National Park Service
U.S. Department of the Interior

Natural Resource Program Center
Biological Resources Management Division

# Exotic Plant Management Team Annual Report

2006

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# Introduction

There is consensus among scientists, land managers, and park managers that invasive non-native organisms are changing the structure and composition of ecosystems around the world. Invasive plants have been reported on all National Park Service (NPS) units. Current estimates are that more than 2.6 million acres or between 3-5 percent of park lands are dominated by non-native invasive plant species. Along with the loss

Figure 1: Knotweed along the Dickey River, Olympic National Park.

of open space, global climate change, and fragmentation, biological invasions are one of major contributors to ecosystem change and instability. Invasive plant species are able to modify ecosystem function by a variety of mechanisms including: changing the composition of plant communities, contributing to soil erosion, changing soil chemistry, changing the physical structure of ecosystems and modifying water availability. These changes in turn lead to loss of biodiversity, threatening rare species, altering the visual landscape, loss of habitat for wildlife and other native organisms.

The Executive Order 13112 (1999) recognized the contribution of invasive species to biological and ecosystem change. The international roundtables for forest and rangeland sustainability have similarly recognized invasive species as an indicator of ecosystem viability. Most of the National Park Service Inventory and Monitoring networks have also recognized invasive species as an important vital sign for ecosystems.

It is the goal of invasive plant programs within the National Park Service (NPS) to implement the executive order, manage the sources of new infestations, reduce the effects of existing infestation, and to restore native plant communities and ecosystem function.

Achievements in invasive species management are reported through the Government Performance and Results Act (GPRA) in goal 1a1b, Invasive (non-native) plants. More than 230 parks report activity under this goal.

In the National Park Serve, invasive plant management is a partnership among many programs, including: park resource management, maintenance, interpretation, the Inventory and Monitoring networks, and the Exotic Plant Management Teams (EPMT or Teams). The Exotic Plant Management Teams are funded through the National Resource Challenge, within the Biological Resource Management Division. The Teams were established to provide a framework and a first response to exotic plant invasions within NPS. This annual report documents the activities and achievements of the Exotic Plant Management Teams in 2006.

## Exotic Plant Management Teams

The Exotic Plant Management Teams (EPMTs) are an integral part of the invasive plant species program for the National Park Service. The program has been developing over the last six years with the last of the Teams becoming operational in 2003. Each of the Teams is headquartered in a field or park unit and then operate over a wide geographic area, serving multiple parks. The activities of each Team are coordinated through a steering committee, which consists of representatives of partner parks.


Figure 2: Pampass Grass along the California coast.

The Teams are staffed with highly trained individuals with specialized knowledge and training in invasive plant management. They assist parks in all aspects of invasive species

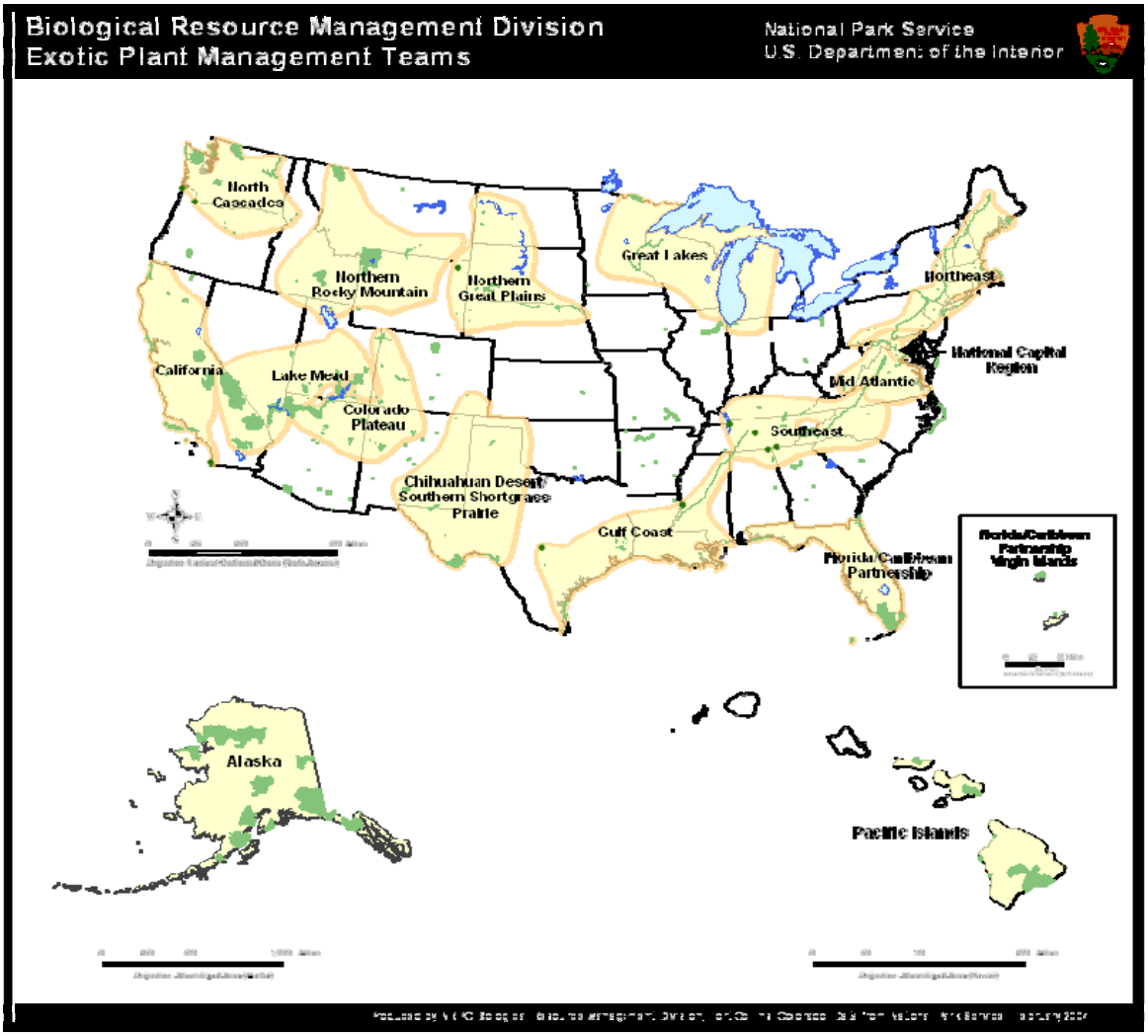



Figure 3: The Exotic Plant Management Teams.

**Alaska Region**

**Alaska EPMT** based in the Alaska regional office serving parks throughout Alaska.

**Pacific Region**

**California EPMT** based at Point Reyes National Seashore.

**North Cascades EPMT** based at North Cascades National Park.

**Lake Mead EPMT** based at Lake Mead National Recreation Area.

**Pacific Islands EPMT** based at Haleakala National Park.

**Intermountain Region**

**Colorado Plateau EPMT** based at Petrified Forest National Park.

**Northern Rocky Mountain EPMT** based at Yellowstone National Park.

**Chihuahua Desert/Southern Shortgrass Prairie EPMT** based at Carlsbad Caverns National Park.

**Gulf Coast EPMT** based at Big Thicket National Park.

**Midwest Region**

**Great Lakes EPMT** based at the Great Lakes Inventory and Monitoring Network Office.

**Northern Great Plains EPMT** based at Theodore Roosevelt National Park.

**Gulf Coast EPMT** based at Big Thicket National Park.

**Northeast Region**

**Mid Atlantic Cooperative EPMT** based at Shenandoah National Park.

**Northeast EPMT** based at Delaware Water Gap National Recreation Area.

**National Capital Region**

**National Capitol Region EPMT** based at Rock Creek Park.

**Southeast Region**

**Southeast EPMT** based at Blue Ridge Parkway.

management. The Teams expand the parks ability to manage invasive plants by concentrating on the treatment of the large, difficult, and often remote infestations.

## 2006 Accomplishments

Management of invasive species is a combination of prevention, inventory, monitoring, control or treatment, restoration and research. The EPMTs play an important part of all these components of managing invasive species. In addition to project work, Teams provide technical assistance to parks, regions, and the Inventory and Monitoring networks in invasive plant management. Teams are playing an increasing role as regional experts in vegetation and invasive species management. The Teams provide invasive species training to park resource managers, maintenance, and staffs, as well as, other federal and non federal partners. Teams also assist parks with general management plans, vegetation management plans, and environmental compliance.

| | |
|---|---|
| **Inventoried Acres** | 467,676 |
| **Gross infested Acres** | 149, 008 |
| **Infested Acres** | 18,365 |
| **Acres Treated and Retreated** | 14,700 |
| **Acres Restored** | 280 |
| **Monitored Acres** | 12,223 |

Figure 5: 2006 Accomplishments.

In 2006, the Exotic Plant Management Teams treated 343 species on 14,168 acres in 156 parks; the largest annual treatment accomplishment to date. Over the last five years, they have treated more than 48,600 acres and worked at more than 189 parks treating over 600 invasive plant species.

### Inventory and Monitoring

A critical component of invasive species management is knowing the location and distribution of invasive plants across the landscape. This information facilitates identifying treatment locations, setting priorities, identifying pathways of invasion, and allows management plans to be written. For invasive plants, monitoring determines changes in the size, location, density and distribution of invasive plants and the efficacy of management practices. The Teams work in close cooperation with park staff and the NPS Inventory and Monitoring program to gather this information.

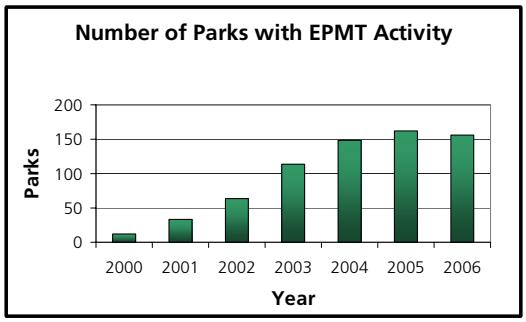



Figure 4: Parks with EPMT activities.

A common axiom of invasive species management is *weeds know no boundaries.* Effective weed management requires coordinated management across ownerships. Managing invasive species across jurisdictions requires creating mechanisms to share information. Over the last eight years, there has been acceptance of national standards for the inventory and monitoring of invasive species, North American Weed Management Association standards. The EPMT program has implemented these standards so that information can be shared with other parks, across agencies and across jurisdictions. Inventory and monitoring data collected by the Teams can now be used in local and regional weed coordination efforts such as Cooperative Weed Management Areas and state weed planning efforts.

Figure 6: Mapping weeds at Lake Mead National Recreation Area.

In 2006, the Teams inventoried more than 467,676 acres. These inventories recorded information on 384 separate invasive plant species. Over the last five years, 2,442,503 acres have been inventoried by the EPMT program.

Like inventory, monitoring is an important component of invasive species management. Monitoring can reveal changes in the locations, size, and distribution of invasive plant populations. Monitoring can also identify pathways for introduction and spread of invasive plants, efficacy of treatments , ecological changes prior to and following treatments can be determined, and the need for site restoration.

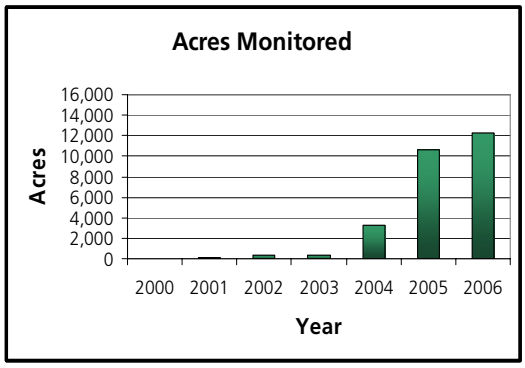



Figure 7: Acres monitored 2000 through 2006.

The Teams monitored more than 27,000 acres and 238 invasive plant species in 2006. Over the last five years, there has been a steady increase in monitoring. As initial park surveys and inventories become more complete, a decline in acres inventoried will likely occur and be replaced with by an increase in acres monitored. This trend is beginning to emerge as seen in Figure 7, showing a steady increase in acres monitored. The following demonstrate team inventory and monitoring activities:

- For the last four years, the Alaska Team has been concentrating on inventory and mapping. The result is that over 4,000 sites of nonnative plants have been located. This information will be used to create an invasive plant management plan for all Alaska parks.
- The Northern Rocky Mountain Team has been treating yellow starthistle at Minidoka Internment National Monument since 2004. In 2006, monitoring revealed not a single starthistle plant in the park.
- The Florida Team combined resources with local and state interests to develop and implement a biannual systematic survey of South Florida. By 2005, the cooperative effort has resulted in maps of weed species that cover more than 16 million acres.
- The Teams closely coordinate with local NPS Inventory and Monitoring networks. The Teams assist the network and parks in the inventory and monitoring of invasive plant populations, efficacy of treatments and changes to plant communities. Teams spend between 10 and 20 percent of their time on inventory and monitoring.

Figure 8: Mapping leafy Spurge on horseback in Theodore Roosevelt National Park.

## Treatment and Control

Control or treatment of invasive plants continues to be the focus of the Exotic Plant Management Teams, comprising between 40 and 70 percent of their time. In 2006, the Teams treated 339 species, on 14,700 acres. The annual number of acres treated has been increasing, with 2006 being the year with the largest number of acres treated and retreated since the Teams formation (Figure 9).

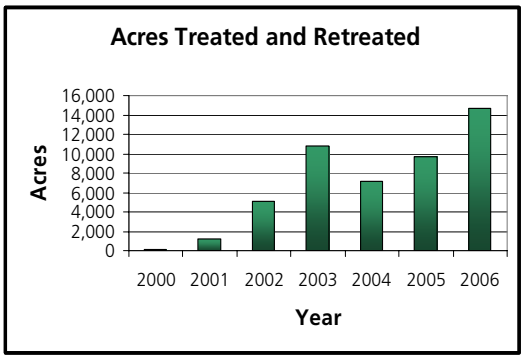



Figure 9: Acres treated and retreated from 2000 through 2006.

