

Assateague Island National Seashore

Alien Plant Management Program (APMP) / Phragmites Control Project Report 2013



Jonathan Chase, Biological Technician
Vegetation Management
Division of Resource Management

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

December 2013

Introduction

During 2013 Assateague Island National Seashore's (ASIS) alien plant management program (APMP) worked to monitor and control infestations of: *Ailanthus altissima*, *Alnus glutinosa*, *Artemisia stelleriana*, *Artemisia vulgaris*, *Carex kobomugi*, *Clematis terniflora*, *Elaeagnus umbellata*, *Eragrostis curvula*, *Hedera helix*, *Lezpedeza cuneata*, *Lonicera japonica*, *Ligustrum vulgare*, *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 *Phragmites australis* infestations in the developed area at the Life of the Forest Trail, in Burn Unit 8 and in the vicinity of the Bullpen at Km 22 in the Over Sand Vehicle zone of the park's backcountry.. The alien plant species infestations that were treated by the Alien Plant Management program (APMP) during 2013 occurred in the park as well as around the park's Headquarters area. Previously documented and treated infestation sites were monitored during 2013 and those sites found to be inactive during each of the past three years were determined to be controlled.

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 2013 APMP activities. Additionally, the *Phragmites* database was updated to store and manage data associated with the ASIS *Phragmites* Control Project. During FY13 the ASIS APMP continued to expand its management of *P. australis* with large scale ground treatments and continued to treat/ retreat the previously mapped infestations associated with this monitoring and management project. The grand size and complexity of this ambitious project became the responsibility of the biological technician and 4 seasonal employees were hired to assist them. Additionally, 2 Student Conservation Association (SCA) members were recruited and subsequently delegated to assist with this project along with other Resources Management activities, though the majority of their assistance was dedicated to this project. The permanent biological technician and the Chief of Resources Management 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 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 were reassessed in 2013. The APMP database sites are listed in Table: 4. The herbicide use log is included for all APMP activities in Table 5, which was generated from the APMP ASIS Exotic Plants Database.

The ASIS *Phragmites* Control Project attempted, in the past, to use a system to describe its sites that divided portions of the island by using roadscars and placenames to identify the location of their treatments. This system was found to be cumbersome for new employees and was subsequently dropped from the program. Each treatment received a code named Rx Code that included the characters "Rx" and the date of the treatment and if more than 1 treatment was conducted on that day the filename was appended with discreet numbers added to the end of the filename. For example the second treatment on 7/5/2013 would be labeled "Rx070513_02".

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 the safety of the applicator by making visible, possible contamination of his/her protective clothing. Proper protective equipment (PPE) was always employed during treatment activities. Employee safety is important to ASIS, especially when working with potentially hazardous materials. Therefore the project lead assured that all equipment was in good working order and that all permits were current at the start of the season prior to large scale treatment activities. This methodology has been adopted as standard operating procedure by the ASIS APMP. The lead technician responsible for coordinating and implementing the APMP is a certified pesticide applicator in the State of Maryland who is 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 (ASIS SOMC).
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 2013 and Global Positioning System (GPS) units were used to record data. The Trimble® Juno 3B® handheld unit was the preferred unit in 2013. 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 2013 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*, *P. australis*, *P. alopecuroides* and *C. terniflora*.

Results

A summary of the ASIS APMP accomplishments during the fiscal year 2013 follows. This summary includes ASIS APMP monitoring and treatment activities as well as those conducted with the assistance of the NCR EPMT. During 2013, the NCR EPMT visited for a week during which time they helped treat *P. australis* infestations.

Treatment data are presented by species including the time associated with these treatments in Table 5. Treatment and monitoring information are presented in the narrative for each species. The sites used by the APMP are found in Table 4 for reference, as mentioned previously.

Ailanthus altissima:

During 2013 all 5 sites (AIAL_Site_01 to 05) were found to be inactive. Because these sites have not been active for more than 3 consecutive years they can be considered to have been controlled/ eradicated.

Alnus glutinosa:

ALGL_Site_01 was found to be inactive during 2013 and required no further treatment. Because the site has not been active for more than 3 consecutive years the single tree once present at this site can be considered to have been controlled/ eradicated.

Artemisia stelleriana:

ARST_Site_01 and ARST_Site_02 were visited in August of 2013 during Seabeach Amaranth searches and were found to be inactive and required no further treatment. Because the sites have not been active for more than 3 consecutive years they can be considered to have been controlled/ eradicated.

Artemesia vulgaris:

A sizable infestation has appeared in the vicinity of the ASIS Sinepuxent District Visitor Center since 2012. The many parking islands and planting beds surrounding the Visitor Center have provided ideal growing conditions for this new (to ASIS) invader. It is possible that the species came to the area when the planting beds surrounding the Visitor Center were mulched during various plantings at this site. To begin control of the infestation at the Visitor Center treatments were conducted in May of 2013 with a foliar spray application of 2% glyphosate herbicide solution of Rodeo® in water.

A small infestation is thought (Chase 2013) to have been vectored from the ASIS Sinepuxent District Visitor Center to the Sinepuxent Ranger Station where it has become established between the Ranger Station and the Hunt Shack. This small infestation was treated in August of 2013 with a foliar spray application of 2% glyphosate herbicide solution of Rodeo® in water.

Carex kobomugi:

In August of 2013, all of the known *C. kobomugi* sites in Maryland were monitored and if encountered, they were treated. Eight of the Maryland sites were found to be active. They were: CAKO_Sites_43, 33, 13, 14, 39, 37, 36 and 22. These sites were promptly treated after being located with a foliar spray application of 2% glyphosate herbicide solution of Rodeo® in water.

The Seabeach Amaranth Restoration project provides the opportunity to locate new infestations of this species annually both during the island wide census, as well as before the census when we attempt to locate and protect as many plants as possible with cages. Because we continue to find new infestations of this species and re-emergent or newly emergent populations in previously treated sites it is believed this species will be of continued concern for many years to come.

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 found to be active during a late season assessment of the area in August of 2013. Because the footprint of this infestation had been proposed to be the relocation of an adjacent parking lot it was not deemed to be a worthy recipient of treatments this year by the biological technician. Later, the relocation of the lot garnered significant dissatisfaction and did not gain approval. Therefore, we plan to work in this area early in next year's growing season to continue the control of what has become a significant population of vines that pose a very significant threat to the island.

Elaeagnus umbellata:

Many *E. umbellata* saplings continue to emerge at the Headquarters area of ASIS. Both large mature trees at ELUM_Site_01 and saplings were treated with a basal bark or cut stump application of a 25% triclopyr herbicide solution of Garlon4 Ultra® in diesel fuel. Monitoring, conducted during treatments of *L. japonica* during April of 2013 revealed that ELUM_Site_02 was not active in 2013. Both sites will continue

to be monitored and treated, if necessary, in 2014. Because a great number of these trees can be found bordering the Headquarters land, as well as being well established throughout South Point, it is believed that this species will remain on our watch list for many years to come.



Eragrostis curvula:

E. curvula infestations have been treated in the Developed Area (which it has remained confined to) at ASIS since 2005. The Developed Area was treated during August 2013 within ERCU_Site_01. The previous years of treatments had significantly diminished *E. curvula* occurrences in the Developed Area's Federal Lands. Cutting was not performed in 2013 because *E. curvula* occurrences were comparatively small. Cutting of large tussocks followed by allowing re-growth to reach 15 cm height that is then treated with a foliar application of a 2% glyphosate herbicide solution of Rodeo™ in water remains the optimal treatment for this species.

The *E. curvula* occurrences present during 2013 were likely recruits from a well developed seed bank that remains established along ASIS's paved roads during previous years. During August of 2013, all observed *E. curvula* occurrences at ERCU_Site_01 were treated with a foliar application of a 2% glyphosate herbicide solution of Rodeo® in water.

Hedera helix:

The single *H. helix* plant discovered and treated at HEHE_Site_01 during 2006 was monitored in July of 2013 and found to be active with a single vine extending 1 meter from its base. This small infestation is targeted for treatment in 2014.

Lezpedeza cuneata:

This species is present in 2 locations, they are: 1. The Sinepuxent Vegetation Buffer behind the ASIS Sinepuxent District Visitor Center and 2. Bayside Peninsula along the south side of Bayside Drive in the Developed Area on the island. Treatments have been conducted on the mainland in the past, but not on the island. A single treatment in May was conducted at the Sinepuxent Vegetation Buffer where a foliar application of a 3% triclopyr herbicide solution of Garlon 3A® in water was used. Because the level of detection has increased at both locations, treatments of this highly invasive species are recommended to resume in 2014.

Ligustrum vulgare:

Recruits from the original infestation (500 m²), found in the vegetated buffer that borders the Sinepuxent Bay on our Headquarters property were found during treatments of *L. japonica* in the same location. The *L. vulgare* saplings were foliar-treated in May with a 3% triclopyr solution of Garlon 3A® in water.

Lonicera japonica:

LOJA_Site_01- This site was found to be active and will require treatment during 2014, perhaps with the help of the NCR EPMT, who have helped extensively, in the past, to treat the site.

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. The treatments have always been effective for this species, but the well established seed bank created by this species continues to produce prodigious amounts of seedlings. We hope to return to this site in 2014 to continue control efforts.

LOJA_Site_03- Located in the Assateague State Park remained highly infested and has not been treated since 2012. Perhaps, with the help of volunteer groups in 2014, we can return to find and treat the largest vines of this infestation, as has been done in the past.

