help guide future management and restoration efforts.

Monitoring for rare, threatened, and species of management concern plants was also done around all the *P. australis* infestations before they were aerially sprayed in FY09. The Phragmites Crew searched a 50 meter overspray buffer for these plant species. This was done in order to prevent these critically important species from being killed by the herbicide spray. When the crew found any of them, they collected data that consisted of the species type, if it was threatened, concerned or rare, and the location where it was found. The data collected was used in order to protect any species that was found before it was sprayed during aerial operations. If the proposed spray area could not be altered to protect these species, then they would be protected from the spray by covering them up just before spray and later removing the cover once the spraying was completed. The Phragmites Crew was able to find 2 plants that were threatened and 14 that were of concern.

Project Effort

All effort and time spent by ASIS staff to accomplish project goals was recorded for each project phase. Table 6 reports the total hours spent towards the completion of each phase of the project by individual park employees for the period of May 1, 2009-September 30, 2009.

Table 6: NPS Staff Time Spent on Mapping, Treating, and Monitoring for *P. australis* Project

NPS Staff	Mapping Hours	Treatment Hours	Monitoring Hours	Total Hours
RM Phrag Crew (2)	90	410	320	820
RM Bio Tech (2)	80	120	220	420
RM Ecologist	0	0	0	0
LE Ranger	0	25	0	25
Total Hours	170	555	540	1265

Contracting, Purchasing, and Budget Management

To conduct the helicopter operations necessary to accomplish the aerial spraying portion of the project, a scope of work was written and put out to bid through the DOI NBC Aviation Management Division. The bid included an end use contract agreement for the aerial spraying of selected infestations of *P. australis* on ASIS. Summit Helicopters Inc., based out of Roanoke Virginia, was the lowest bidder and won the contract for 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; Arthur Sandford, Pilot; and Barry, Lead Ground Support.

In support of the project a number of purchases have been made to procure equipment and supplies for all 3 years of the project, including 2 seasonal employees that were hired for ground control operations during FY09. They are a major focus of management actions. Listed below are the major equipment used to support operations for FY09.

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 (60 psi) 15 gallon Spot Sprayer
- High Pressure 4 gallon SP0 Backpack Sprayers
- Herbicide Application Personal Safety Supplies
- Trimble Juno ST GPS unit

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.
Introduction