The number of invasive species treated has increased along with the increase in treated acres. In the year 2000, only 17 species were treated. The number of species treated had increased to 107 in 2001; 171 in 2002; 257 in 2003; 305 in 2004; 349 in 2005; and 343 in 2006. In total, the Teams have treated more than 600 species during the last six years. Similar trends can be seen in the number of parks where treatment occurred. In 2000 with only a few of the Teams in operation,

the EPMT programs serviced fewer than 20 parks. By 2005, the number of parks involved in the program had increased to more than 150. Over the last six years, more than 180 parks have benefited from EMPT activities. Following are some highlights of EPMT programs in 2006:

- The National Capital Team adopted Assateague Island National Seashore as a partner park. After initial treatments in 2005 and retreatments in 2006, two exotics were eradicated from the island – Japanese black pine (*Pinus thunbergiana*) and white mulberry (*Morus alba*).

Figure 10: Assateague Island National Seashore.

- The California Team has increased treated acres by 163 percent since its first year of operation.
- The Northern Great Plains Team has been assisting Knife River Indian Villages with prairie restoration. The Team has assisted the park with invasive plant removal, site preparation, and then the selection and planting of locally adapted native seed materials.
- The Colorado Plateau Team completed removal of tamarisk at all known sites in Colorado National Monument. The Team will continue to monitor these sites and treat any new plants over the next few years.
- The Chihuahuan Desert Team eradicated the last remaining stand of tamarisk from Pecos National Monument. The Colorado Plateau Team has completed removal of all tamarisk stands within Colorado National Monument.
- The longest operating EPMT Team, Lake Mead, has been treating invasives in the southwest for ten years. The Team has successfully reduced tamarisk to maintenance levels in seven of its partner parks.
- The Gulf Coast EPMT has been treating Chinese privet at Big Thicket National Preserve. Work by the Team has assisted the park in exceeding their GPRA goals.
- The Northeast EPMT has been working with area parks designing more effective techniques for knotweed control. They are also assisting with park resource management plans.
- The Florida Team completed the initial treatment of the Brazilian pepper tree on the Western Mainland Tract of Canaveral National Seashore. This 4,000-acre tract, jointly managed by Canaveral National Seashore and the Merritt Island National Wildlife Refuge provides habitat for the federally listed Florida Scrub jay. This species requires open pine flat woods. These flat woods were rapidly disappearing due to the encroachment of the invasive Brazilian pepper tree.
- The Alaska Team provides technical assistance and guidance to the region, working with interagency groups to coordinate management of invasive species across Alaska. The Team is coordinating with regional and park staff to create a regional management plan including environmental compliance for managing invasive plants in Alaska parks.

Figure 11: Treating tamarisk at Lake Mead.

Figure 12: Treating Russian olive, Northern Great Plains Team.

## Prevention

The most effective and economical approach to managing invasive plants is to prevent their introduction and spread. Prevention is a combination of early detection and prompt treatment of new populations, management

practices that limit introduction and enlisting the support of the public and park staff through education. Such practices as cleaning equipment and vehicles, monitoring and treating along known pathways like roads, trails, parking lots and campgrounds and using weed free material in construction and maintenance projects can significantly reduce invasive plant introductions. The Teams spend between 5 and 15 percent of their time on prevention activities. Examples of prevention practices implemented by the Teams include:

- The Alaska Team worked with partners to produce the first field guide for invasive plants of Alaska. The Team also developed a statewide tracking and ranking system to assist in management of invasive plants in Alaska across all ownerships.

Figure 13: Cleaning equipment to prevent dissemination of invasive plants.

- Roads and trailways have been well documented as a principal pathway and corridor for invasive species spread. The Teams are working on cooperative efforts between engineering, maintenance and the invasive plant program to implement simple practices and methods to reduce the introduction and spread of invasives plants. Such prevention practices as the use of weed free materials, equipment cleaning, using weed free gravel sources, and road maintenance practice can minimize the introduction and spread of invasive plants.

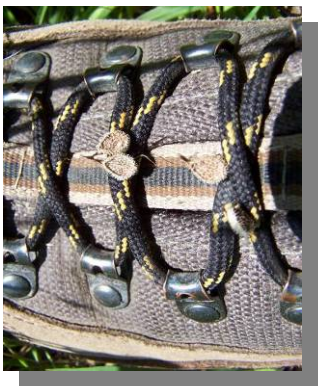


Figure 14: How weed seeds can spread.

- The Pacific Island EPMT has developed protocols for preventing the spread of highly mobile invasive miconia seeds.
- The Northern Great Plains EPMT has prioritized leafy spurge treatment areas. The Team has targeted waterways, roads, bikeways, hiking and horse trails to minimize the transportation of invasive plant seeds to other area both in and outside the park.
- The Gulf Coast EPMT, with assistance from the Biological Resources Management Division staff, is participating the a partnership between the National Park Service, Lady Bird Johnson Wildflower Center, Garden Clubs of America and others in the "Be PlantWise" program. It is an education program, which encourages gardeners to plant alternatives to invasive species.

- The Northern Great Plains EPMT is completing surveys and inventories on all their partner parks. The surveys revealed previously unknown populations in five parks, including the first salt cedar found in the south unit of Theodore Roosevelt National Park.

## Cooperation and Collaboration

Effective management of invasive species requires cooperation and coordination across jurisdictions and property lines. To achieve the goal of coordinated management the EPMT program has focused on identifying opportunities for coordination, fostering partnerships with organizations and agencies, and removing any institutional boundaries. The EPMT are leaders and active participants in regional local and regional cooperative efforts; the following are some examples of this:

- In 2006, the Teams have received more than 3 million dollars in supplemental funding from grants, cooperative efforts, in-kind services, and parks.
- The Great Lakes Team is a leader in the Midwest Natural Resources Group. The Team was instrumental in the formation of the Northwoods Cooperative Weed Management Association.
- The California Team liaison is a member of the California Interagency Noxious and Invasive Plant Committee, which coordinates weed control efforts across all ownerships in California.
- The Pacific Island Team plays a pivotal role in the Maui Invasive Species Committee, leading

a five year effort to control Miconia on the island.

- The Northeast Team has given several presentations at regional meetings such as Connecticut Invasive Plant Working Group.
- The Southeast, Florida, and California Team liaisons are in leadership roles in regional and national Exotic Plant Pest Councils.
- The Mid-Atlantic Team has been leader in enlisting volunteers in invasive plant management. Several volunteer events resulted in hundreds of donated hours. Over 400 volunteers and contributed 1,640 work hours in 2006.
- The Lake Mead Team continues to play a leadership role in regional efforts to control salt cedar. In concert with other federal, state, and local agencies, the Team provides direct coordinated control efforts in the area. Using scientific principals to prioritize control the Team in concentrates in areas where tamarisk free areas can be maintained.
- The North Cascades Team has been instrumental in the formation of Cooperative Weed Management area around area parks. Coordination with area tribal governments had lead to more effective coordinated treatment of growing populations of knotweed along local rivers.
- The EPMTs have created strong partnerships with such organizations as the Student Conservation Association and Americorps. With the exception of Florida, all the Teams have relied on these organizations to meet program objectives. Since 2000 over 50,000 hours of EPMT work has been accomplished using Student Conservation Association personnel. This represents just fewer than ten percent of all field hours for the Teams.

Figure 15: The 2006 Alaska Americorps Weed Control Team.

- The National Capital Team forged a partnership with the District of Columbia Department of Natural Resources to work cooperatively to control populations of exotics on adjacent lands.

## Safety

The Exotic Plant Management Teams often work in demanding and hazardous conditions. Treatments may require potentially hazardous equipment such as chainsaws, weed wrenches, ATVs, and helicopters. Crews must often hike for long distances, carrying heavy loads and navigate remote, steep, and uneven terrain. Pack stock and technical climbing equipment is sometimes used to reach remote invasive plant infestations.

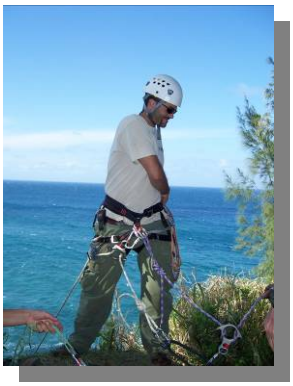


Figure 16: Roping up for inventory work in Hawaii.

To manage these hazardous working conditions the EPMT program emphasizes safety and caution in all operations. Each Team prepares a job hazard analysis for each type of operation. These analyses are updated frequently to reflect current conditions. On the job safety meetings are held regularly and often, reinforcing good safety practices. The Teams work with each park to ensure that the safety plans and hazardous analysis meets park standards and local environmental conditions.

The Teams have recorded more than a half million-field hours over the last three years. Over the last five years, lost time injuries represent less than 0.0002 percent of field hours worked. Following are some examples of the EPMT program safety record:

- The Mid Atlantic EPMT had no lost time accidents in 2006. The staff emphasized risk management with safety briefings on many mornings. The Team works in forested, remote settings using power equipment and herbicides, their safety record reflects only one lost-time accident since 2003.
- In the past six years, the Pacific Island Team has logged more than 1,000 hours of high-risk time in helicopters without a single accident. This Team deploys in excess of 15 field workers on a daily basis in hazardous terrain with low accident rates.

- Treating pampas grass along the California coast requires using technical climbing equipment and ropes to reach plants on the steep cliffs above the ocean. In three years of treatment, none of these treatments has resulted in an injury.
- All herbicide applications are supervised by certified applicators.
- The Southeast team has completed their third year of work without a single injury or accident. The Team travels more than 22,000 miles each year using herbicides and chainsaws under hazardous conditions and still maintains a perfect safety record.

## Creating Efficiencies in the Invasive Plant Program

In most endeavors, efficiency is achieved through experience and repetition, as more experience and understanding of an activity occurs the possibility of efficiencies emerge. In the management of invasive species often the inverse occurs. As invasive plant management programs mature, the cost and resources per acre can actually increase. Though some efficiency can be achieved in managing the program and individual activities, the treatments themselves can become more difficult and costly.

Figure 17: Northeast Team - Handpulling brome.

Initial treatment of a large, heavily infested site, means that you can use methods with lower per acre treatment costs; such as aerial spraying or broadcast applications. A mortality of greater than 90 percent of the plants for initial treatment is considered very successful. The seed life of invasive species varies from 3-90 years, with annual or periodic germination when site conditions are advantageous. A successful treatment program requires annual monitoring and treatment for seedlings germinating from the seedbank, any plants remaining from the initial treatments and recruitment from outside sources. Even though the number of plants treated will drop dramatically, the cost per acre of annual follow-up can increase more than tenfold on a per acre treated basis, as the entire area must still be monitored and the occasional plant treated.

In developing programs, treatment often occurs at easily identified and accessible sites close to development, like headquarters, roads, trails, and picnic areas. The cost per acre of treating these more accessible sites is less than treating more remote sites where travel may contribute significantly to the cost. In long standing invasive plant programs, the more accessible sites have usually been treated and are now under a monitoring and retreatment mode. Access to more remote sites such as backcountry or Wilderness Areas may take two or three days to reach by hiking or horseback. Treatment in these more remote sites is critical to prevent dominance of exotic species in these relic and biologically diverse areas. Remote locations may be less efficient, or have higher per acre cost but are critical to preventing the spread of invasive species throughout wildland environments.

The same principal holds true for the type of plants treated. Broadleaf herbaceous plants such as knapweeds and thistles are treated more easily than vines, grasses, and woody species. They are more susceptible to selective herbicides and do not pose the physical challenges of climbing plants such as epiphytes and saprophytes. The focus of treatment for continuing programs often become monitoring, retreatment, and isolated new infestations, along with species that are more difficult to treat and sites that are less accessible.

NPS is seeking to create efficiencies in the program by creating a well informed, interconnected workforce; providing oversight; creating priority treatment areas and directing funds to dynamic programs. Team leaders and staff are required to be highly trained and experienced. All herbicide applications are preformed under the supervision of certified applicators. Staff is encouraged to remain current with research and new information. An annual meeting is held to exchange information and ideas between our working professionals. New and effective treatment options are discussed. Meetings are held in conjunction with scientific

societies to encourage continued learning and exposure to professions in other agencies and outside NPS. Membership in scientific societies and organizations is also encouraged.

Figure 18: Yellow toadflax at Glacier National Park.

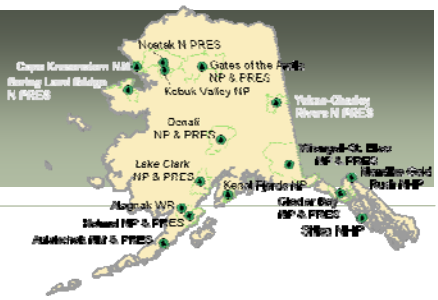
The program continues to find mechanism to increase productivity and multiply appropriated funds. A central tenant of invasive species management is that invasive species do not recognize jurisdictional boundaries. Within the last few years, NPS has greatly increased partnership efforts. NPS is now participating in Cooperative Weed Management Areas (CWA) across the country. New CWMAs were formed in the Great Lakes area and the Pacific Northwest in 2006. Volunteerism is also playing a growing role in managing invasive plants.

In 2006 EPMT treatment costs declined by more than 35 percent from the previous year. While some efficiency can still be achieved, it is likely that cost per acre will increase in the coming years based on the factors described above. Portions of the large roadside infestations have been treated. A larger percentage of the EPMT efforts will be focused on monitoring, maintaining areas already treated, infestations in more remote locations, treating more challenging species and finding and treating newly discovered infestations.