LOJA_Site_04- Located north of the Shell Rd by the Duck blind trail was found to be active in June of 2013 while deploying Seabeach Amaranth cages and will require treatment in 2014.

LOJA_Site_05- Was found to be inactive during Seabeach Amaranth searches in August of 2013 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. The active infestations, LOJA151,150,125,124,123,122,121,120,119,118,117,116, and 115 respectively, were treated mechanically by cutting the stumps to 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.

LOJA_Site_06 was revisited in 2013 and several active infestations (LON_JAP_151,125,123,122,121,120,146,008,110,111,112) were treated with a foliar application of a 2% glyphosate herbicide solution of Rodeo® in water.

LOJA_Site_07- This site received treatment along the length of the Sinepuxent Bay vegetation buffer west of the tree line near the site of the new Visitor Center while spraying for *M. sinensis*. The plants were treated using a 2% glyphosate herbicide solution of Rodeo® 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. In 2010, just MISI_Site_01 received treatment. None of the sites were monitored in 2013 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 2014 at all of the known *M. sinensis* sites.

Treatments of *M. sinensis* did occur, however at the Headquarters area where newly discovered large plants were found just west of the Hudsonia house in Park Housing. These plants were treated in with a foliar application of a 2% glyphosate herbicide solution of Rodeo® in water.

Morus alba:

All known sites where *M. alba* has been present in the past were found to be inactive during 2013, but a new single sapling was discovered at the entrance of the OSV that will be treated during 2014. This species is brought to the island by birds that have eaten the ripe fruits from the nearby mainland. The birds vector the seeds by evacuating seeds in random places. We will continue to see this species appear periodically in random locations in the open at the edge of vegetated areas along roadways and paths of the island.

Pennisetum alopecuroides:

This species was originally discovered in September 2007 in the footprint of what would later be the ASIS Sinepuxent District Visitor Center. At that time the ASIS infestation measured approximately 100 m². The source of this invasive plant had been 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 4 years ago that this plant was an aggressive invasive plant and they have not taken any action to control the source of the problem since that time.

The purple-colored inflorescence of this species is very distinctive and in September of 2013 hundreds of plants were seen throughout the ASIS Headquarters land. These plants will be treated with a foliar application of a 3% glyphosate herbicide solution of Rodeo® in water, late in the 2014 growing season when they will be flowering, which makes them easier to locate. We will continue to spray the infestations found on Federal lands in 2014. This species may offer opportunities for volunteer involvement because it would be helpful to remove the seed heads of plants that escape treatment, thereby reducing further recruitment of the species.



Phragmites australis:

Abstract

The native coastal communities of Assateague Island National Seashore (ASIS) are threatened by the expansion of *P. 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 out competes 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 continues to undertake this large scale project to document and treat *P. australis* infestations in order to restore native coastal communities and ecosystem health. After 5 years of treatments ASIS has made measurable progress in the effort to gain control of this aggressive invader.

Treatment of Infestations: Ground

The effective control of *P. australis*, particularly larger well-established stands, has required multiple treatments using a combination of methods including aerial applications of herbicide, ground based cut stem treatments followed by applications of concentrated solutions of herbicide, and ground based foliar 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*. However, because the window of hiring opportunity and workforce availability occurs earlier than this optimal treatment time period, managers have had to conduct their treatments during the growing season, rather than at the end of the growing season. Despite treating this species outside of optimal treatment interval ASIS has had success in gaining control of this species.

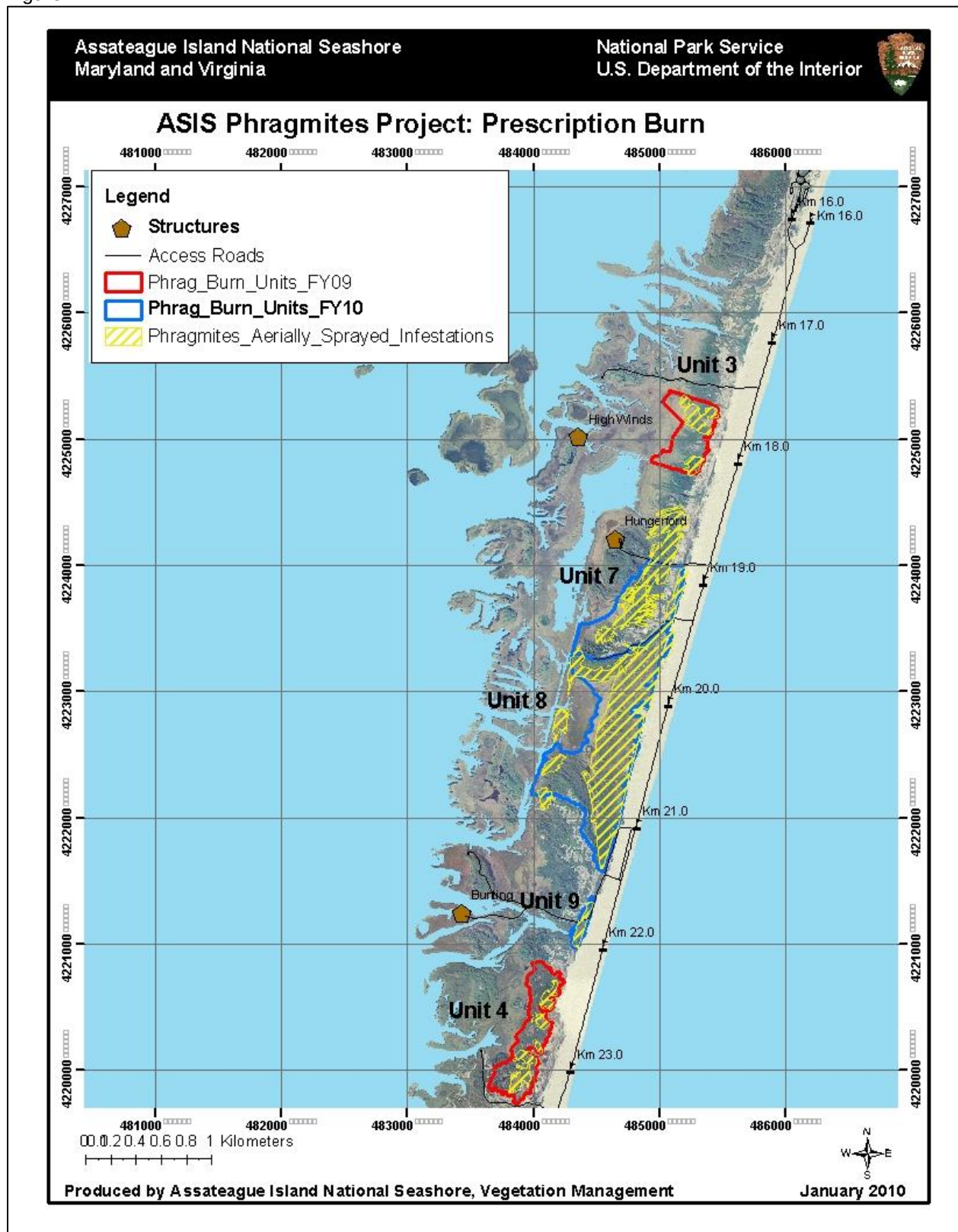
During FY2013 *P. australis* was sprayed exclusively from the ground with only foliar backpack and UTV/Truck pump sprayer applications. With the assistance of four seasonal crew members and two Student Conservation Association (SCA) interns, the Vegetation Management crew was able to spray, or retreat larger infested areas that had been sprayed aerially in the past. Backpack sprayers were used in infestations with moderate density 0-60% and a 50 gallon ATV sprayer, transported on a Kawasaki Teryx® UTV, was used to fill the backpacks near the infestation. Infestations of higher density (60-80%) were sprayed with UTV/Truck pump sprayer applications with few exceptions. The treatments were mapped and sprayed with a solution containing 2% concentration of Habitat®, Polaris®, or Rodeo® herbicide and 0.5% concentration 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 1.197 gallons of Habitat® herbicide (ASIS), 16.362 gallons of Polaris® herbicide (ASIS) and 19.589 gallons of Rodeo® herbicide (NCR EPMT) was applied in the treatment of 65.57 acres of *P. australis* infestations.

When applied to the foliage of actively growing plants, Imazapyr the active ingredient in Polaris® and Habitat® herbicide, is rapidly absorbed and transported throughout the plant tissues. The herbicide kills the entire plant: leaves, stems, and rhizomes. Rodeo® glyphosate-based herbicide is also effective for the control of *P. australis*, is the preferred product when treating near sources of water, and is less persistent in the soil following treatment. ASIS has primarily used Imazapyr based herbicides to control this species.

The crews' efforts during 2013 were employed in the retreatment of *P. australis* within the ASIS burn units 3 (aerially treated in 2008), 7 and 8 (aerially sprayed in 2009) (see Figures 1, 2: below and Table 1:). Initial goals were set for the treatment crew that included:

- 1) Treatments would all be foliar applications to reduce time spent cutting *P. australis* stems that would have to be sprayed individually.
- 2) To build off of what other prior crews had accomplished in burn units 3, 7 and 8, essentially "tying in" with previous treatment boundaries.
- 3) To work closer to the entrance of the OSV to reduce travel time, allowing more time to be spent treating infestations in the field, rather than spending time reaching more remote infestations.
- 4) To see what a larger crew could accomplish working together in homogeneous stands of *P. australis* as opposed to splitting the crew up and having them work in separate treatments areas. The accomplishments of this year's treatment crew are listed below in Figure 3: .