# Team Reports

# Alaska

## Exotic Plant Management Team




**Partner Parks:** *Alagnak WR, Aniakchak NM & PRES, Bering Land Bridge N PRES, Cape Krusenstern NM, Denali NP & PRES, Gates of the Arctic NP & PRES, Glacier Bay NP & PRES, Katmai NP & PRES, Kenai Fjords NP, Klondike Gold Rush NHP, Kobuk Valley NP, Lake Clark NP & PRES, Noatak N PRES, Sitka NHP, Wrangell-St. Elias NP & PRES, Yukon-Charley Rivers N PRES*

The focus of the Alaska EPMT (AK-EPMT) is early detection and rapid response of new invasive plant infestations. Apart from scattered infestations in developed areas, Alaska's National Park System units are among the last landscapes in the United States that have seen neither the addition nor the subtraction of species in the past century. This provides the AK-EPMT with a remarkable opportunity to begin defending against invasive plants before they become a major problem, minimizing long-term management costs. We do this by stationing employees in park units with the greatest risk of invasion and providing them with training, equipment, and volunteer support for mapping and controlling infestations, and educating park staff, local residents, and visitors. The more remote areas and parks are surveyed periodically, and high priority infestations are treated. Concurrently, we develop prevention measures and educational materials, collaborate extensively with partners, and provide a proactive model for invasive plant management in Alaska.

| 2006 Accomplishments | |
|---|---|
| **Inventoried Acres** | 3,542 |
| **Gross Infested Acres** | 1,359 |
| **Infested Acres** | 83 |
| **Treated Acres** | 0.7 |
| **Monitored Acres** | 0.5 |
| **Retreated Acres** | 1 |
| **Restored Acres** | 0 |

The small acreages treated each year are a sign of our success. For example, Japanese knotweed and reed canarygrass are two problem plants that are spreading rapidly in Southeast Alaska, but on parklands we have contained them to a single small population of each species. We have kept white sweetclover, which has infested thousands of acres of glacier riverbars in Alaska, from colonizing parklands in the state's Interior through vigilant annual survey and control efforts. In 2006, the Alaska EPMT mapped 2,255 infestations and uninfested areas – 891 of which were inventoried, 938 treated, 167 monitored, and 259 retreated – for a cumulative total of 4,350 records over four summers. Most sites are less than a thousandth of an acre in size. For the first time this summer, an AmeriCorps crew of Native American youth spent two months as a traveling strike team to help EPMT field employees remove our few large infestations. Many other volunteers assisted our efforts throughout the season. This approach provides youth with an opportunity to perform service in natural resource management and learn about the National Parks, while our parks benefit from this valuable field assistance.

Our partnerships with other agencies and landowners are essential for protecting Alaska and its parks. Towns and roadsides across the state are experiencing the arrival of new species and rapidly expanding populations of those already present. To address invasive plants beyond park boundaries, we work closely with other federal, state, and non-government agencies through the statewide Committee for Noxious and Invasive Plants Management, multiple Cooperative Weed Management Areas, and a newly formed Alaska Invasive Species Workgroup. These partnerships have developed over the course of the AK- EPMT program and are more productive each year. On the

Figure 19: Tribal Civilian Community Corps and NPS prepare to control sowthistle in Glacier Bay.

educational front, this year we finalized and distributed a new field guide, "Invasive Plants of Alaska," which has been well received across the state and country. We also developed a website, spread the word by newspaper, television, and radio, and gave numerous presentations about our program and the importance of addressing invasive plants in Alaska sooner rather than later.

Figure 20: Restoration after invasive plant control at Nelson Slough in Klondike Gold Rush National Historic Park.

With the support of park Superintendents and the Alaska Regional Director, the AK-EPMT has initiated a region-wide Invasive Plant Management Plan and Environmental Assessment. We are developing a strategy, with public involvement, to maintain the unique integrity of Alaska parks. We could not do this without the fieldwork, data management, partnerships, and educational efforts of the past three years. NPS is the first land management agency in Alaska to take this important step.

With 54 million acres to keep weed-free, inventory and monitoring have been priorities for the AK-EPMT. Only small portions of these lands are impacted by human use and development; invasive plants in Alaska parks are still limited to areas, such as roads, trails, facilities, and airstrips. The only way to reliably detect new infestations in these areas is to regularly survey likely areas for invasion each summer. This has required a different model from some other EPMTs, whose field employees travel as a crew from park to park. In Alaska, we work with parks at greatest risk of invasion to employ one to two individuals to serve as our primary early detectors. Each year, they survey disturbed and vulnerable areas, find new infestations in very early stages of establishment, and control them. This early detection and rapid response model prevents the development of larger populations. Areas previously inventoried are also monitored annually to document new arrivals, population changes, and control effectiveness.

Five years of collaborative inventories with USGS have provided us with baseline invasive plant information for 12 of our 16 park units, of which only 3 are directly accessible by road. Second-hand reports indicate that the remaining four units are free of invasive plants, which will evaluated in coming seasons. We have inventoried all of the roads in Alaska parks, 275 miles in total, and all frequently used foot trails. To improve our chances of finding new infestations in remote areas, we provide park staff with trainings and educational materials to watch for, identify, and properly record invasive plants.

Figure 21: NPS Fire Ecologist and NASA scientists assess modeling invasive plant colonization after a wildfire.

Field data recording incorporates high precision Global Positioning System (GPS) units to document change in population size and shape with one-meter accuracy. We have developed a standardized data collection protocol for use in the field and office. This year we transformed our existing spatial data into a geodatabase format that is accessible to all Alaska NPS employees to serve as a central storage and analysis tool for past, present, and future data. The geodatabase enables evaluation of our control effectiveness to date and prioritization of future control efforts, both of which will be critical components of our Invasive Plant Management Plan. We are working with the National Aeronautical and Space Administration and the NPS Fire Program on a pilot project to model the potential spread of invasive plants across burned lands in Interior Alaska, which can be a pathway for their dispersal into remote areas. Over the course of the AK-EPMT program, we have increased the understanding of invasive plants in Alaska parks from several limited surveys to an inventory, control, and monitoring spatial database with thousands of records spanning multiple years.

# California

## Exotic Plant Management Team


**Partner Parks:** *Cabrillo NM, Channel Islands NP, Devils Postpile NM, Golden Gate NRA, John Muir NHS, Lassen Volcanic NP, Pinnacles NM, Point Reyes NS, Redwood NP, Santa Monica Mountains NRA, Sequoia and Kings Canyon NP, Whiskeytown NRA, Yosemite NP*

The California Exotic Plant Management Team (CA-EPMT) serves 13 parks ranging the entire length of the California coast.. This region constitutes the majority of the west coast of the United States and

| 2006 Accomplishments | |
|---|---|
| **Inventoried Acres** | 4,284 |
| **Gross Infested Acres** | 2,515 |
| **Infested Acres** | 193 |
| **Treated Acres** | 89 |
| **Monitored Acres** | 1,478 |
| **Retreated Acres** | 40 |
| **Restored Acres** | 0 |

has been determined by The Nature Conservancy to be a "global biodiversity hotspot". Consequently, the range of species and the nature of sites treated are diverse. The elevation of the sites, extend from a few feet above sea level in Golden Gate National Recreation Area, to the Sierra Nevada range in Sequoia and Kings Canyon National Parks. This year alone, the California Exotic Plant Management Team (CA-EPMT) has helped parks treat 53 species on 126 separate sites.

One of the highlights of this season has been the extensive treatment of Scotch broom (*Cytisus scoparius*) at Point Reyes National Seashore. With strategic planning, additional park-provided funding for multiple treatments, and the assistance of an additional satellite Team (Public Land Corp-CEPMT), we made significant progress towards the control of the Scotch broom within the park. We conducted a 563 acre inventory, and documented 58 acres of Scotch broom. Our initial treatment this year will be followed with a long-term plan for the site. An interdisciplinary approach will involve coordination between fire, park natural resource staff, and the CA-EPMT, using a variety of treatment methods to provide long-term control of the population.

Over the five-year life of the CA-EPMT we have annually reviewed our Team placement strategy and modified our approach to incorporate efficiency lessons into the following year program. For instance, in 2006 we funded local Teams for three parks (Golden Gate National Recreation Area, Point Reyes National Seashore and Redwoods National Park). As a result, the parks received more comprehensive treatments, while extending the capacity of the CA-EPMT program by sharing more of the costs associated with hosting Teams (daily supervision and housing).

Figure 22: French broom removal at Point Reyes National Seashore.

As in previous years, we have continued to expand services to parks through increasing field practitioner numbers. From 2002 to 2006 the CA-EPMT has expanded from a 6-person Team to a 25-person, multi-level program. A large part of our increased field presence was made possible through a partnership with the Student Conservation Association, 18 of the 25-Team members were Student Conservation Association interns. This growth was possible through a series of successive grants, outreach, collaborating, and building incentives for parks contributing

resources to the CA-EPMT. This expanded number allowed for fine-tuning the number of persons per project to the workload, and in many cases being able divide the group into smaller units and treat multiple parks simultaneously. The refinement of techniques, leveraging of efforts, and heightened field presence in 2006 has rendered a 163 percent increase in annual-acres-treated since the inception of this program (49 net-infested acres were treated in 2002, and 129 acres in 2006).

Figure 23: Buttress gridding at Devil's Postpile National Monument.

Another leveraging approach we explored in 2006 was the incorporation of incentives for parks to coordinate and host volunteer events that revolve around the scheduled CA-EPMT projects. This arrangement not only tapped into a larger workforce, but also offered mentoring opportunities for the public interested in learning about invasive plant management.

This was the first year the CA-EPMT conducted a project with the assistance of the Sierra Club. Superintendent Deanna Dulen of Devil's Postpile National Monument and Sarah O'Gara of the Sierra Club coordinated a work trip to assist the CA-EPMT in non-native plant inventory and treatment efforts. We had an opportunity to expand field treatments by integrating a large group of Sierra Club volunteers into our treatment efforts, and teaching them about problems caused by non-native plants - specifically bull thistle (*Cirsium vulgare*), cheat grass (*Bromus tectorum*), and salsify (*Tragopogon dubius*). It was a perfect venue to share our love and knowledge of the area and immensely gratifying to be appreciated by such a dedicated group of people. This trip was such a success that plans are already underway to coordinate future CA-EPMT projects with the Sierra Club's Service Trip Program. This project constitutes a milestone for CA-EPMT and Devil's Postpile. After five years of CA-EPMT assistance, invasive species are reduced sufficiently for the park to take the leading role in managing infestations in the park. Volunteers and park staff will perform annual monitoring and limited treatment, with the CA-EPMT treatments performed in a cyclic fashion every few years.

In addition to treating California parks, the CA-EPMT began cooperating with other agencies. In 2006, the Team formed a partnership with the USDA Forest Service on a yellow starthistle project neighboring Yosemite National Park. We initiated another interagency project with Marin County Public Works for the removal of a French and Spanish broom population along a road corridor leading into Point Reyes National Seashore.

Figure 24: Student Conservation Association interns and NPS remove Scotch broom.

Typical CA-EPMT projects occur in remote, rugged, and often hazardous environments. Careful consideration of the site, the species, and capacity of the control effort has helped us hone treatment strategies. As we expand service, treat more acres, and contain some of the incipient populations, there has been a gratifying shift towards treating core populations. We expect some of this is due, in part, to the success of treating outlying populations, thereby constituting a significant step towards achieving control of invasive species within our partner national parks.

# North Cascades

## Exotic Plant Management Team


**Partner Parks:** *Ebey's Landing NH RES, Fort Vancouver NHS, John Day Fossil Beds NM, Lake Roosevelt NRA, Lewis and Clark NHP, Mount Rainier NP, North Cascades National Park Complex (Lake Chelan NRA, North Cascades NP, Ross Lake NRA), Nez Perce NHP, Olympic NP, San Juan Island NHP, Whitman Mission NHS*

In 2006, the North Coast Cascades Network Exotic Plant Management Team (NCCN-EPMT) served parks in Western Washington and Oregon as well as park units in Eastern Washington and Idaho. This area represents a diversity of

| 2006 Accomplishments | |
|---|---|
| **Inventoried Acres** | 13,587 |
| **Gross Infested Acres** | 13,228 |
| **Infested Acres** | 3,311 |
| **Treated Acres** | 901 |
| **Monitored Acres** | 9 |
| **Retreated Acres** | 6 |
| **Restored Acres** | 0 |

ecosystems from coastal riparian areas and rainforest to high desert and dry island microclimates. The focus of the NCCN-EPMT continues to be on maintenance control of noxious species; especially in wilderness boundary areas, Cooperative Weed Management Areas and riparian zones.

This field season, the NCCN-EPMT was able to capitalize on projects from previous seasons. Although the Team was short-handed due to unexpected changes in personnel, services to partner parks were not significantly reduced. The hiring of several Student Conservation Association interns helped increase cost effectiveness and field personnel. Following several years of planning, Poison hemlock (*Conium maculatum*) was treated in a coordinated project with the Cooperative Weed Management Association partners at Ebey's Landing National Historical Reserve. Through a grant from Center for Invasive Plant Management, restoration of the site will begin in 2007. Along the Dickey River in Olympic National Park, initial removal of Japanese and Giant Knotweed (*Polygonum spp*.) was completed along the seven mile section of the river from the Pacific Ocean to the park boundary. This project was undertaken in cooperation with the Quileute Indian Nation and represents 100 percent control of these species along the entire length of this riparian corridor.

After three seasons of continuous treatments of reed canary grass (*Phalaris arundinacea*) throughout wetlands in the Ross Lake National Recreation Area (North Cascades National Park), a significant change is occurring in the composition of resident vegetation. Areas once dominated by a monoculture of reed canary grass are now moving toward to a mix of native herbaceous species. Recruitment of this non-native grass has been significantly reduced.

Figure 25: Herbicide treatment of poison hemlock (Conium maculatum) monoculture at Ebey's Landing National Historical Reserve.

The NCCN-EPMT continues to extend budget dollars by supporting park weed management programs whenever possible. The Team supported several hundred acres of contract weed control at Lake Roosevelt National Recreation Area. In addition, the EPMT supported Lake Roosevelt personnel with equipment and other supplies so maintenance staff can continue their on-going efforts to control noxious species in visitor use areas, prescribed burn units along riparian zones near the lake and in areas near private agricultural lands. In its fifth field season, the NCCN-EPMT continues to focus on riparian and aquatic ecosystems, as well as preventing the movement of noxious species from the front country to relatively pristine wilderness areas.

The concept of the CWMA exemplifies the work of the EPMT; as partnerships with county weed control boards, state parks, tribal entities, and The Nature Conservancy continue to drive the successful management of problem species at the landscape level.

Figure 26: Japanese, Giant and Hybrid knotweed population along the Dickey River prior to treatment, 2004.

Invasive knotweeds (Japanese, Giant, Himalayan, and their hybrids) are of increasing concern in the Pacific Northwest. This complex of knotweed species is responsible for the degradation of riparian resources throughout the Northwest, primarily by reducing native species along river corridors. Knotweed monocultures invade salmon spawning channels, effectively reducing available nesting space. Shading by knotweed increases water temperatures and reduces quality of forage for the insects on which juvenile salmon feed.

The goal of the NCCN-EPMT knotweed management program has been to focus on areas where cooperative management can result in sustained control of knotweed species at the landscape level. Over the last two field seasons, populations of knotweed along the Dickey River in Olympic National Park have been reduced to maintenance levels. Reduced knotweed populations should allow seasonal flooding to return to the river and begin the process of restoring native plant communities and stream flow patterns. While populations of knotweed have not been completely eradicated from this area, annual treatment will be reduced to occasional plants requiring no more than one work week for a single employee. Eventually, control and monitoring efforts may be reduced to once every several years, representing a significant success in the control of this species.

The most important effort NCCN-EPMT focuses on is preventing the introduction of non-native, invasive plant species to relatively pristine areas. Inventory, monitoring, education, and decontamination are often emphasized as the primary methods in which plant invasions are

Figure 27: Japanese, Giant, and Hybrid knotweed population brought to maintenance control after two successive seasons of broadcast herbicide treatment, 2006.

prevented. However, an aspect of prevention that often lacks implementation is rapid response. The NCCN-EPMT rarely undertakes a project with the sole intent of simply inventorying or monitoring a given area. Instead, inventory and initial control of suspect areas are conducted on the same day, thus controlling problem weed populations instead of simply monitoring their spread. Additionally, while daily projects focus on the control of a specific suite of species, crews are always on the lookout for potential problematic species that may currently be unrecorded in the targeted management area. The NCCN-EPMT has begun to make progress in the control of roadside and right-of-way weed populations, another avenue of preventative weed control, which remains problematic. While often considered to fall low on the priority list, roadside rights-of-way and visitor use areas present one of the greatest threats of introduction of problem weed species into relatively undisturbed areas. The failure to adequately control weed populations in these areas results in a never-ending supply of seeds and vegetative plant parts available to be transported on vehicles, shoes, and gear from the front country to the back country. Many of the most heavily infested areas in the North Cascades are roadsides and consist of Roadside Right of Way and Visitor Use Areas. It is of paramount importance that a comprehensive program, similar to the cyclic maintenance of facilities, be conducted to prevent the transport of these species to relatively weed free zones.

# Pacific Islands

## Exotic Plant Management Team

**Partner Parks:** *Hawaii Volcanoes NP, Haleakala NP, Kalaupapa NHP, Kaloko-Honokohau NHP, Pu`uhonua o Honaunau NHP, Pu`ukohola Heiau NHS*

The Pacific Islands EPMT (PI-EPMT) has continued to serve the Hawaiian parks during 2006. Hawaiian parks are threatened by an inundation of invasive plants that displace native vegetation

| 2006 Accomplishments | |
|---|---|
| **Inventoried Acres** | 138,065 |
| **Gross Infested Acres** | 75,244 |
| **Infested Acres** | 171 |
| **Treated Acres** | 134 |
| **Monitored Acres** | 0.6 |
| **Retreated Acres** | 87 |
| **Restored Acres** | 40 |

forming single species stands over extensive areas. At risk are natural communities that are over 90 percent endemic, an assemblage resulting from millennia of extreme isolation in the middle of the Pacific Ocean.

On the Big Island, the PI-EPMT continued to leverage efforts by partnering with the expert resource management staff at Hawaii Volcanoes National Park. The Team focused significant resources on controlling incipient species threatening four Big Island parks. The Team also serves as a rapid knockdown force to control disruptive weeds that are widely established over large landscapes. Control activities use existing partner park staff is common, with personnel regularly joining forces with the EPMT to maximize efficiency.

The PI-EPMT expanded partnership efforts on the Big Island in 2006, by controlling weeds that threaten portions of Hawaii Volcanoes on adjacent conservation partnership lands through the leveraging of dollars to support partnership personnel, volunteers and interns. The professional EPMT staff provided technical guidance and in-park alien plant control work to support the partnership effort.

The PI-EPMT continued its five-year commitment to serve as coordinating entity for the interagency Miconia control program on the Island of Maui. The PI-EPMT works with the Maui Invasive Species Committee, using funds from a variety of sources. These funds include state and county agencies, private entities, watershed partnership groups, and Federal agencies. Utilizing partner groups with common goals, the PI-EPMT achieved a six-fold increase in work capacity on the Island of Maui to protect Haleakala National Park from weed invasion.

Figure 28: An excited volunteer pulling invasive pines at Haleakala National Park.

After operating under a unified EPMT command for a number of years, the Miconia control program on Maui is demonstrating the success of the current strategy. Intensive repeat entries into management units via helicopter and ground based crews have lowered the total number of target plants on island. More importantly, areas that receive timely attention show a definitive reduction in the number of mature individuals. Both the breeding population and the existing seed bank have been reduced.

The PI-EPMT and the Maui Invasive Species Committee will be challenged in the next several years to seek additional funding sources to support the interagency Miconia program. A number of non-permanent fund sources became unavailable in 2007. Potentially at stake is an aviation program that provides aerial reconnaissance and control and eight full-time professional partnership staff. Between the

aviation and ground field crews, over 37,000 acres of potentially infested lands were surveyed and treated in 2006 in the continuing effort to protect Haleakala from Miconia invasion.

Outreach activities during the year included numerous presentations on invasive species to professional audiences, state, county and federal partners. Additionally, articles in state and local press highlighted partnership efforts to control invasive species on the Islands of Maui, Molokai and the Big Island. Both MISC and Hawaii Volcanoes National Park employ full time education and public relations specialists to coordinate information dissemination.

Figure 29: Navigators consulting GPS units in dense East Maui rainforest.

Although the PI-EPMT suffered its first lost time injury in 2006, the overall effort continued to maintain a strong safety program by proactively identifying and mitigating risks. In the past six years, the program has logged more than 1,000 hours of high-risk helicopter time with no accidents and deploys in excess of 15 field workers on a daily basis in hazardous terrain with low accident rates.

Invasive non-native plants pose serious threats to isolated island ecosystems such as those found in Hawaii. Prior to human habitation, it is estimated that a new species successfully colonized the archipelago once every 70,000 years. The rate of introduction has increased dramatically with western contact and contemporary global trade. These species can threaten the preservation of intact natural communities and Hawaiian cultural integrity.

For the past six years, the PI-EPMT has played a critical role in developing decontamination protocols to prevent unintentional spread of problem species by utilizing a common-sense approach to integrated pest management and weed risk assessment. Preventing the spread of unwanted weeds is by far the most efficient and effective method of exotic plant management.

The PI-EPMT prevention strategy is based on simple concepts: decontamination, containment and isolation. In each of step of the control process, a risk assessment is performed on the target species to determine:1) The likelihood for unintentional spread of the species and, 2) The potential impacts of a vectoring event. The PI-EPMT bases its risk decisions on a collaborative process with partner entities. Additional levels of prevention are required for species posing a high risk of unintentional spread due to mobile seeds, high germination rates, time to sexual maturity, limited range, and/or limited ability to be detected. The Miconia control project on Maui provides an extreme example of precautionary protocols to prevent the spread of unwanted weeds. Field crews controlling Miconia use only dedicated equipment. The crew itself is largely dedicated to a single project. In addition, equipment is decontaminated on a daily (sometimes hourly) basis, storage and crew facilities are located adjacent to the infestation, rinse water is contained on-site, and all equipment is transported in sealed containers.

The PI-EPMT collaborates with groups that include county, state and federal agencies, Island Invasive Species Committees, and Conservation Partnerships to define incipient threats to National Parks. These collaborative efforts have resulted in the pre-emptive eradication of several invasive plants that would threaten Hawaii's National Parks, such as common mullein and Downy rose myrtle on the Island of Maui. In the case of common mullein on Maui, one individual plant was removed from Haleakala National Park in the 1990's and a few individual plants were recently eradicated in a cultivated setting in close proximity to the national park. All known individuals on Maui have been treated.

In the past two years, PI-EPMT began mapping invasive weeds and initiating control of incipient threats to the newly acquired 116,000 acre Kahuku Ranch portion of Hawaii Volcanoes National Park. As a result, the PI-EPMT took a central role in the management of incipient alien plants in Kahuku. Following the extensive surveys which identified the distribution of approximately 60 target weedy species, the PI-EPMT crew systematically controlled all known individuals of highly disruptive taxa including Octopus tree, African Olive, Pepper tree, California privet and fountain grass. The EPMT developed new control techniques, identified new infestations, and controlled a suite of more widely distributed habitat modifying weeds while maintaining strict decontamination and containment protocols to prevent spreading invasive species.

# Chihuahuan Desert / Shortgrass Prairie

## Exotic Plant Management Team


**Partner Parks:** *Alibates Flint Quarries NM, Amistad NRA, Bent's Old Fort NHS, Big Bend NP, Capulin Volcano NM, Carlsbad Caverns NP, Fort Davis NHS, Guadalupe Mountains NP, Lake Meredith NRA, Washita Battlefield NHS, White Sands NM*

The Chihuahuan Desert/Southern Shortgrass Prairie Exotic Plant Management Team (CDSP-EPMT) serves 11 partner parks spread across 500 miles of the desert southwest. This EPMT was established in the year 2000. Since its inception, the Team has eradicated hundreds of acres of exotic, invasive plants and helped restore native, wildland habitats. To illustrate the significance of this Team's impact, it is important to understand that an acre of exotic salt cedar in the Southwest uses four acre-feet of water every year (approximately 1,300,000 gallons of water). Its removal contributes greatly to restoring native plant communities and saving valuable water resources. These trees must be sawed limb by limb, including the trunk, which is cut within two inches from the soil surface; a herbicide is then applied to the stump. The entire process is slow and arduous. Detailed safety briefings, training, and standard safety practices are followed stringently, which attests to the commendable safety record (no lost-time injuries).

| 2006 Accomplishments | |
|---|---|
| **Inventoried Acres** | 1,581 |
| **Gross Infested Acres** | 1,031 |
| **Infested Acres** | 39 |
| **Treated Acres** | 31 |
| **Monitored Acres** | 830 |
| **Retreated Acres** | 6 |
| **Restored Acres** | 0.4 |

The CDSP-EPMT culminated a very successful year by eradicating several hundred acres of exotic plants from its member parks. Twenty-three projects were completed. In addition to the work conducted on member parks, the Team assisted a number of additional parks in the treatment of exotic plants.

Pecos National Monument is located near Pecos, New Mexico. The CDSP-EPMT along with Student Conservation Association interns assisted with the treatment. The Teams were successful in eradicating the remaining stand of salt cedar from the park, as well as several acres of invasive Scotch thistle. The project was a success.

Figure 30: Treatment of Johnsongrass at Carlsbad Caverns National Park.

Sand Creek National Historic Site is located south of La Junta, Colorado. The CDSP-EPMT assisted the park in the treatment of Russian thistle and salt cedar; both exotic, invasive species. This is a new park with many natural resource management challenges with limited staff.

The CDSP-EPMT conducts outreach and awareness training continually to member parks, schools, and the public. This past spring, the CDSP-EPMT and Student Conservation Association interns conducted training on exotic plants (weeds) to the public during the March for Parks Celebration held in Carlsbad, New Mexico. The presentation, which was held at the Living Desert State Park during Earth Day weekend, explained the impacts caused to our natural and human resources from these exotic, invasive plants.

Outreach and partnership actions continue to enhance the accomplishment record of this CDSP-EPMT. Volunteers and interagency partners contributed several hours and several hundred dollars of funding for weed control efforts in partner parks served by the CDSP-EPMT. The EPMT once again utilized Student Conservation Association interns and assembled a plant management crew at Pecos National Monument in New Mexico for a project. After receiving several hours of training in safety herbicide applications and chainsaw use, the five students worked for six months alongside the National Park Service Exotic Plant Management Team.

The EPMT continues to foster the following partnerships:

- The Bureau of Reclamation (funding of potential biological control treatments, salt cedar removal projects, and restoration),
- The Canadian River Water Authority (in-kind water sampling funding and treatment of salt cedar) and Texas State Parks and Wildlife (in-kind habitat restoration funding),
- The Wild Turkey Federation (funding for project work) and the National Interagency Fire Management Program (funding for prescribed burns and hazard fuels reduction of salt cedar),
- Texas Tech University Cooperative Agreements (monitoring and contractor treatments),
- The World Wildlife Fund, Friends of the Big Bend National Park, and Texas State Parks, (all three provide volunteers and in-kind assistance),
- The Trull Foundation (international salt cedar work including areas in Mexico),
- Colorado State Forestry Division (coordination with private landowners to remove salt cedar),
- The Colorado State Correctional Department crews (inmate labor to conduct salt cedar removal),
- The U.S. Air Force at Holloman Air Force Base (exotic plant management projects on neighboring lands and provides in-kind support of GIS and maps),
- Bureau of Land Management ,
- USDA Forest Service (research, informational bulletins, chainsaw training, and tools and equipment),
- New Mexico State University Cooperative Extension Service (herbicide application training, plant identification, and research on chemicals and treatments),
- Natural Resources Conservation Service (equipment and propagation of native plant seed) and,
- Sul Ross State University (plant propagation services).

The following cooperative partnership activities were accomplished during the 2006 field season:

- The State of New Mexico Living Desert State Park provided a venue to the National Park Service EPMT/Student Conservation Association crew to present outreach training to the local public, and
- The CDSP-EPMT Liaison assisted USDA, Agricultural Research Service with the Salt Cedar Biological Control Symposium in Austin, Texas and provided assistance to the development of long-range planning for use of biological control treatments on salt cedar.

The Team assisted the Chihuahuan Desert Network Inventory and Monitoring in implementing NPS "Vital Signs" for future planning.

The CDSP- EPMT continues to assist our host park, Carlsbad Caverns National Park in presenting the "ParKids" summer program on exotic plants.

Figure 31: NPS presenting awareness training to 3rd and 4th graders during ParkKids.

The CDSP-EPMT/Student Conservation Association were featured in three articles regarding exotic plant management and control projects, within the National Parks.

The CDSP-EPMT Liaison assisted coordinating the signing of the Eddy County Interagency Weed Memorandum of Understanding. Carlsbad Caverns and Guadalupe Mountains National Parks are signatories to this important plan.