Figure 1:



Assateague Island National Seashore
Maryland and Virginia

National Park Service
U.S. Department of the Interior

ASIS Phragmites FY13 Rx Map of Burn Unit 3

Unit_3

START

END

START

END

START

END

START

END

18.0

0 0.045 0.09 0.18 0.27 0.36 Kilometers

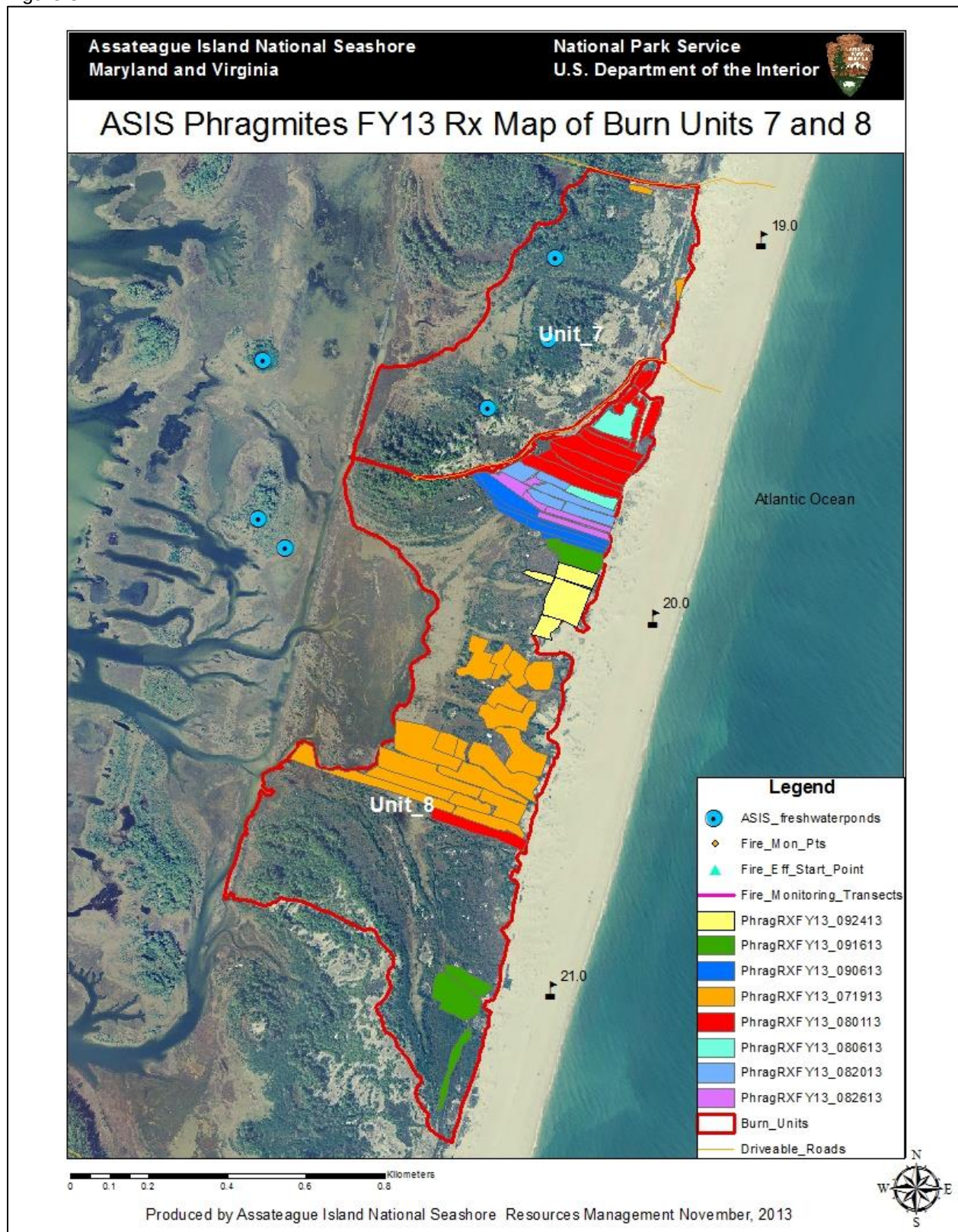
Legend

- ASIS_freshwaterponds
- Fire_Mon_Pts
- Fire_Eff_Start_Point
- Fire_Monitoring_Transects
- PhragRXFY13_071913
- Burn_Units
- Driveable_Roads

Produced by Assateague Island National Seashore Resources Management November, 2013

Produced by Assateague Island National Seashore Resources Management November, 2013

Figure 3:



Treatment Accomplishments for *P. australis*:

Table 1:

Location	Acres (ac) Treated	Responsible Crew
Burn Unit 3	0.81 ac	ASIS
Burn Unit 7	0.56 ac	ASIS
Burn Unit 8	59.2 ac	ASIS
Burn Unit 8	4.30 ac	ASIS/ NCR EPMT
Life of the Forest Trail	0.70 ac	ASIS/ NCR EPMT

Monitoring of *P. australis* in ASIS Burn Units:

In 2013, it was determined by the ASIS Resources Management Chief that monitoring of the burn units would be conducted to better understand the effect of our treatments as well as the extent of remaining infestations within the boundaries of the burn unit areas. An island-wide aerial survey of the *P. australis* has been proposed for 2014 to quantify the extent of the infestations outside of the burn units. To accomplish the task of monitoring the burn units, the biological technician developed a rapid assessment to monitor the existing cover and density of *P. australis* within the boundaries of the previously burned areas and to have an indicator of whether *P. australis* had either gone untreated on the periphery of the burn units, or had escaped the burn unit boundaries and had become better established outside of these boundaries.

Burn Units 1, 7 and 8 were excluded from the monitoring because they had either not been retreated after aerial applications (as was the case for Unit 1 on Great Egging Island), or they were under treatment in FY13 (Units 7 and 8) and it would be too early to interpret the effect of these recent treatments. Burn Unit 3 was an exception, because the treatments that had occurred there in 2013 were quite small and were just included as infested area, rather than being excluded from the total infestation that was measured while monitoring.

Methods:

Experimental Design

A grid was developed with the assistance of the ASIS GIS Specialist that was used to overlay all terrestrial lands of the island, utilizing the UTM grid (Datum: Zone 18 North Conus) as a template that would not change over time. The size of each grid was chosen to be 200 m x 200 meters in size. The 200 m x 200 m grids were numbered from south to north and retain the UTM grid number in the shapefile for cross referencing. In the field, each grid was subdivided into (4) 100 m x 100 m sub plots (blocks) that would be sampled individually and averaged later as a total for each grid. When monitoring, these (4) blocks within each grid were numbered in a clockwise fashion starting with 1 which was located in the upper northwest quadrant. Each 100 m x 100 m block were visited individually. These discreet 100 m x 100 m blocks were coded by starting with the grid Id and adding the block number to the end of the grid Id to name the blocks individually. For example Grid 947 in (Figure 5:) would yield the following codes: 947_01, 947_02, 947_03 and 947_04 respectively.

To monitor the *P. australis* within the sub plots of each grid, ocular estimates were utilized to rapidly assess the extent of the infestations. Monitoring personnel began preparation by becoming familiar with making ocular estimates of area. Personnel familiarized themselves with various sizes of square plots, in particular, the 10 m x 10 m plot which is equal to 100 m², or 1% of the size of a sub plot within the overlying grids. By counting these smaller 10 m x 10 m plots and adding them up during monitoring assessments, very accurate estimates of infested area were recorded. Attention was given only to recording infested areas; the area that was not infested is the sum of the total area minus the infested

area. The attributes that were recorded were % Cover *P. australis*, % Density *P. australis*, Size Class (1- 0m to 1m, 2- 1m to 2m, 3- 2m to 3m height, Present or Absent (1/0) *P. australis* outside of the burn unit boundary that is within the grid block, and Comments relating to the sub plot.

Monitoring Procedure:

In the office, preparations for the day of monitoring were conducted by creating a list of the quads that overlay that encompass the area to be surveyed by observing the target areas with grid overlay, in this case, a burn unit, using the GIS software ArcGIS 10. Datasheets were prepared to include 4 blocks for each grid (see Figures 4 and 5:). Grid block Id's (1 through 4) were attached to each grid name as described in the experimental design by coding the sub plots to give a discreet reference to the data attributes.

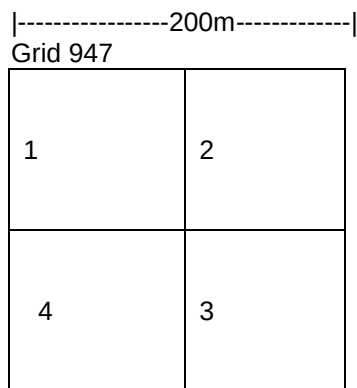
The best routes to enter the burn units were then determined and recorders navigated within them using a handheld PDA/GPS (that has the grid layer and grid center points as well as burn unit layer) and a compass to navigate to the center of each grid block. The compass was checked prior to fieldwork to ensure that declination had been adjusted to read True North for this locality. The GPS tracklog was activated on the GPS device.

While observing the "bread crumb trail" of the GPS Tracklog indicated in the screen of the PDA/GPS as small points showing the path that the observer had travelled, recorders thoroughly investigated the sub plots and recorded the data for the attributes that were observed.