# Colorado Plateau

## Exotic Plant Management Team


***Partner Parks**: Aztec Ruins NM, Bandelier NM, Black Canyon of the Gunnison NP, Canyon De Chelly NM, Chaco Culture NHP, Colorado NM, Curecanti NRA, Dinosaur NM, El Malpais NM, El Morro NM, Glen Canyon NRA, Grand Canyon NP, Hubbell Trading Post NHS, Mesa Verde NP, Petrified Forest NP, Rainbow Bridge NM, Sunset Crater Volcano NM, Walnut Canyon NM, Wupatki NM, Yucca House NM*

The Colorado Plateau-Petrified Forest Exotic Plant Management Team (CPPF-EPMT) conducted invasive species control projects at thirteen park sites this year which included: Grand Canyon National Park, Glen Canyon National Recreation

| 2006 Accomplishments | |
|---|---|
| **Inventoried Acres** | 2,982 |
| **Gross Infested Acres** | 2,866 |
| **Infested Acres** | 257 |
| **Treated Acres** | 153 |
| **Monitored Acres** | 77 |
| **Retreated Acres** | 0 |
| **Restored Acres** | 0 |

Area, Petrified Forest National Park, El Malpais National Monument, Dinosaur National Monument, Black Canyon of the Gunnison National Recreation Area, Mesa Verde National Park, Montezuma Castle National Monument, Wapatki National Monument, Sunset Crater National Monument, Chaco Culture National Monument, Canyon de Chelly National Monument, and Colorado National Monument. The NPS crew was assisted on some projects by public land corps groups from Coconino Rural Environment Corps (Flagstaff, AZ), Southwest Youth Corps (Durango, CO), Rocky Mountain Youth Corps (Steamboat Springs, CO), Utah Conservation Corps (Logan, UT), Western Colorado Conservation Corps (Grand Junction, CO), as well as the Navajo Nation NPS crew out from Canyon de Chelly.

Crews worked on removing and treating tamarisk (salt cedar), Siberian elm, spotted knapweed, bull thistles, malta star thistle, sweet clover, arundo, Russian thistle, ravenna grass, Russian olive, Russian knapweed, musk thistle, camelthorn, Canada thistle, field bindweed, perennial pepperweed, tree of heaven and hoary cress infestations.

Consultation and project planning assistance provided to parks included site visits to Flagstaff Area parks (Wapatki, Sunset Crater and Walnut Canyon National Monuments), El Malpais, Hubbell Trading Post, Montezuma Castle and Well, Tuzigoot, and Aztec Ruins National Parks and Monuments.

Figure 32: Tamarisk islands on the Gunnison River, Black Canyon of the Gunnison N.P.

The first large-scale tamarisk removal at Chaco Culture resulted in 50 percent of the standing tamarisk removed in Kin Bineola Wash. In addition, the first treatment of perennial pepperweed occurred at the monument. The pepperweed was first reported in 2004.

At Colorado National Monument, all tamarisk removal is complete and has shifted to monitoring status. The tamarisk has been treated and retreated and seems to be under control at this time.

Black Canyon of the Gunnison remains one of our most challenging projects logistically. Control sites are in a remote area at river level, which is reached

by a steep and somewhat treacherous "route". The rough terrain precludes safely packing in equipment on foot. Once in the canyon, high water level and rapid currents make movement to the various tamarisk sites difficult. Large plants are often located on islands in the river and are washed by the swift-moving river waters.

To solve some of the access difficulties, we contracted a helicopter to sling load in the chainsaws, backpack sprayers, herbicide, personal camping equipment, a raft, and some personnel. The raft was used to ferry personnel and gear back and forth across river. The park provided personnel and logistical support such as rangers for river crossing, helicopter manager, and heliteck personnel.

Figure 33: Helicopter transport at Black Canyon of the Gunnison N.P.

Wading through waist-deep, fast-moving water to get to the islands with backpack sprayers and chainsaws was extremely challenging. We believe next year we will need kayaks to cut remaining tamarisk since rafts cannot be moved upstream due to large boulder fields.

Ravenna grass (Saccharum ravennae) was introduced into Glen Canyon National Recreation Area as an ornamental grass by the National Park Service in the 1970's. It was first planted at the Wahweap Marina employee housing area. Since then it has spread from the original planting to areas throughout Lake Powell. Some populations are found up to 60 miles up lake from the original planting. Vectors for spread are not known at this time, but wildlife and people are the main suspects. Park staff has recognized it as a problem for some time, but manual control has been the only control option attempted by the park. The plant has moved into extremely rocky terrain where manual removal has proven difficult. CPPF-EPMT attempted manual control on the lake with Utah Conservation Corps during the summer of 2005. Chemical control using herbicides was discussed with park staff as a possible alternative to manual control.

CPPF-EPMT attempted to locate herbicide control options for Ravenna grass in weed science literature, but was unsuccessful. After discussing control possibilities with weed scientists, we decided to test various herbicides and strengths based upon successes with other similar ornamental grasses.

Plots were established in the Wahweap area of the park. Two brands of herbicides were used at two different concentrations:1 percent Habitat, 5 percent Habitat, 1 percent Rodeo, and 5 percent Rodeo. The surfactant used was Kinetic at the specified label rate. Forty plants of various sizes were sprayed in late April using backpack sprayers. The plots were read in July and late September. Results were mixed with all herbicides tested but 5 percent habitat exhibited the best control of all mixtures tested with around 50 percent effectiveness. All other mixtures resulted in fewer than 10 percent control. A possible reason for the low effectiveness was there was not enough green-up of the plants. A fall treatment was applied in late September 2006 with 5 percent Habitat. Plots will be read in Spring 2007 to determine efficacy.

# Gulf Coast

## Exotic Plant Management Team


**Partner Parks:** *Big Thicket N PRES, Gulf Islands NS, Jean Lafitte NHP & PRES, Lyndon B. Johnson NHP, Natchez Trace PKWY, Natchez Trace NST, San Antonio Missions NHS, Vicksburg NMP*

The Gulf Coast Exotic Plant Management Team (GC-EPMT) is situated in a region of relatively warm year round temperatures, high precipitation, and high plant diversity, including a high diversity of exotic vegetation. As a result, we employ a strategy of early detection and early eradication. New species of exotic vegetation are discovered annually in our parks and we make every effort to eradicate those new exotic populations before they have a chance to spread to a larger area. Exotic species that have become well established in our parks are managed by a strategy of containment to avoid further spreading into undisturbed native plant communities.

| 2006 Accomplishments | |
|---|---|
| **Inventoried Acres** | 3,397 |
| **Gross Infested Acres** | 2,389 |
| **Infested Acres** | 246 |
| **Treated Acres** | 180 |
| **Monitored Acres** | 104 |
| **Retreated Acres** | 4 |
| **Restored Acres** | 0.5 |

Exotic species of concern vary by geography but include Chinaberry tree, Japanese privet, giant cane and Johnson grass in our western upland parks. Coastal park invasive species of concern include: Japanese climbing fern, cogon grass, Chinese privet, mimosa tree, and Japanese honeysuckle. Chinese tallow tree is expanding rapidly after damage to trees from hurricanes Katrina and Rita. Kudzu is spreading throughout parks in the interior humid south but is also growing in importance at coastal parks.

Control techniques thus far have concentrated on chemical methods utilizing an understanding of each species ecology and growth habits. Biological controls for the species in our region are not yet well developed and mechanical methods have not proven effective. An effort to identify a biological control for Chinese tallow tree was initiated this year in cooperation with the Florida Exotic Plant Management Team and utilizing the expertise of the USDA Agricultural Research Service.

Partnerships with the Lower Neches Valley Authority, Big Thicket Association, Nature Conservancy, Texas Parks and Wildlife Department, AmeriCorps, American Youthworks, Rice University, and other National Park Service units within our area have helped to supplement our efforts and improve our efficiency. These partnerships have also aided in our outreach efforts, generating interest in our work from outside parties.

Figure 34: The 20.5 acre Voth Mill site was obscured by an understory of Chinese privet that has been removed revealing building structural features and artifacts.

Control efforts at Big Thicket National Preserve for 2006 concentrated on removal of Chinese privet at the Voth Mill site in the Beaumont unit. The Team was successful in achieving and exceeding the parks GPRA goals for exotic plant management and assisted with the with the cultural resource objectives of the park. The work also facilitated the first phase restoration objectives for the mill site to be followed by development of an interpretive trail system.

Notable advances from this year's effort include partnerships with McDaniel College, the National Wildlife Federation and AmeriCorps volunteers to remove 15 acres of Chinese tallow tree from the Jean Lafitte Barataria Preserve. The goal of the project was to reduce the number of mature seed bearing Chinese tallow trees in an effort to head off the impending invasion. Other advances include expansion of projects at National Park Service units outside of the partner park network that have greatly increased our efficiency by providing staging areas to perform work at our partner parks and allowed the addition of a satellite team to reduce travel costs.

This was the fifth and most productive year of the GC-EPMT. The lessons learned from previous years were employed to improve efficiency and help establish appropriate work priorities. New methodologies have been developed to expand our operation to aquatic exotic species which are a particular concern in our region.

Numerous volunteer groups assisted the GC-EPMT this year, the largest contribution thus far to the Team. Volunteers from McDaniel College in Westminster, Maryland assisted in the treatment of Chinese Tallow trees (*Triadica sebifera*) in the Barataria Unit of Jean Lafitte NHP. The volunteers, in coordination with Jean Lafitte NHP and the GC-EPMT, helped eliminate the exotic invasive tree along 1,130 meters of Hurricane 'V' Levee.

In another example, 19 National Wildlife Federation volunteers participated in "Restoration Day- Lending a Hand to New Orleans" at Jean Lafitte National Historical Park on March 18, 2006. The volunteers helped remove Chinese Tallow from over four acres of riparian habitat at the Barataria Preserve.

The success of the National Wildlife Federation partnership led to the formation of a joint effort between the GC-EPMT, Jean Lafitte National Historic Park, and AmeriCorps during April and May 2006 to curb the spread of Chinese Tallow in the wake of Hurricane Katrina.

High winds from Hurricane Katrina caused significant blow down in the Preserve and opened the tree canopy. With more light reaching the ground, the potential for exotic plant invasion, especially of Chinese Tallow increased particularly in previously undisturbed areas. Continued efforts from the park, EPMT, and volunteer resources will be necessary to manage the threat. The volunteers were taught to identify Chinese Tallow, proper treatment methods, and safety precautions by members of the GC-EPMT.

The GC-EPMT has become involved in a national effort to curb and/or prevent the spread of exotic vegetation into National Park properties. Invasive exotic vegetation in the eastern third of the nation largely results from escaped ornamental and horticultural plants. In an effort to curb this trend and provide defensible buffers to National Park units, "PlantWise" was developed.


Figure 35: A Gulf Coast EPMT member, supported by National Wildlife Federation volunteers, cuts into the bark of a Chinese Tallow before a cambium treatment of herbicide.

In November 2005, experts representing a variety of constituencies gathered at the Lady Bird Johnson Wildflower Center in Austin, Texas, to develop a public education program focused on controlling the spread of invasive plants across the urban-wildland interface. The participants developed a set of invasive plant best management practices for public use. The development of a web-accessed, community education program on invasive plant management such as the successful "Firewise" or Litter prevention campaigns will help communities, agencies, and nongovernmental organizations manage their invasive plant problems by providing them with educational materials. The materials outline the problem of how homeowners and landowners can prevent introduction of invasive species, how to manage their landscapes in the presence of introductions, and how to use native plants or non-invasive plants as an alternative.

"*Be PlantWise*" is a partnership between the National Park Service, Lady Bird Johnson Wildflower Center, Garden Club of America, Student Conservation Association, and the Center for Plant Conservation to educate the public and communities about best management practices to control harmful invasive plants from invading parklands and natural areas.

# Lake Mead

## Exotic Plant Management Team


**Partner Parks:** *Arches NP, Bryce Canyon NP, Canyonlands NP, Capitol Reef NP, Cedar Breaks NM, Death Valley NP, Great Basin NP, Hovenweep NM, Joshua Tree NP, Lake Mead NRA, Manzanar NHS, Mojave NP, Natural Bridges NM, Parashant NM, Pipe Spring NM, Timpanogos Cave NM, Zion NP*

The Lake Mead EPMT (LM-EPMT) continues to emphasize weed control within high value biologically important riparian habitats. Selective weed control treatments in these sensitive habitats using highly trained NPS employed crews has proven to be very effective and efficient. Tamarisk or salt cedar is a widespread invader of riparian areas throughout the West which consumes vast amounts of water and displaces native plant communities. Long term monitoring, for more than 15 years, has proven that tamarisk control consistently produces more than 90 percent mortality after initial treatments and minimal follow up treatments are necessary to maintain tamarisk free sites. The strategy of the Team is to systematically remove high priority exotic invasive species from drainages within each partner park and to collaborate with adjacent land agencies to effectively manage weeds beyond park boundaries using a watershed approach.

| 2006 Accomplishments | |
|---|---|
| **Inventoried Acres** | 186,153 |
| **Gross Infested Acres** | 1,059 |
| **Infested Acres** | 338 |
| **Treated Acres** | 164 |
| **Monitored Acres** | 3,583 |
| **Retreated Acres** | 10 |
| **Restored Acres** | 6 |

In order to improve efficiency, other federal agencies and local entities have developed partnerships with the LA-EPMT to effectively manage weeds across watersheds and agency boundaries. The LA-EPMT conducts interagency weed control projects for five million acres of federal and county land in Southern Nevada. These partners include the Southern Nevada Water Authority, Clark County Wetlands Park, and Nature Preserve, Bureau of Land Management, USDA Forest Service, U.S. Fish and Wildlife Service, the Bureau of Reclamation, and the City of Henderson, Nevada. These partnerships not only facilitate effective weed management across boundaries but also reduce the amount of infrastructure and overhead costs if each agency or entity took a separate approach on their own. The result of this partnering is more money being spent on the ground controlling weeds. The LA-EPMT has leveraged NPS funds at a 1:3 ratio through these various partnerships. Funding to facilitate these partnerships comes from multiple sources including Clark County, Nevada, and the Southern Nevada Public Lands Management Act. These additional funds enable the LA-EPMT to increase the number of field crews and thus the Team's capacity to accomplish more weed control treatment acres while at partner NPS units.

Figure 36: Cutting tamarisk.

Restoration and maintenance of native plant communities are the Team's priority. The Team continues to focus its efforts on protecting and preserving native plant habitats by controlling weeds that threaten their existence. Most of our projects are conducted in native plant dominated systems that have not been completely displaced by weeds. If weed control actions are not implemented in these areas, the trend shows most of these weed species will eventually displace the

native plant communities. Through many years of monitoring, we have observed native plants such as cottonwood, willows, mesquite, and other shrubs and grasses expand into our weed control project areas via natural colonization. The Team has planted nearly 1,000 native trees and seeded with native grasses to aid in the establishment of desirable vegetation when native plant propagules are severely depleted.

The Liaison was requested to conduct weed assessments at seven Arizona NPS Units. Weed priorities and control strategies were assessed and many projects were outlined that could be ideal for EPMT support to these parks. Several high priority weed species can be easily eradicated at a few of the parks with support from an EPMT. Future EPMT partnership possibilities and options were discussed during this trip as none of these parks are officially included in an EPMT network.

The LA-EPMT was started in 1996 and has been in existence for ten years when including the NPS Natural Resource Preservation Project funding (NRPP). The Team is primarily responsible for eradicating tamarisk to maintenance levels in seven of its past and previous partner NPS Units.

Figure 37: Treating 200 acres of tamarisk resprouts after wildfire at Valentine Bottom on the Green River, Canyonlands NP, Utah.

Several exotic weeds are responsible for fueling and spreading wildfires including cheatgrass (Bromus spp.) and tamarisk, both of which are fire tolerant and will recolonize quickly after fire. Fires, in general, create disturbances that allow weeds to establish on the landscape including areas not previously occupied prior to the fire. The LA-EPMT has partnered with several agencies and parks to assist with weed treatments following a wildfire event. Following are examples of post fire weed management to facilitate restoration:

- Zion NP: Cleartrap Fire, cheatgrass treatment
- Mojave NP: Hackberry Fire, multiple species monitoring and treatment
- Canyonlands NP: Valentine Bottom Fire, tamarisk treatment
- Ash Meadows NWR (USFWS): Longstreet Fire, Russian Knapweed treatments, Nevada Bureau of Land Management: Southern NV Complex fires, strategic planning

The LA-EPMT is assisting with conducting research evaluating control methods on some of the most challenging and difficult weed species. The Team is partnering with the United States Geological Survey (USGS), Western Ecological Research Center based in Henderson, Nevada.

Ripgut Brome and Cheatgrass dominate the understory of the Virgin River Canyon creating a wildfire hazard and inhibiting desirable plant establishment. The project is evaluating combinations of herbicides and application timing, pre-treatments, seeding, and prescribed burning. Preliminary results indicate that burning followed by herbicide application may be most effective. The information obtained from this research will aid weed managers beyond NPS boundaries.

A second research project on Sahara mustard (*Brassica tourneforti*), is exploring the explosion of exotic annual forbs throughout the deserts of California, Nevada and Arizona. These nonnative forbs may replace native wildflowers and alter habitat for the desert tortoise. The project is a cooperative effort between the Bureau of Land Management, the US Geological Service, and the LA-EPMT; funding support is from the Southern Nevada Public Lands Management Act. The study will evaluate multiple herbicides and treatment methods.

Figure 38: Spraying annual brome grass research plots at Zion NP, Utah.

The Team is also cooperating with Ash Meadows National Wildlife Refuge, U.S. Geological Service, and DOW Chemical on the control of Russian knapweed, a difficult weed to control. The study will evaluate multiple herbicides, treatment timings including response to desirable species.

# Northern Rocky Mountain
## Exotic Plant Management Team


**Partner Parks:** *Bear Paw Battlefield, Big Hole NB, Big Horn Canyon NRA, City of Rocks N RES, Craters of Moon NM, Fossil Butte NM, Glacier NP, Golden Spike NHS, Grand Teton NP, Grant-Kohrs Ranch NHS, Hagerman Fossil Beds NM, John D. Rockefeller Jr. Memorial PKWY, Little Bighorn Battlefield NM, Minidoka Internment NM, Yellowstone NP*

The Northern Rocky Mountain Exotic Plant Management Team (NRM-EPMT) just completed its fourth year of operation serving 15 partner national parks in the states of Idaho, Montana, Utah, and Wyoming. These parks vary from high desert to mountain forest, alpine and sub-alpine meadow, sagebrush-steppe, and wetland and riparian areas to unique hydrothermal communities. Covering more than four million acres and serving millions of visitors, these national treasures are constantly threatened by invasion of non-native weeds. In order to serve such a broad geographic area, the NRM-EPMT Team is divided into three satellite crews, which are guided by the Liaison Officer. Each of the satellite crews is based at one of the host parks: Yellowstone National Park, Glacier National Park or Craters of the Moon National Monument and Preserve. The NRM-EPMT satellite crew model increases our team's efficiency and enables us to better assist our partner parks in the large four-state area; therefore, more of our time is spent working *in* the parks instead of traveling *to* the parks.

| 2006 Accomplishments | |
|---|---|
| **Inventoried Acres** | 14,134 |
| **Gross Infested Acres** | 5,662 |
| **Infested Acres** | 587 |
| **Treated Acres** | 508 |
| **Monitored Acres** | 1,060 |
| **Retreated Acres** | 0.7 |
| **Restored Acres** | 1 |

During the 2006 season, our focus was placed on improving service to our partner parks. The NRM-EPMT located and treated more than 46 different species of invasive weeds during our relatively short season. In 2003, our first year, we inventoried 9,169 acres and in 2006, we inventoried 14,134 acres, a 64 percent increase in productivity. Our treated acres also grew by more than seven-fold from an initial 67 acres in 2003 to 508 acres treated in 2006. This increase in the number of acres inventoried and treated is due to our enhanced knowledge of the parks and improved communication with their staff, better equipment usage, improved data management, and decreased travel time. In a nutshell, we have become more efficient and effective at maximizing field time, finding invaders and removing them.

Figure 39: Monitoring, mapping and treating leafy spurge at Craters of the Moon National Monument and Preserve.

In response to our management actions, we have observed a marked decrease in the size of priority infestations in many of the parks. When the infestations were detected early and treated before many plants became established, we prevented their spread. In 2004 and 2005, we identified and hand-pulled two small infestations of yellow starthistle at Minidoka Internment National Monument. In 2006, we were unable to find a single yellow starthistle plant. Although this infestation of yellow starthistle is currently controlled, annual monitoring of these sites will remain a high priority for many years due to the existence and longevity of seed in the soil. In Grand Teton National Park, we are providing technical expertise for large implementation projects, which help to prevent the spread of

invasive non-native plants throughout the park. We focus on highly disturbed travel corridor areas such as gravel pits, sewage treatment lagoons, campsites, trails, and roadsides. Elimination of exotic plants at gravel pits helps prevent the park's construction projects from becoming future weed management projects. Prevention is the least expensive tool in weed management and yields the greatest returns.

Partnerships remain important to our Team. We continue to participate in Cooperative Weed Management Areas, which include national park lands. The NRM-EPMT participated in several cooperative weed management area projects to monitor, map and control leafy spurge, knapweeds, thistles, and rush skeletonweed. Visitor education, training of park staff in various exotic plant management techniques, and making weed management recommendations remain a significant part of our service our partner parks. The NRM-EPMT appreciates the continued support and cooperation of the partner parks, Inventory and Monitoring program, Intermountain and Pacific West Regional Offices, WASO-Biological Resources Management Division, and support from the Natural Resource Challenge.

Figure 40: Treating spotted knapweed and thistles at Glacier National Park.

The major role for the Northern Rocky Mountain Exotic Plant Management Team is to assist partner parks in the control of exotic invasive plants and noxious weeds. Partner parks without weed management staff support, such as Golden Spike National Historic Site, Hagerman Fossil Beds National Monument, Minidoka Internment National Monument, and City of Rocks National Reserve rely largely on the NRM-EPMT to implement an integrated weed control program.

Our Team is well trained in safe and effective control tactics for the wide array of exotic weeds found in the parks.

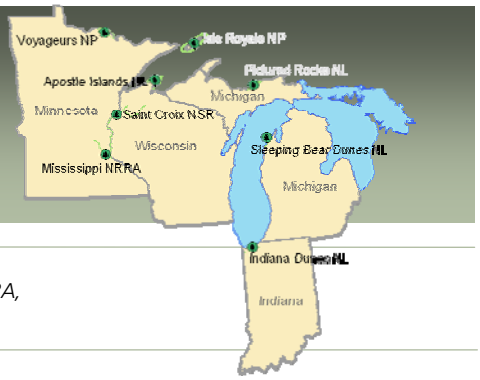
Figure 41: Team project treating leafy spurge and yellow toadflax at Grant- Kohrs Ranch National Historic Site.

The following parks are relatively weed-free: Big Hole, Little Bighorn National Battlefields, and Craters of the Moon National Monument and Preserve. At these parks, we focus on early detection of new invaders and a rapid treatment when any new exotics are found. These efforts can be time intensive, but the most successful control occurs when weed infestations are treated early, while the population and seed bank are small. Once these small control efforts are successful, we can then expand our areas of treatment, partner with Cooperative Weed Management Areas, and begin to battle larger infestations that threaten park resources.

In September of this year, the entire ten-person NRM-EPMT began the first phase of a large riparian control and restoration project at the Grant-Kohrs Ranch National Historic Site. The riparian area here is a haven for white-tailed deer, sand hill cranes, and many other animals. It is heavily infested with leafy spurge and yellow toadflax, which are state-listed noxious weeds in Montana. As part of the efforts to reclaim this important river corridor, the Team dedicated 384 person hours treating 80.5 acres of weeds in the more than 200-acre riparian area. Follow up to the control treatments will include annual monitoring for treatment effectiveness and additional herbicide treatments, as necessary. The goal of this large project is to remove and/or control the leafy spurge and yellow toadflax; releasing the willow, trees, sedges, grasses, and other native plants. This will give desirable plants an edge at winning the battle against these invasive non-native plants.

# Great Lakes

## Exotic Plant Management Team




**Partner Parks:** *Apostle Islands NL, Indiana Dunes NL, Isle Royale NP, Mississippi NRRA, Pictured Rocks NL, Saint Croix NSR, Sleeping Bear Dunes NL, Voyageurs NP*

The Great Lakes Exotic Plant Management Team (GL-EPMT) serves eight National Parks located in four states in the western Great Lakes Region. Some of the parks such as Isle Royale National Park are predominantly wilderness and relatively unencumbered by exotic plants, whereas other parks such as Indiana Dunes National Lakeshore, exist in a mosaic of both urban and natural areas. The Great Lakes parks, extending from the boreal forest of northern Minnesota to the sand dunes of southern Lake Michigan, also work in association with the Great Lakes Network Inventory and Monitoring Program. Co-location of the GL-EPMT and Inventory and Monitoring Network in Ashland, Wisconsin, provides the opportunity for the two programs to work closely together, taking advantage of shared positions and functions.

| 2006 Accomplishments | |
|---|---|
| **Inventoried Acres** | 323 |
| **Gross Infested Acres** | 309 |
| **Infested Acres** | 63 |
| **Treated Acres** | 45 |
| **Monitored Acres** | 50 |
| **Retreated Acres** | 0.1 |
| **Restored Acres** | 0 |

This past field season (2006) marked the third year that seasonal crews worked in parks served by the GL-EPMT. These repeated visits have brought a noticeable population decline in many of the park's most problematic plant species. The density of mountain bluet, a cultural escapee form the Rock Harbor area in Isle Royale National Park, has dropped 95 percent since the Team began its efforts there. The amount of Canada thistle along the roadsides at Voyageurs National Park has also been reduced by over half. Garlic mustard spread at Sleeping Bear Dunes has been halted with annual control efforts and the population is in decline.

Each year the Team has been on the ground has brought an increased efficiency in Team activity. Despite the transportation logistics of working in water-dominated landscapes, the Team has been able to double the number of acres treated annually since its initiation. The Team has extended its expertise to assisting other national parks outside the Great Lakes area by assisting with plant identification, herbicide training and other integrated pest management strategies.

Figure 42: Early season treatment of buckthorn at a partner National Wildlife Refuge.

Partnerships continue to play an important role in the GL-EPMT program. The Northwoods Cooperative Weed Management Association entered into official status in May 2006 with over 22 agencies, tribes, organizations, and cooperators signing on to target invasive species in the four northern counties of Wisconsin. Parks served by this cooperation include Apostle Islands National Lakeshore and St. Croix National Scenic Riverway. Region-wide, the GL-EPMT program is working with the Midwest Natural Resources Group Committee on terrestrial invasive species. This group is focusing its efforts on building a communication structure and sharing resources among federal agencies.

The GL-EPMT has benefited from a third year of cooperation with the Student Conservation Association. A crew of four individuals inventoried and treated exotic plant species at Sleeping Bear Dunes and Pictured Rocks National Lakeshores. Additionally, control work by the GL-EPMT at a local Fish and Wildlife Service Refuge provided important early season training for both NPS and Fish and Wildlife Staff. Work at the Mississippi National Riverway and Recreation Area, an urban management area, continued in cooperation with several city and county parks in the watershed.

Purple loosestrife has been present at Voyageurs National Park since the park's inception in 1975. By the late 1980's, at least 130 acres of west Kabetogema Lake were infested with purple loosestrife, with over 100,000 plants per acre found at some locations. Large-scale control efforts by park staff and volunteers began in 1989. These efforts consisted of both manual control and the use of herbicides, and resulted in a large reduction in the overall amount of this plant.

However, annual herbicide use was discontinued in 1997 due to cost and difficulty in maintaining appropriate applicator certification. Only limited manual control has been conducted annually since. Biocontrol agents (beetles) were released in 2000, but overall effectiveness has not been assessed since 2003. In 2006, park staff requested GL-EPMT visit historically infested areas (and in many cases currently infested) with purple loosestrife, map, and treat these areas with herbicides.

Figure 43: Monitoring, mapping and treating purple loosestrife at Voyageurs National Park.