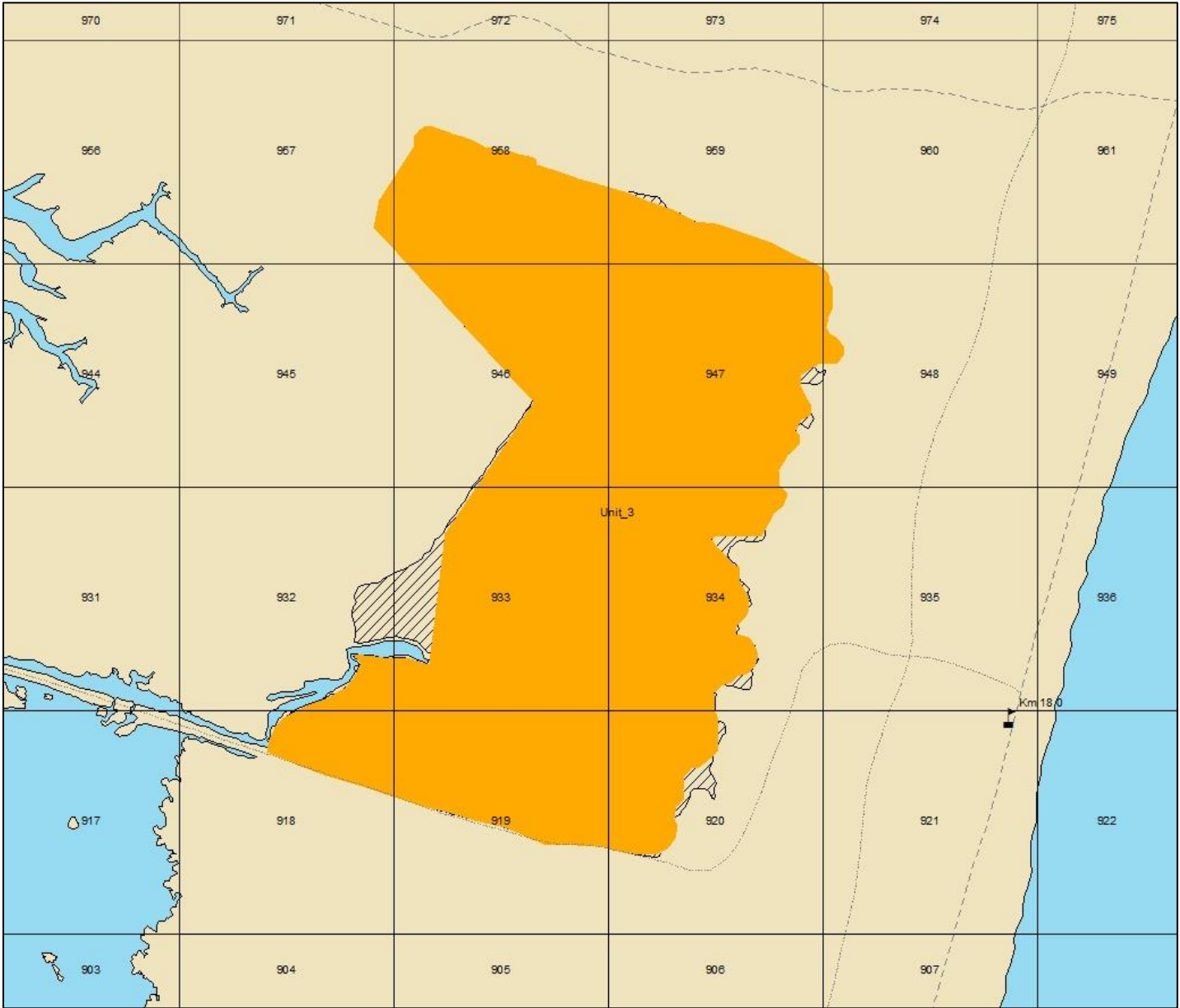
When an infestation of *P. australis* was encountered, the size, or extent, of the infestation was recorded by the observer after determining their location on the map and proximity to the boundaries of the grid block to be certain that information was recorded for the correct grid id and block. Recorders combined the use of the GPS, compass and ocular assessment to best estimate the extent of the infestation(s) within each block .

Once ocular assessments of the infestation's size were determined and individual infestations' percentages were summed the values were recorded individually in the appropriate column of the datasheet along with the other data ie. % Density (average) *P. australis*, Size Class (1- 0m to 1m, 2- 1m to 2m, 3- 2m to 3m Height (average) of *P. australis*, and Presence or Absence (1/0) of *P. australis* outside of the burn unit boundary, and comments for each sub plot individually within the grid block were recorded.

Figure 4:



The map shows a grid of numbered cells (901-975) and a large orange-shaded area labeled 'Unit_3'. A dashed line indicates a boundary, and a scale bar shows 18.0 km.



Results

Table 2:

Burn Unit	Unit Area (ac)	Phragmites Area (ac) in Burn Unit FY2008/2009	Phragmites Area (ac) in Burn Unit FY2013	% Cover Phragmites in Burn Unit FY08/09	% Cover Phragmites in Burn Unit FY2013	% Change of Phragmites Cover from FY08/09 to FY2013
1	15.63	16.00	N/A	102.39	N/A	N/A
2	17.82	13.34	1.63	74.82	9.14	-87.78
3	43.56	17.40	2.26	39.95	5.19	-87.01
4	74.93	15.35	14.56	20.48	19.43	-5.13
5	54.10	22.96	4.61	42.44	8.52	-79.92
6	6.48	2.98	0.31	45.90	4.78	-89.58
7	84.15	36.26	N/A	43.09	N/A	N/A
8	197.05	147.31	N/A	74.76	N/A	N/A
9	5.76	5.52	0.20	95.88	3.47	-96.38
10	11.49	5.10	0.87	44.38	7.57	-82.94
11	3.36	2.10	0.09	62.48	2.68	-95.71
12	43.25	17.70	0.16	40.92	0.37	-99.10

Table 3:

Burn Unit	SUM % Cover Phragmites	Phragmites Cover Translate to m ²	Phragmites Cover Convert to acres	AVG % Phragmites Density	AVG Phragmites Size Class	SUM Phragmites Outside Burn Unit +/-
1	N/A	N/A	N/A	N/A	N/A	N/A
2	66.00	6600	1.63	7.34	0.93	3.00
3	91.50	9150	2.26	11.04	0.89	8.00
4	589.00	58900	14.56	29.62	1.12	6.00
5	186.50	18650	4.61	17.89	0.85	4.00
6	12.50	1250	0.31	4.24	0.37	3.00
7	N/A	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A	N/A	N/A
9	8.00	800	0.20	10.09	0.88	0.00
10	35.00	3500	0.87	5.20	1.20	5.00
11	3.50	350	0.09	9.25	0.75	2.00
12	6.50	650	0.16	2.55	0.50	0.00

Figure 6:

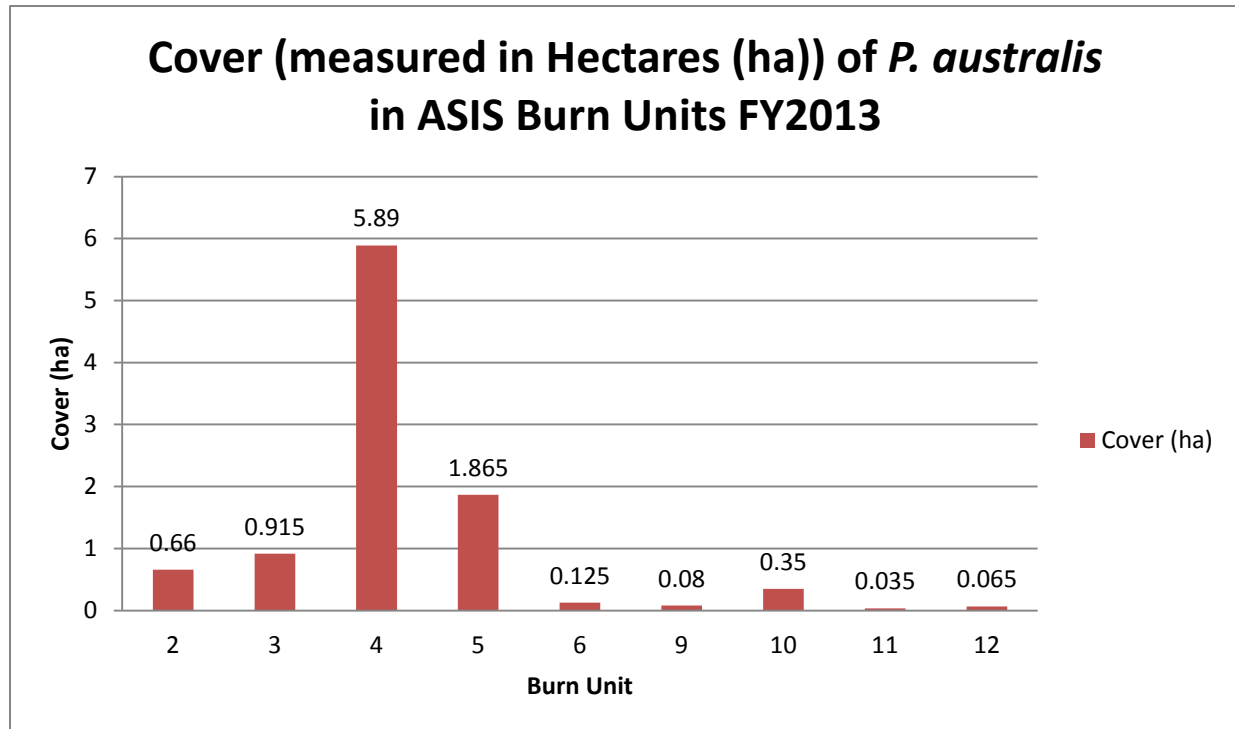


Figure 7:

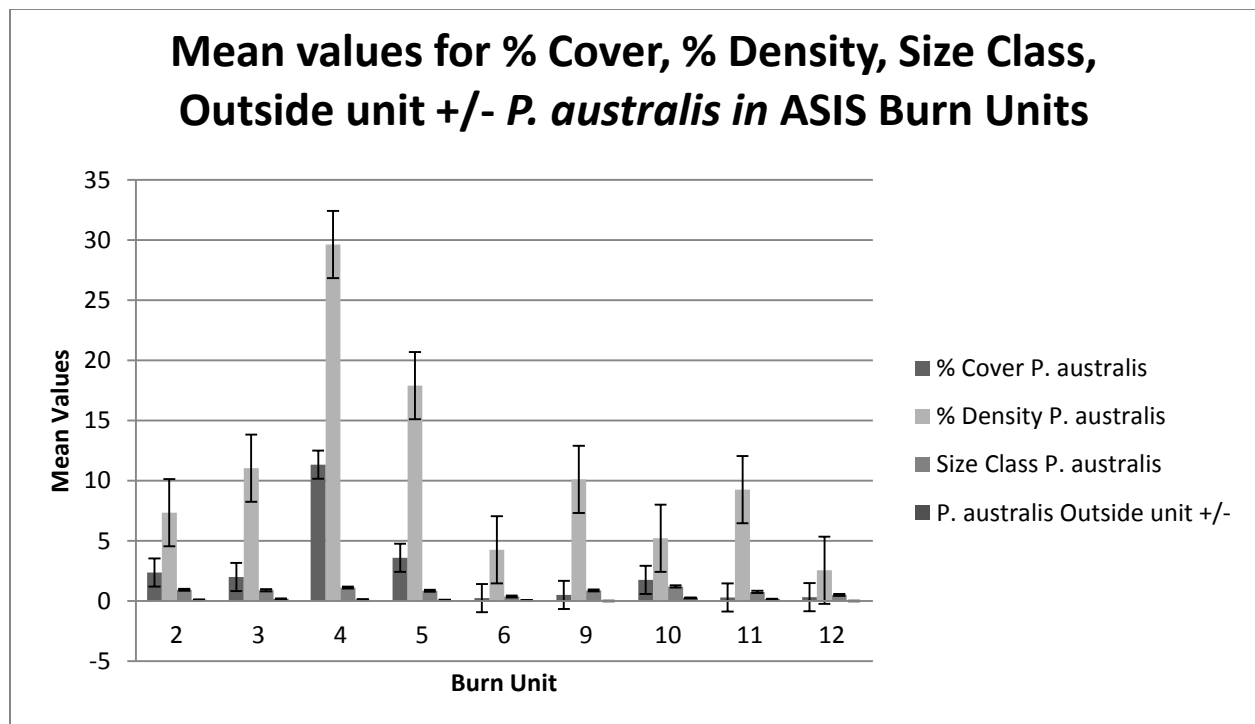


Figure 8:

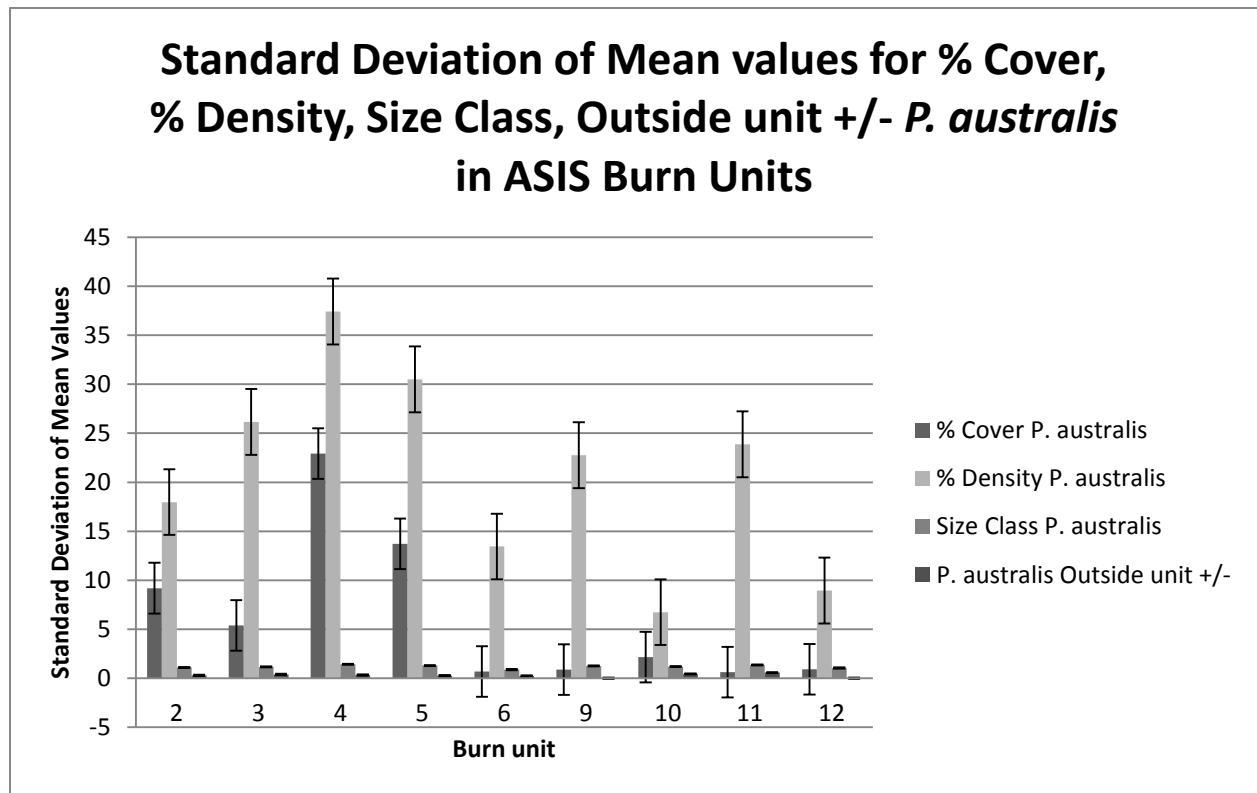
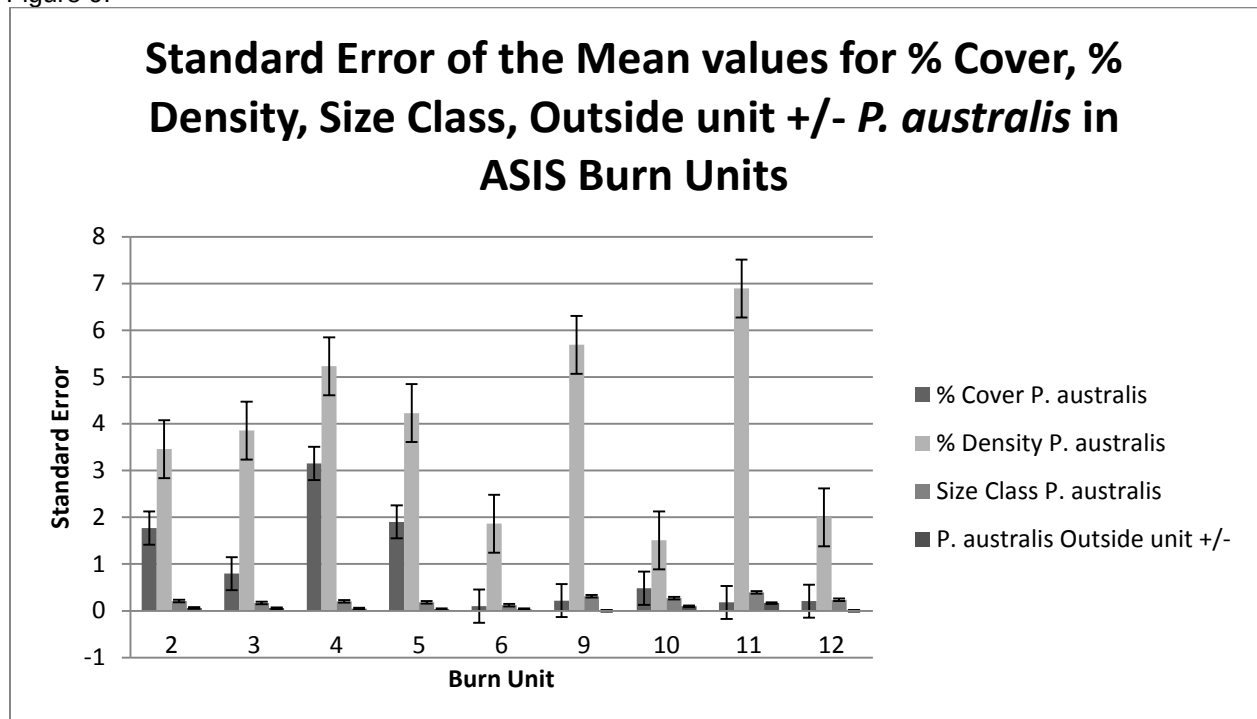


Figure 9:



P. australis Discussion

To understand the changes that have occurred in the ASIS burn units since the combined treatments began, observe the summary of the original cover of *P. australis* presented in Table 2. This table presents the “before and after” that explains where we were at the start and where we are at the present in regards to the combined cover of *P. australis* in our ASIS burn units. With the exception of burn units 1, 7, and 8 there have been significant reductions of *P. australis*, as is indicated in the column titled “% Change of Phragmites Cover from FY08/09 to FY2013” above in Table 2. These reductions in cover are the result of the combined treatments (aerial herbicide application, prescribed fire, and follow up treatments of ground sprayed application of herbicide via foliar application and/ or cut stem treatments). All of the burn units, with the exception of burn unit 4 had a reduction in cover greater than or equal to 80% as a result of the combined treatments. The disparity of remaining cover post treatment in burn unit 4 is likely because the follow up treatments after the initial aerial spraying and subsequent burning of the unit were not thorough and included an experimental cut stem treatment that did not completely include all of the infested area that was present there during the treatment performed in 2011.