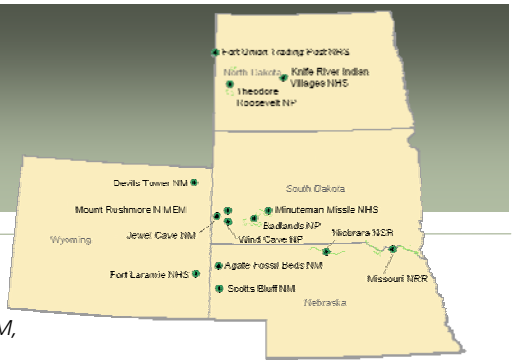
With assistance from park staff and park volunteers, the GL-EPMT was able to visit nearly all areas on Kabetogema Lake designated for purple loosestrife control. Purple loosestrife was found at all areas, albeit mostly at very low levels, and all plants were mapped and treated with herbicide when found. These areas had not been treated in almost ten years. The Team was also able to confirm the presence of beetles, and qualitatively assess that damage to purple loosestrife by beetles was significant in areas where they were released six years prior. In conclusion, the Team was able to re-initiate large-scale purple loosestrife control and confirm that earlier (herbicide and manual) and ongoing (mainly biocontrol) efforts were largely successful. This information, including recommendations provided by the GL-EPMT, will allow park staff to more effectively allocate staff time and limited funding to continue purple loosestrife control.

The Great Lakes Exotic Plant Management Team has focused the majority of its efforts in the control of exotic plants. Due to the geographical position of the Great Lakes parks away from coastal invasion hotspots and their restrictive northern climates, this suite of parks is relatively unencumbered by the number of species and scale of infestations that often affect other parks. As such, the emphasis of the GL-EPMT has been on the early detection and rapid response to new invaders. Finding and eradicating emerging populations before they become full blown infestations is, overall, one of the most cost effective strategies for invasive species management. In most cases ecosystem integrity is preserved, destructive control methods are not used, herbicide use is restricted to spot applications, and costly large-scale restoration efforts are not needed, as the natural environment is able to bounce back with just a little added assistance.

While this approach preserves the ecosystem to the greatest extent and has the lowest long-term costs, it is not without its downside. The short-term costs of such a program on a per treated acre basis are high. For example, the effort to find and treat one square meter patch of spotted knapweed on 159 miles of backcountry trails in the wilderness of Isle Royale National Park costs as much as an aerial treatment of 15 acres with herbicide in a western park. However, that one square meter patch spread to 15 acres in the designated wilderness area of Isle Royale National Park, the cost for treatment and restoration of a large-scale effort in such a remote location would be astronomical. It is through estimates such as these that the GL-EPMT leverages its efforts to have the greatest impact over a long period.

# Northern Great Plains

## Exotic Plant Management Team




**Partner Parks:** *Agate Fossil Beds NM, Badlands NP, Devils Tower NM, Fort Laramie NHS, Fort Union Trading Post NHS, Jewel Cave NM, Knife River Indian Villages NHS, Minuteman Missile NHS, Missouri NRR, Mount Rushmore NM, Niobrara NSR, Scotts Bluff NM, Theodore Roosevelt NP, Wind Cave NP*

The Northern Great Plains Exotic Plant Management Team (NGP-EPMT) has multiple goals, all of which revolve around controlling the spread of invasive species and restoring areas to native plant communities. The Team emphasizes

| 2006 Accomplishments | |
|---|---|
| **Inventoried Acres** | 42,432 |
| **Gross Infested Acres** | 4,118 |
| **Infested Acres** | 3,435 |
| **Treated Acres** | 3,407 |
| **Monitored Acres** | 0 |
| **Retreated Acres** | 26 |
| **Restored Acres** | 109 |

and uses Integrated Pest Management techniques for systematic long-term management and control of invasive species. This approach resulted in the Team completing a Northern Great Plains Exotic Plant Management Plan and Environmental Assessment, signed by the Midwest and Intermountain Regional Directors in September of 2005. The intent of the plan is to manage exotic plants using an Integrated Pest Management approach. The Northern Great Plains Team consists of 14 NPS units in four states and two regions consisting of 452,567 acres. The Team was established in 2002 and has concentrated the majority of our efforts on two particular species, Canada thistle and leafy spurge, although numerous other species such as tamarisk and Russian olive are treated as well. The parks and the Team are seeing tremendous control and recovery of native species on sites the Team has prioritized for treatment. However, due to long seed viabilities in the species the Team controls, repeated treatments are necessary for many years until the seed bank is depleted or at an acceptable level.

Since its inception, the Team has conducted several projects that have nearly eradicated certain invasive species populations. The Team cut down and treated 198 tamarisk and 1,370 Russian olive trees at Fort Laramie National Historic Site from 2003 through 2006. Significant and nearly complete eradication of these species has occurred at Fort Laramie. The Team also concentrated significant efforts on control of Canada thistle and was able to treat every Canada thistle infestation known in 2006.

Figure 44: Leafy Spurge Infestation at Theodore Roosevelt National Park.

A similar project was completed at Scottsbluff National Monument, where the Team treated 1,972 Russian olive trees and 256 tamarisk plants.

The Team has treated high priority areas of leafy spurge at Devils Tower National Monument using chemical and biological control methods. During the past five years, herbicides were applied and over 2.5 million flea beetles were released. The result has been a significant decrease in areas infested with leafy spurge. Decreased levels are notable throughout the floodplain near the park entrance and campground, where a previous yellow "blanket" of leafy spurge is being replaced with native grasses. Since 2002, the Team has collected and released over 15 million biological control agents for leafy spurge control.

The Team prides itself on efficiency, cost-effectiveness, and safe operations. Leading to the overall efficiency is yearly training and yearly refinements of the Team's Standard Operating Procedures. Standard Operating Procedures were developed for data collection, travel, timesheets, photo points, file naming convention, data submission, chemical application, and GIS management. Although this is only a partial list, advancements in the procedures for the Team have continually enhanced the Team's overall efficiency and cost-effectiveness.

In 2006 the NGP-EPMT was involved in several outreach programs. The Team gave two presentations regarding activities to all partner parks and host park personnel at the annual meeting in February2006 as well as a presentation at the North Dakota Weed Control Association Meeting. Several INSIDE NPS news releases were developed and submitted. The Team and park were featured in several local newspapers regarding the Team's activities. In all, the greatest accomplishment in 2006 was treating a record 3,900 acres, the best year yet for acres treated by the Team. To date, the Team has treated nearly 13,000 acres. The Team's accomplishments have relied on strong support at each park. This year (2006) was no different as the Team received exceptional assistance in the field, office, and financially from the parks. We could not have treated as many acres as we did without the assistance of the parks!

The Team implements an Integrated Pest Management approach using "all the tools" including biological controls, mechanical, cultural, prevention, and chemical controls to manage a wide range of invasive species in the northern Great Plains. The NGP-EPMT concentrates much of its time on control of invasive species on prioritized areas and priority species. In earlier years, the Team struggled to gain a handle on the logistics of managing invasive plants, personnel, and equipment amongst parks. The Team has become much more effective with experience. The key to invasive plant control is timing – using the right technique at the right time. The Team now moves crews from park to park when the timing is right to achieve the best results.

Leafy spurge, for example, is an invasive species that has a deep root system and can be very difficult to control. Its seeds can lie dormant in the ground and produce seedlings as long as eight years after deposit and, when seed pods burst, the seeds can fly15 feet away from the plant. Timing of control for this species is critical. The Team gets assistance from the Montana Conservation Corp for additional help during this critical timeframe.

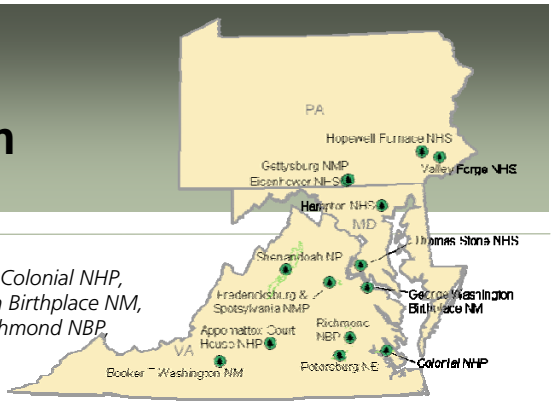
This weed can be found throughout the Theodore Roosevelt National Park; however, the Team has targeted areas where the weed could easily spread. Waterways, roads, bikeways, hiking trails, and horseback riding trails are the key targets because they provide the means for leafy spurge seeds to be picked up and transported somewhere else both within and outside the park; hence these become priority areas. The high-priority targets include areas around campsites and along the Little Missouri River, which flows through the park. Other priority locations include remote locations, rough terrain and Wilderness Areas, sites that are difficult to reach on foot, bike, or horseback ground crews. The major drainages that flow into the Little Missouri River such as Paddock Creek, Jones Creek, Knutson Creek, Government Creek, and Sheep Creek also become important treatment areas. Helicopter application becomes a necessity for a park like Theodore Roosevelt and Badlands. In Theodore Roosevelt National Park alone, the Team has treated nearly 5,000 acres of leafy spurge from 2002-2006 using biological control agents, herbicide application via backpack sprayers, ATV mounted sprayers, and helicopters.

Figure 45: Spraying using ATVs.

The Team also conducted restoration projects, specifically at Knife River Indian Villages and Fort Union Trading Post National Historic Sites. These areas were dominated by three exotic plants: smooth brome, crested wheatgrass and Kentucky bluegrass. This project will provide visitors with a more accurate presentation of Knife River's 19th century landscape. The project started in April 2004 with a prescribed fire, followed by two herbicide applications in May and September 2004. Selected areas were retreated with herbicide in May and seeded in June 2005. The area and environmental conditions were mapped. The Team developed a seed mix that contained not only species that will do well in those areas but were also culturally important to the Mandan, Hidatsa, and Arikara Indians that once occupied the area. In all, ten warm-and cool season grasses were seeded along with 34 native forbs and legumes.

# Mid-Atlantic

## Exotic Plant Management Team




**Partner Parks:** *Appomattox Court House NHP, Booker T. Washington NM, Colonial NHP, Eisenhower NHS, Fredericksburg and Spotsylvania NMP, George Washington Birthplace NM, Gettysburg NMP, Hampton NHS, Hopewell Furnace NHS, Petersburg NB, Richmond NBP, Shenandoah NP, Thomas Stone NHS, Valley Forge NHP*

The Mid-Atlantic Cooperative has formed a durable model in their four-year history. The Cooperative's span has grown from 11 parks in 2003 to 14 parks this year. That expansion was

| 2006 Accomplishments | |
|---|---|
| **Inventoried Acres** | 10,961 |
| **Gross Infested Acres** | 9,529 |
| **Infested Acres** | 791 |
| **Treated Acres** | 205 |
| **Monitored Acres** | 3,207 |
| **Retreated Acres** | 111 |
| **Restored Acres** | 1.4 |

made possible as original parks required less time for high priority species. The good work of the traveling Team and park staffs brought several parks to a "maintenance level" where annual monitoring and light treatments were sufficient to control invasive plants and release native vegetation. Cooperation and hard work are paying dividends. In 2006:

By the consistent and effective treatments of the Cooperative, 1,368 gross infested acres were brought into a controlled status. A total of 1,970 acres are now in controlled status. The rate of control is rapidly increasing because many areas have now received two or more treatments. Forty-five different exotic species on 316 acres were treated, in highly biologically diverse ecosystems requiring expertise and care.

The Team conducted a complete park inventory and drafted a strategic plan for managing invasive plants at Hopewell Furnace Natural Historic Site. The Plan was approved on September 26, 2006. The Cooperative maximized its operational effectiveness by utilizing public volunteers and collaborating with the private sector, outside agencies, and park neighbors.

The Mid-Atlantic Cooperative emphasizes a collaborative approach to management. Over 1,500 field work hours were contributed by volunteers from school groups, universities, civic organizations, churches, and the public.

Figure 46: A volunteer group made up of home school families. Short- term volunteers from various groups contributed over 1,500 hours in the field during the year to help control invasive plants within the Mid- Atlantic Cooperative.

The Cooperative expanded its organizational capacity by using a contractor who coordinated an independent Student Conservation Association field Team, and organized a volunteer program. The Cooperative increased its operating budget by successfully applying for supplemental funding. These additions came in the form of a non-profit grant to build and operate the volunteer program, and funding for Student Conservation Association interns.

The Team increased the public awareness of invasive species problems by participating in 10 news media interviews, speaking at 12 public or professional meetings, publishing 10 articles in professional newsletters, creating 7 reports

available to the public, and responding to public queries for information on many occasions.

The 14-park Mid-Atlantic Cooperative is within a biologically diverse and highly productive region spanning the coastal plains of the Chesapeake Bay, Piedmont, and hill-and-valley formation of the Appalachian Mountains. Exotic vegetation threatens to destroy native diversity and ecosystem health by displacing the complex web of interactions with simplified monocultures. Protecting the natural legacy of the region is essential so that future generations can enjoy its beauty.

The Cooperative consists of the MA-EPMT and park staffs. Together, the Cooperative uses an integrated pest management approach where prevention and early detection are emphasized to reduce the overall need for treatments. Public education and the media are employed for greater public awareness and participation in the program. Park staffs work closely with facility concessionaires, construction contractors, and farmer permittees to avoid new exotic introductions. The Cooperative's motto is "Keep it *beautiful, native and natural!*" These are words that motivate and give clear vision for the future.

Preserving natural resource values is the purpose of invasive plant management and controlling invasive exotic plants is an essential first step. There are far too many exotic plants to hope for full eradication. Ranking of treatment needs is essential to focus efforts on high value areas. Of highest priority, the Mid-Atlantic Cooperative aims to protect areas of high natural and cultural values. Appomattox Court House National Historic Park provides a case in point.

The Appomattox River treatment area contains a rare natural heritage type, Basic Seepage Swamp community, with rare species such as the Kentucky lady-slipper (*Cypripedium kentuckiense*) and bog twayblade (*Liparis loeselii*). The Virginia Natural Heritage department notes, "Communities in this group are not well documented or protected in Virginia and should be high priorities for future inventory and conservation." The park sought the help of the MA-EPMT to protect the area. In response, the Team reconnoitered and diagnosed the area, arriving at a treatment prescription with park staff. Initial treatment began in 2004 eliminating invasive plant dominance along the upper (western) stream banks. The purpose was to decrease downstream infestation potential from invasives upstream. In 2006, the Team and park staffs began treating the lower floodplain and upland reaches of the eastern end. Together, they applied herbicides on targeted invasives. Multiflora rose and Japanese barberry covered 5-to-25 percent of the area along the stream and upland sites; Asian privets at 1-to-5 percent canopy cover with trace amounts of tree of heaven, Japanese honeysuckle, and Mexican bamboo. Monitoring and periodic retreatments will protect the area from reinfestation.