The results from the FY13 monitoring are presented in Table 3 as averages of the combined data for each respective burn unit.. Because the cover of *P. australis* was measured in 100m x 100m sub plots within each block it was easily translated to meters squared by adding up the total percentages of cover (1% is equal to (1) 10m x 10m patch of cover) and multiplying the sum by 100 to come up with meters squared cover. For example, burn unit 2 had a combined sum of 66% (or (66) 10m x 10m portions of cover) which was equal to 6600 meters squared or 1.63 ac of *P. australis* cover. Essentially, percentages were used to factor, or “add up” the observed cover within each of the burn units that were investigated.

To graphically interpret the results of the rapid monitoring assessment for *P. australis* the data processing occurred in two phases. The first phase involved graphing the total cover results of the FY2013 monitoring (Figure 6) using the raw data generated from the assessments. The raw data included a disproportionate amount of monitoring blocks for each burn unit because larger units had more grid blocks of area to be sampled. Therefore, smaller units with less grid blocks had less area to be sampled. So, in larger burn units there is a potential for bias to occur. The second phase of the data processing was to average all of the values for the individual units to establish the mean values of (% Cover, % Density, Size Class (Most Representative), and Presence or Absence of Phragmites outside of the burn unit (as measured from the outside edges of the blocks comprising the outer perimeter of the burn units) for each burn unit. The resultant values were then compared to one another. The second phase of the data processing is represented graphically in Figures 7, 8 and 9 respectively.

Interpretation of Figure 6:

This graph represents the sum of total cover of *P. australis* found inside of the burn units. Essentially when considering the original total cover of *P. australis* in these burn units (see Table 2), excepting burn unit 4, there has been a great reduction of *P. australis* cover in each of these units.

Interpretation of Figure 7:

The values used to generate the graphs are presented below to assist the reader in their interpretation. Regarding Figure 7, there is a correlation between higher average % cover, higher average % density and higher average % size class. It is hypothesized that if there are patches of *P. australis* that remain untreated they will continue to grow, covering more area, and will become taller as well as becoming more dense over time. This trend is most evident in burn unit 4 which had the highest average mean cover highest average mean density as well as the highest averaged mean height. The error bars represent the standard error of the mean of each value and were the greatest for mean % cover in burn units 6, 9, 11 and 12. This disparity is likely due to the fact that there were fewer observations that could be made because these units were proportionately smaller in size to the others and therefore had less sampling in comparison to the larger burn units. Values for *P. australis* outside of the burn unit cannot be compared to the other values because they did not receive any treatments, though they do indicate that

there is some measurable quantity of *P. australis* outside of each burn unit (excepting burn units 9 and 12), albeit in small manageable quantities that cannot be overlooked as they could, in some cases, reinfest adjacent controlled areas and we had the opportunity to note their presence/ absence during the monitoring assessment of each burn unit.

Figure 7 Data:
Sort by % cover

Burn Unit	% Cover Phrag	Mean Values		Phrag Outside Burn Unit +/-	Fx
		% Phrag Density	Size Class		
4	11.32692	29.61538	1.115385	0.115385	avg
5	3.586538	17.88462	0.846154	0.076923	avg
2	2.357143	7.339286	0.928571	0.107143	avg
3	1.98913	11.04348	0.891304	0.173913	avg
10	1.75	5.2	1.2	0.25	avg
9	0.5	10.09375	0.875	0	avg
12	0.325	2.55	0.5	0	avg
11	0.291667	9.25	0.75	0.166667	avg
6	0.240385	4.240385	0.365385	0.057692	avg

Figure 7 Data:
Sort by %density

Burn Unit	% Cover Phrag	Mean Values		Phrag Outside Burn Unit +/-	Fx
		% Phrag Density	Size Class		
4	11.32692	29.61538	1.115385	0.115385	avg
5	3.586538	17.88462	0.846154	0.076923	avg
3	1.98913	11.04348	0.891304	0.173913	avg
9	0.5	10.09375	0.875	0	avg
11	0.291667	9.25	0.75	0.166667	avg
2	2.357143	7.339286	0.928571	0.107143	avg
10	1.75	5.2	1.2	0.25	avg
6	0.240385	4.240385	0.365385	0.057692	avg
12	0.325	2.55	0.5	0	avg

Figure 7 Data:
Sort by size class

Burn Unit	% Cover Phrag	Mean Values		Phrag Outside Burn Unit +/-	Fx
		% Phrag Density	Size Class		
10	1.75	5.2	1.2	0.25	avg

4	11.32692	29.61538	1.115385	0.115385	avg
2	2.357143	7.339286	0.928571	0.107143	avg
3	1.98913	11.04348	0.891304	0.173913	avg
9	0.5	10.09375	0.875	0	avg
5	3.586538	17.88462	0.846154	0.076923	avg
11	0.291667	9.25	0.75	0.166667	avg
12	0.325	2.55	0.5	0	avg
6	0.240385	4.240385	0.365385	0.057692	avg

Figure 7 Data:

Sort by Phrag outside burn unit

Burn Unit	% Cover Phrag	Mean Values			Fx
		% Phrag Density	Size Class	Phrag Outside Burn Unit +/-	
10	1.75	5.2	1.2	0.25	avg
3	1.98913	11.04348	0.891304	0.173913	avg
11	0.291667	9.25	0.75	0.166667	avg
4	11.32692	29.61538	1.115385	0.115385	avg
2	2.357143	7.339286	0.928571	0.107143	avg
5	3.586538	17.88462	0.846154	0.076923	avg
6	0.240385	4.240385	0.365385	0.057692	avg
9	0.5	10.09375	0.875	0	avg
12	0.325	2.55	0.5	0	avg

Interpretation of Figure 8:

In Figure 7, there is a correlation between higher standard deviation and size of the burn unit, when there are even a few well covered and highly dense areas when compared to the larger amount of uninfested plots. The largest burn units, burn units 4, 5, 2 and 3 have a larger proportion of samples and also a proportionately higher level of disparity because if there are large quantities of controlled, low cover and density plots, the few highly infested and comparatively higher densities create the observed disparity by creating a large range in value over the data points.

Figure 8 Data:

Sort by %cover

Burn Unit	% Cover Phrag	Standard Deviation of Mean Values			Fx
		% Phrag Density	Size Class	Phrag Outside Burn Unit +/-	
4	22.93845	37.41762	1.426087	0.325396	stdev
5	13.72086	30.50789	1.304361	0.269069	stdev
2	9.193221	17.9762	1.099629	0.309295	stdev
3	5.388763	26.15442	1.159085	0.383223	stdev
10	2.167341	6.746149	1.196486	0.444262	stdev
12	0.921598	8.947067	1.051315	0	stdev

9	0.875595	22.76124	1.258306	0	stdev
6	0.703565	13.44214	0.886253	0.235435	stdev
11	0.620056	23.88276	1.356801	0.57735	stdev

Figure 8 Data:
Sort by %density

Standard Deviation of Mean Values					
Burn Unit	% Cover Phrag	% Phrag Density	Size Class	Phrag Outside Burn Unit +/-	Fx
4	22.93845	37.41762	1.426087	0.325396	stdev
5	13.72086	30.50789	1.304361	0.269069	stdev
3	5.388763	26.15442	1.159085	0.383223	stdev
11	0.620056	23.88276	1.356801	0.57735	stdev
9	0.875595	22.76124	1.258306	0	stdev
2	9.193221	17.9762	1.099629	0.309295	stdev
6	0.703565	13.44214	0.886253	0.235435	stdev
12	0.921598	8.947067	1.051315	0	stdev
10	2.167341	6.746149	1.196486	0.444262	stdev

Figure 8 Data:
Sort by size class

Standard Deviation of Mean Values					
Burn Unit	% Cover Phrag	% Phrag Density	Size Class	Phrag Outside Burn Unit +/-	Fx
4	22.93845	37.41762	1.426087	0.325396	stdev
11	0.620056	23.88276	1.356801	0.57735	stdev
5	13.72086	30.50789	1.304361	0.269069	stdev
9	0.875595	22.76124	1.258306	0	stdev
10	2.167341	6.746149	1.196486	0.444262	stdev
3	5.388763	26.15442	1.159085	0.383223	stdev
2	9.193221	17.9762	1.099629	0.309295	stdev
12	0.921598	8.947067	1.051315	0	stdev
6	0.703565	13.44214	0.886253	0.235435	stdev

Figure 8 Data:
Sort by Phrag outside burn unit

Standard Deviation of Mean Values					
Burn Unit	% Cover Phrag	% Phrag Density	Size Class	Phrag Outside Burn Unit +/-	Fx
11	0.620056	23.88276	1.356801	0.57735	stdev
10	2.167341	6.746149	1.196486	0.444262	stdev

3	5.388763	26.15442	1.159085	0.383223	stdev
4	22.93845	37.41762	1.426087	0.325396	stdev
2	9.193221	17.9762	1.099629	0.309295	stdev
5	13.72086	30.50789	1.304361	0.269069	stdev
6	0.703565	13.44214	0.886253	0.235435	stdev
9	0.875595	22.76124	1.258306	0	stdev
12	0.921598	8.947067	1.051315	0	stdev

Interpretation of Figure 9:

While the standard error of the mean is more likely to approach zero as sample size is increased, this was not observed for % Cover Phrag, or % Phrag Density for those burn units (2, 3, 4, and 5 respectively) that were larger and therefore had larger sample sizes. This unexpected result could be because of variations in soil chemistry, grazing effects, salinity, water availability and the effects of other co-habitant vegetation. Once again the *P. australis* outside the burn units is not analyzed for the reasons stated previously.

Figure 9 Data:

Sort by %cover

Standard Error of Mean Values					Fx
Burn Unit	% Cover Phrag	% Phrag Density	Size Class	Phrag Outside Burn Unit +/-	
4	3.152093	5.231889	0.199271	0.044737	stderr
5	1.902741	4.230684	0.180882	0.037313	stderr
2	1.769236	3.459522	0.211624	0.059524	stderr
3	0.79453	3.856259	0.170898	0.056503	stderr
10	0.484632	1.508485	0.267542	0.09934	stderr
9	0.218899	5.69031	0.314576	0	stderr
12	0.206075	2.000625	0.235081	0	stderr
11	0.178995	6.89436	0.391675	0.166667	stderr
6	0.097567	1.864089	0.122901	0.032649	stderr

Figure 9 Data:

Sort by %density

Standard Error of Mean Values					Fx
Burn Unit	% Cover Phrag	% Phrag Density	Size Class	Phrag Outside Burn Unit +/-	
11	0.178995	6.89436	0.391675	0.166667	stderr
9	0.218899	5.69031	0.314576	0	stderr
4	3.152093	5.231889	0.199271	0.044737	stderr
5	1.902741	4.230684	0.180882	0.037313	stderr
3	0.79453	3.856259	0.170898	0.056503	stderr
2	1.769236	3.459522	0.211624	0.059524	stderr
12	0.206075	2.000625	0.235081	0	stderr
6	0.097567	1.864089	0.122901	0.032649	stderr

10	0.484632	1.508485	0.267542	0.09934	stderr
----	----------	----------	----------	---------	--------

Figure 9 Data:

Sort by Size class

Standard Error of Mean Values					Fx
Burn Unit	% Cover Phrag	% Phrag Density	Size Class	Phrag Outside Burn Unit +/-	
11	0.178995	6.89436	0.391675	0.166667	stderr
9	0.218899	5.69031	0.314576	0	stderr
10	0.484632	1.508485	0.267542	0.09934	stderr
12	0.206075	2.000625	0.235081	0	stderr
2	1.769236	3.459522	0.211624	0.059524	stderr
4	3.152093	5.231889	0.199271	0.044737	stderr
5	1.902741	4.230684	0.180882	0.037313	stderr
3	0.79453	3.856259	0.170898	0.056503	stderr
6	0.097567	1.864089	0.122901	0.032649	stderr

Figure 9 Data:

Sort by Phrag outside burn unit

Standard Error of Mean Values					Fx
Burn Unit	% Cover Phrag	% Phrag Density	Size Class	Phrag Outside Burn Unit +/-	
11	0.178995	6.89436	0.391675	0.166667	stderr
10	0.484632	1.508485	0.267542	0.09934	stderr
2	1.769236	3.459522	0.211624	0.059524	stderr
3	0.79453	3.856259	0.170898	0.056503	stderr
4	3.152093	5.231889	0.199271	0.044737	stderr
5	1.902741	4.230684	0.180882	0.037313	stderr
6	0.097567	1.864089	0.122901	0.032649	stderr
9	0.218899	5.69031	0.314576	0	stderr
12	0.206075	2.000625	0.235081	0	stderr

Pinus thunbergiana:

Because seedlings continue to emerge at PITH_Site_01, this site was revisited in August of 2013 and 2 saplings were located. A return visit in 2014 will be scheduled to cut, at the ground level, the newly emergent saplings. Annual monitoring of the site will continue to occur as a result of its ongoing activity there.

Rosa multiflora:

A handful of plants were encountered at ROMU_Site_02 (Park Housing) in 2013. They were treated in August with a foliar spray of 2% glyphosate herbicide solution of Rodeo® in water. No activity was

observed at ROMU_Site_01 (Bayside Peninsula), though seedlings are likely to exist beneath vegetation obscuring their discovery. All of the large shrubs have been treated there in the past

Rosa wichuriana:

The ASIS headquarters area was landscaped with *R. wichuriana* in 1979, a species that is now considered to be an invasive plant by the National Park Service. Since its introduction to ASIS, *R. wichuriana* has expanded and has become widespread throughout the surrounding headquarters area. The extent of its proliferation continued in 2013 where it continues to be well established throughout the Headquarters and border State of Maryland land.

During 2013 two treatment methods were utilized to control the infestations at ROWI_Site_01 during of 2013.

These treatments were:

1. A foliar application of a 3% triclopyr herbicide solution of Garlon3A® in water was used at the Sinepuxent Vegetation Buffer in May because the plants were comingling with other native plants this herbicide was used because it is only effective on broad leafed plants and would not kill the many grasses at this location behind the Sinepuxent Visitor Center.
2. A foliar application of a 2% glyphosate herbicide solution of Rodeo® in water was used in August to treat infestations in the Housing Vegetation buffer where there was not an issue with using a non-selective herbicide because there were no non-target plants beneath the shrubs that were treated.

The methods used were the best universal treatment for the other alien, invasive species being targeted at the same time of these treatments. Both methods used were are known to be successful at controlling the *R. wichuriana* infestations, although the emergence of new *R. wichuriana* recruits will require continued monitoring and treatment at ROWI_Site_01 during 2014. Many large infestations of *R. wichuriana* exist on the neighboring State of Maryland land that borders the ASIS Headquarters area and we will continue to receive propagules that are vectored from adjacent lands.

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 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. The treatment was considered to be a success because the site has not been active for more than 3 consecutive years, therefore it can be considered to have been eradicated/ controlled.

Table 4:

ID	Site	Northing	Easting	Species	Site Description
1	AIAL_Site_01	4241835	491440.7	Ailanthus altissima	A discreet location the epicenter of which is indicated by the coordinates
2	AIAL_Site_02	4241800	491414.5	Ailanthus altissima	A discreet location the epicenter of which is indicated by the coordinates
3	AIAL_Site_03	4215810	481379.4	Ailanthus altissima	A discreet location the epicenter of which is indicated by the coordinates

4	AIAL_Site_04	4215049	481260.1	Ailanthus altissima	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	478053.1	Ailanthus altissima	A discreet location the epicenter of which is indicated by the coordinates
6	ALGL_Site_01	4241153	491106	Alnus glutinosa	A discreet location the epicenter of which is indicated by the coordinates
7	ARST_Site_01	4236363	489500	Artemisia stelleriana	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	Artemisia stelleriana	A discreet location the epicenter of which is indicated by the coordinates
9	CAKO_Site_01	4241654	491796.8	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
10	CAKO_Site_02	4238487	490186.9	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
11	CAKO_Site_03	4237589	489897	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
12	CAKO_Site_04	4237503	489793.6	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
13	CAKO_Site_05	4237425	489824.1	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
14	CAKO_Site_06	4237420	489843.7	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
15	CAKO_Site_07	4237419	489825.8	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
16	CAKO_Site_08	4237404	489838.6	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
17	CAKO_Site_09	4237402	489824	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
18	CAKO_Site_10	4237394	489843.4	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
19	CAKO_Site_11	4237039	489716.9	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates

20	CAKO_Site_12	4236194	489394.7	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
21	CAKO_Site_13	4236173	489412.3	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
22	CAKO_Site_14	4236123	489409.4	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
23	CAKO_Site_15	4225647	485760.2	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
24	CAKO_Site_16	4225037	485594.4	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
25	CAKO_Site_17	4222491	484802.9	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
26	CAKO_Site_18	4222447	484789.4	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
27	CAKO_Site_19	4224430	485407.9	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
28	CAKO_Site_20	4222427	484820.5	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
29	CAKO_Site_21	4216381	482792.6	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
30	CAKO_Site_22	4216370	482801.6	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
31	CAKO_Site_23	4216367	482811.7	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
32	CAKO_Site_24	4216361	482827.9	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
33	CAKO_Site_25	4216356	482852.7	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
34	CAKO_Site_26	4215252	482321.1	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
35	CAKO_Site_27	4214321	481780.7	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
36	CAKO_Site_28	4210394	479583.6	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
37	CAKO_Site_29	4209968	479281.4	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates

38	CAKO_Site_30	4190275	466183.2	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
39	CAKO_Site_31	4190178	466247.7	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
40	CAKO_Site_32	4190025	466371.8	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
41	CAKO_Site_33	4237292	489768.1	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
42	CAKO_Site_34	4237424	489822.9	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	4189535	466500.8	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	478513	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
50	CAKO_Site_42	4216380	482799.9	Carex kobomugi	A discreet location the epicenter of which is indicated by the coordinates
51	CLTE_Site_01	4229108	485365.6	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	4229033	485466.3	Elaeagnus umbellata	The entire developed area from the northern park boundary to the OSV entrance
54	ERCU_Site_01	4229434	486764.2	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	LOJA_Site_01	4215263	481374.7	Lonicera japonica	Is a series of infestations located along the access road to Valentines cabin.
57	LOJA_Site_02	4228590	486484	Lonicera japonica	Originally located within the Bayside Campground peninsula, was expanded during 2007 to include ASIS' entire developed area.
58	LOJA_Site_03	4231224	487325	Lonicera japonica	Located along Bayberry Drive within Assateague State Park.
59	LOJA_Site_04	4232259	487949	Lonicera japonica	Located along the Shell Road and the trail leading to the handicapped accessible duck blind.
60	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.
61	LOJA_Site_06	4225065	485380	Lonicera japonica	Is located within shrub and forested areas between km 17 and 20.
62	LOJA_Site_07	4233405	486447	Lonicera japonica	Is located on the mainland within the ASIS headquarters area Federal land only.
63	LYSA_Site_01	4227399	486228	Lythrum salicaria	A discreet location the epicenter of which is indicated by the coordinates
64	MISI_Site_01	4241657	491485.7	Miscanthus sinensis	A discreet location the epicenter of which is indicated by the coordinates
65	MISI_Site_02	4240156	490579	Miscanthus sinensis	A discreet location the epicenter of which is indicated by the coordinates
66	MISI_Site_03	4239777	490387	Miscanthus sinensis	A discreet location the epicenter of which is indicated by the coordinates
67	MISI_Site_04	4225014	484363	Miscanthus sinensis	A discreet location the epicenter of which is indicated by the coordinates
68	MISI_Site_05	4240009	490500	Miscanthus sinensis	A discreet location the epicenter of which is indicated by the coordinates
69	MOAL_Site_01	4233425	486455	Morus alba	The combined State and Federal lands surrounding the Headquarters building on the mainland
70	MOAL_Site_02	4227399	486228	Morus alba	A discreet location the epicenter of which is indicated by the coordinates
71	PEAL_Site_01	4233296	486521	Penisetum alopecuroides	A discreet location the epicenter of which is indicated by the coordinates

72	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
73	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
74	ROMU_Site_02	4233583	486209	Rosa multiflora	Is located on the mainland within the ASIS headquarters area Federal land only.
75	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
76	ROWI_Site_01	4233405	486447	Rosa wichuriana	The combined State and Federal lands surrounding the Headquarters building on the mainland

Table 5: APMP Herbicide Use FY2013

Date	Location	Site	Species	Applicator	Start Time	End Time	Rx Method	Product	Active Ingredient	Amt Product (mL)	% Conc	Area Treated (m sq)	Equip. Used	Retreatment	Notes
05/15/13	New Visitor Center	ROMU_Site_02	Artemisia vulgaris	J. Chase	08:30	10:00	Foliar Spray	Rodeo (62719-324)	Glyphosate	90	3	30	1	No	
08/14/13	Sinepuxent Ranger Station	ARVU_Site_02	Artemisia vulgaris	J. Chase	08:30	09:00	Foliar Spray	Rodeo (62719-324)	Glyphosate	10	2	9	1	No	
08/14/13	CARKOB_0043	CAKO_Site_043	Carex kobomugi	Crew	12:00	14:30	Foliar Spray	Rodeo (62719-324)	Glyphosate	80	2	320	1	Yes	
08/14/13	CARKOB_0033	CAKO_Site_033	Carex kobomugi	Crew	12:00	14:30	Foliar Spray	Rodeo (62719-324)	Glyphosate	25	2	100	1	Yes	
08/14/13	CARKOB_0013	CAKO_Site_013	Carex kobomugi	Crew	12:00	14:30	Foliar Spray	Rodeo (62719-324)	Glyphosate	0.5	2	2	1	Yes	
08/14/13	CARKOB_0014	CAKO_Site_014	Carex kobomugi	Crew	12:00	14:30	Foliar Spray	Rodeo (62719-324)	Glyphosate	0.44	2	1.75	1	Yes	
08/14/13	CARKOB_0039	CAKO_Site_039	Carex kobomugi	Crew	12:00	14:30	Foliar Spray	Rodeo (62719-324)	Glyphosate	1	2	4	1	Yes	
08/14/13	CARKOB_0037	CAKO_Site_037	Carex kobomugi	Crew	12:00	14:30	Foliar Spray	Rodeo (62719-324)	Glyphosate	22	2	88	1	Yes	
08/14/13	CARKOB_0036	CAKO_Site_036	Carex kobomugi	Crew	12:00	14:30	Foliar Spray	Rodeo (62719-324)	Glyphosate	25	2	100	1	Yes	sprayed during a Phrag Rx
08/14/13	CARKOB_0022	CAKO_Site_022	Carex kobomugi	Crew	12:00	14:30	Foliar Spray	Rodeo (62719-324)	Glyphosate	75	2	300	1	Yes	
09/13/12	HQ Sinepuxent Veg Buffer	HQ	Elaeagnus umbellata	J. Chase	9:00	11:30	Cut Stump	Garlon 3A (62719-37)	Triclopyr	300	50	300	2	No	57 saplings cut and treated

05/02/13	HQ across from triangle in HQ entrance rd.	ELUM_Site_01	Elaeagnus umbellata	J. Chase	07:30	07:45	Basal Bark	Garlon 4 (62719-40)	Triclopyr	250	25	451	2	Yes	
08/14/13	ERA_CUR_0001	ERCU_Site_01	Eragrostis curvula	J. Chase	10:00	14:30	Foliar Spray	Rodeo (62719-324)	Glyphosate	330	2	165	1	Yes	with 4 helpers
08/20/13	Walk-in site 78	ERCU_Site_01	Eragrostis curvula	J. Chase	08:30	09:00	Foliar Spray	Rodeo (62719-324)	Glyphosate	40	2	20	1	No	
04/17/13	Valentine's Rd 100 m south of house	LOJA_Site_01	Lonicera japonica	J. Chase	9:00	14:00	Foliar Spray	Rodeo (62719-324)	Glyphosate	200	2	49	1	No	
04/18/13	Valentine's Rd. West of bridge and south of road	LOJA_Site_01	Lonicera japonica	J. Chase	9:00	14:30	Foliar Spray	Rodeo (62719-324)	Glyphosate	200	2	100	1	Yes	seedlings
04/25/13	LONJAP_0151	LOJA_Site_06	Lonicera japonica	J. Chase	09:00	15:00	Foliar Spray	Rodeo (62719-324)	Glyphosate	2.4	2	1	1	Yes	
04/25/13	LONJAP_0125	LOJA_Site_06	Lonicera japonica	J. Chase	09:00	15:00	Foliar Spray	Rodeo (62719-324)	Glyphosate	23	2	10	1	Yes	
04/25/13	LONJAP_0123	LOJA_Site_06	Lonicera japonica	J. Chase	09:00	15:00	Foliar Spray	Rodeo (62719-324)	Glyphosate	10	2	5	1	Yes	
04/25/13	LONJAP_0122	LOJA_Site_06	Lonicera japonica	J. Chase	09:00	15:00	Foliar Spray	Rodeo (62719-324)	Glyphosate	10	2	5	1	Yes	
04/25/13	LONJAP_0121	LOJA_Site_06	Lonicera japonica	J. Chase	09:00	15:00	Foliar Spray	Rodeo (62719-324)	Glyphosate	10	2	5	1	Yes	
04/25/13	LONJAP_0120	LOJA_Site_06	Lonicera japonica	J. Chase	09:00	15:00	Foliar Spray	Rodeo (62719-324)	Glyphosate	20	2	10	1	Yes	
05/01/13	LONJAP_0146	LOJA_Site_06	Lonicera japonica	J. Chase	09:00	14:00	Foliar Spray	Rodeo (62719-324)	Glyphosate	80	2	450	1	Yes	5% infested
05/02/13	LONJAP_0008	LOJA_Site_06	Lonicera japonica	J. Chase	09:00	15:00	Foliar Spray	Rodeo (62719-324)	Glyphosate	20	2	30	1	Yes	
05/02/13	LONJAP_0110	LOJA_Site_06	Lonicera japonica	J. Chase	09:00	15:00	Foliar Spray	Rodeo (62719-324)	Glyphosate	15	2	18	1	Yes	

05/02/13	LONJAP_0111	LOJA_Site_06	Lonicera japonica	J. Chase	09:00	15:00	Foliar Spray	Rodeo (62719-324)	Glyphosate	20	2	18	1	Yes	
05/02/13	LONJAP_0112	LOJA_Site_06	Lonicera japonica	J. Chase	09:00	15:00	Foliar Spray	Rodeo (62719-324)	Glyphosate	20	2	18	1	Yes	
05/20/13	Sinepuxent Veg Buffer	ROMU_Site_02	Lonicera japonica	J. Chase	08:00	12:00	Foliar Spray	Garlon 3A (62719-37)	Triclopyr	600	3	200	1	Yes	also ROSMUL, ELEUMB, LIGVUL, ROSWIC, LEZCHI
08/20/13	HQ Housing Veg Buffer	ROMU_Site_02	Lonicera japonica	J. Chase	09:30	13:00	Foliar Spray	Rodeo (62719-324)	Glyphosate	600	2	300	1	Yes	40% Lonjap, 15% Cirarv, 5% Rosmul, 1% Missin, 10% Roswir, 1% Ligvul, 1% Artvul

1- Backpack Sprayer

2- Hand Pump