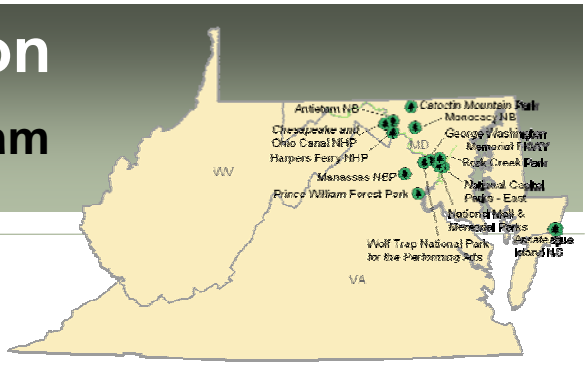
Figure 47: Appomattox River treatment site.

Public involvement Improves invasive species prevention and control. The MA-EPMT invited the public to report sightings of targeted invasive plants at Shenandoah National Park; the response was immediate. Not only did the program generate a listing of "Least Wanted" plant locations, but a network coalesced that became the seed for a volunteer program.

Made possible by a grant from the National Park Foundation and Tauck Foundation, 2006 was the program's first field season. Grant funding was used to purchase hand tools, gloves, and retain seasonal volunteer leaders to make public contacts, set up field events, and direct volunteers in the field. Volunteer leaders made contacts with schools, universities, civic groups, clubs, and churches. The short-term program consists of three kinds of field events: special events, events by appointment, and weekend events. Nine groups and 270 volunteers devoted 494 hours controlling invasive plants. The special and weekend events helped the overall program by increasing public understanding. The events also offered an activity for park visitors who wanted to help "their parks." Regarding events by appointment, two special events and ten weekend events produced 121 volunteers who devoted 278 hours to field work. Combining short- and long-term volunteers' activities, 402 volunteers devoted 1,640 hours to controlling invasive plants. There is a maxim in working with volunteers: meaningful work attracts eager workers. That is proving true for the volunteer program headed by the MA-EPMT at Shenandoah National Park.

# National Capital Region

## Exotic Plant Management Team




**Partner Parks:** *Antietam NB, Assateague NS, Catoctin Mountain Park, Chesapeake & Ohio Canal NHP, George Washington Memorial PKWY, Harpers Ferry NHP, Manassas NB, Monocacy NB, National Mall and Memorial Parks, National Capital Parks-East, Prince William Forest Park, Rock Creek Park, Wolf Trap National Park for the Performing Arts*

The National Capital Region Exotic Plant Management Team (NCR-EPMT) continued treating exotic invasive plants at 11 of our 12 original partner parks and portions of the Appalachian Trail. The NCR-EPMT also adopted a new partner park into the program this year, Assateague Island National Seashore. This barrier island provides a refuge for important native ecosystems. Despite increasing development pressures, the habitat is relatively intact with only a few, discreet populations of non-native invasive plants. We are optimistic that the Team will be able to control the large exotics infestations so that the dedicated park staff can then maintain the island.

| 2006 Accomplishments | |
|---|---|
| **Inventoried Acres** | 852 |
| **Gross Infested Acres** | 826 |
| **Infested Acres** | 86 |
| **Treated Acres** | 113 |
| **Monitored Acres** | 1,668 |
| **Retreated Acres** | 213 |
| **Restored Acres** | 0 |

The NCR-EPMT treated or retreated more than 325 species-acres and 72 non-native species in 2006 and conducted inventories in new areas that totaled more than 850 species acres. A Student Conservation Association Native Plant Corps Team, which was shared with the Mid-Atlantic EPMT, gave able assistance at three of our partner parks. In 2006, the NCR-EPMT focused primarily on retreating high priority areas to assure invasive plant control. The Team has had good success controlling common reed (*Phragmites australis*) in two tidal wetlands, as well as Chinese wisteria (*Wisteria sinensis*), kudzu (*Pueraria montana var. lobata*), and bamboo (*Phylostachys spp*) in many areas. There have been multiple exotic species controlled on two islands within the biologically rich Potomac Gorge, a section of the Chesapeake and Ohio Canal National Historical Park, which harbors 113 rare, threatened or endangered plant species and 3 rare plant communities. Exotics on several of these sites should be under control so that park staff and volunteers can assume long-term maintenance and (if necessary) native revegetation. We look forward to helping our partner parks move into this new phase of ecological restoration.

Figure 48: NCR- EPMT and SCA killing English ivy, Theodore Roosevelt Island, GWMP, VA.

The NCR-EPMT joined the Maryland Department of Natural Resources and private land managers, to launch a Pulling Together Initiative Project to find and implement safe, effective control measures for Japanese hops (*Humulus japonica*), which has begun to invade state forestry plantations and floodplains within the region. Efforts have also begun to create a Cooperative Weed Management Agreement with the Metropolitan Washington Council of Governments, regional counties, and the District of Columbia. The District of Columbia staff has joined us for training and agreed to work together to battle large infestations across jurisdictional boundaries. The cooperative venture with Council of Governments should be formalized during the winter of 2006-2007.

An important responsibility of the NCR-EPMT is to provide outreach to the general public and interested groups. During 2006, the Team provided six training talks to professional and semi-professional groups and answered innumerable questions via phone and e-mail. The Team liaison gave an interview on the local CBS/USA Today news, the latest in a series of at least eight newspaper, radio and TV articles that she and the Team have provided over the years. The Team conducted demonstrations and staff training for two US Fish and Wildlife Service facilities: the National Conservation Training Center in Shepherdstown, West Virginia, and the Patuxent Wildlife Research Center in Laurel, Maryland.

Figure 49: NCR- EPMT Conducts training to Interagency Integrated Pest Management Course.

Since 2003, the NCR-EPMT has supported the staff of the National Conservation Training Center in Shepherdstown, West Virginia, providing training through demonstrating techniques and encouraging hands-on practice. Each year, the Team has demonstrated different control techniques - foliar spraying one year, injection (hack-and-squirt) and cut-stump treatments the next, and basal bark treatments in 2006. In the process, the NCR-EPMT documented the successful control of approximately 30 acres of multiflora rose (*Rosa multiflora*), as well as several acres of tree-of-heaven (*Ailanthus altissima*) infesting the hedge rows between fields. In 2003, the training class included a crew from the West Virginia Civilian Conservation Corps. This year at the National Conservation Training Center, the Team also taught a module of the cooperative NPS and US Fish and Wild Life Integrated Pest Management course, guiding the class through the decision-making process that controlling weeds requires, as well as field techniques, plant identification, and safety issues and precautions.

Effective, efficient invasive plant control begins with knowing what and how much needs control. The NCR-EPMT has made it a policy to inventory all non-native plants on the site of any project parks ask us to treat. Although some floral surveys exist, they generally neither are incomplete inventories nor emphasize non-native plants. Parks within the National Capital Region are close enough together and small enough to allow the NCR-EPMT to inventory all treatment sites. During the first few years of its existence, the Team surveyed some sites more than once in different seasons. This allowed staff to find species that might be dormant during some parts of the year and to efficiently utilize the winter season (when weather prevents control work on many days) to identify woody exotic species so that treatments could begin as soon as weather permits.

The Team surveyed the four parks entirely - Harper's Ferry NHP (2,500 acres), Manassas NBP (5,000 acres), Monocacy NBP (1650 acres), and Wolf Trap NP (130 acres) - to give park staff the information they need to better plan restoration projects. The Team found 17 to 75 exotic species per park, covering 290 to more than 23,000 acres per park. In 2004, a cooperating Student Conservation Association Team also surveyed the 186 miles of the Chesapeake and Ohio Canal National Historic Park to document almost 4,000 acres of Japanese knotweed (*Polygonum cuspidatum*). This effort helped identify what exotic plant control was needed to restore habitat for the federally listed plant harperella (*Ptilimnium nodosum*) that is found in the mid-Atlantic only within the Potomac River floodplain. Throughout the entire region, the Team has inventoried 152 non-native species, covering about 114,000 acres.


Figure 50: Demonstrating Basal Bark treatment on tree- of- heaven.

# Northeast

## Exotic Plant Management Team


**Partner Parks:** *Acadia NP, Allegheny Portage Railroad NHS, Appalachian NST, Boston Harbor Islands NRA, Cape Cod NS, Delaware Water Gap NRA, Fire Island NS, Fort Necessity NB, Friendship Hill NHS, Gateway NRA, Johnstown Flood N MEM, Marsh-Billings-Rockefeller NHP, Martin Van Buren NHS, Minute Man NHP, Morristown NHP, Roosevelt-Vanderbilt NHS, Sagamore Hill NHS, Saint-Gaudens NHS, Saratoga NHP, Saugus Iron Works NHS, Steamtown NHS, Upper Delaware SRR, Weir Farm NHS*

Since 2003, the Northeast Exotic Plant Management Team (NE-EPMT) has assisted parks in identifying and controlling invasive exotic plants.

The Team serves 23 parks with a combined total of 322,000 acres across eight states from Pennsylvania and New Jersey up to Maine. This season, the Team worked at 14 parks. 2006 was the Team's third field season.

| 2006 Accomplishments | |
|---|---|
| **Inventoried Acres** | 1,754 |
| **Gross Infested Acres** | 1,196 |
| **Infested Acres** | 57 |
| **Treated Acres** | 53 |
| **Monitored Acres** | 155 |
| **Retreated Acres** | 3 |
| **Restored Acres** | 121 |

The number of restored acres increased in 2006 from zero in 2005 to 121 acres. Treatment of old farm fields at Delaware Water Gap in the last two-to-three years paved the way for planting native warm-season grasses and forbs this year.

We worked with Jim Bean of BASF Company to provide three integrated vegetation management training sessions for our parks. Jim runs one-hour interactive web-based courses so participants do not have to travel. The EPMT Team Leader arranged for pesticide applicator license update credits from New Jersey, New York and Pennsylvania for these courses. Personnel from at least seven partner parks participated in one or more sessions.

Recognizing the need to cover more ground in less time, the Team acquired and tested a 12-foot boom sprayer that is compact enough to be transported to other parks and fitted to smaller tractors. We will be acquiring a boomless sprayer in 2007. To increase control efficacy, we are considering new herbicides and mixes. We are investigating herbicides which:1) are more target specific, lessening collateral damage; and 2) enter plant root systems more quickly and effectively, allowing their use earlier in the season. This second category of herbicides would allow greater latitude in scheduling park visits since more species of invasives could be treated at the same time.

Figure 51: Restoration work—Delaware Water Gap, April 2006. Planting native grasses on former agricultural field with seed drill.

The Team is becoming more involved in cooperative efforts. The Liaison will join the Board of the Mid-Atlantic Exotic Pest Plant Council in August. She is also involved in an effort to revitalize an existing partnership, the Delaware River Invasive Plant Partnership. The Northeast Region is at a point where entities such as weed management areas have a better chance of survival due to increased awareness at the state level and the infusion of money by some, notably New York.

Northeast-EPMTs three seasons of work have been productive in experience gained and projects accomplished. We are at the point where several

smaller, high priority sites can now be maintained by park staff. One park, Weir Farm National Historic Site, went "offline" after 2005 as staff felt invasives could be managed with help from a Student Conservation Association intern. These successes, however small, have increased the value of involved parks' natural resources and freed the Team for new challenges. Greater knowledge of control techniques, better equipment, and more skillful use of adaptive management techniques permit the Team to work more quickly and effectively than they could in 2003. Increased involvement in collaborative efforts will extend the scope of the Team's influence in the region.

In 2005, funds were put aside for a contractor to clear two abandoned agricultural fields at Delaware Water Gap totaling 37 acres. The contractor worked on 25 of the most heavily infested acres. The fields were choked with a variety of invasive woody shrubs, including bush honeysuckle, multiflora rose, Japanese barberry, and autumn olive (see Fig. 52, November 2005).

In November 2005, the contractor used a Fecon Bull Hog to grind the invasive shrubs to below ground level to reduce resprouting. Seven months later, the change in the fields' appearance was striking (see photographs on this page). The tangle of invasive woody plants was now open grassland interspersed with native trees and shrubs. Native plants are expected to fill in wherever invasives have been removed. The Team will return in 2007 to treat missed and resprouted shrubs.

This project was done in partnership with Delaware Water Gap to highlight NE-EPMTs collaboration with the park and provide a public demonstration site to stress the problems posed by invasive plants and how NPS is managing them. One of Delaware Water Gap's long-term goals is to restore former farm fields to shrub and grasslands. This will provide habitat necessary for bird species whose numbers have been declining in recent years. When restoration is complete, there will be approximately 200 acres of contiguous shrub and grasslands.


Figure 52: Before cutting (top) and after 7 months (bottom). Cut shrubs are small 'lumps' in 2006. Top: Native grasses are in foreground and intermixed with shrubs in background. Bottom: Grasses have begun to grow in bottom photo and will later shade resprouting shrubs.

Another collaborative restoration project at Delaware Water Gap is a forest stabilization and restoration project in an eastern hemlock ravine. Eastern hemlocks are in danger of being lost throughout the Northeast and mid-Atlantic due to attack by the non-native hemlock woolly adelgid. Hemlocks are an important part of the forest canopy, found in 141 discrete stands covering 3,000 acres of the park, many designated as "outstanding natural features with high intrinsic or unique values."

The project area covers roughly six acres. The multi-phase project has a number of objectives:

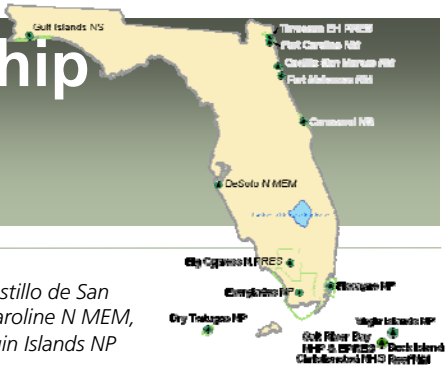
- Remove exotic plants: The Northeast-EPMT worked on the site this past spring and summer, chemically treating or mechanically removing exotic non-native species such as multiflora rose, Japanese barberry, garlic mustard and Japanese stilt grass. These treatments will continue next year.
- Foster regeneration of hemlocks and other native plants: The Northeast-EPMT helped to plant native tree saplings at the site.
- Minimize erosion from nearby trails.

This project is serving as a pilot project for other land management agencies which are losing their hemlock stands.

Because restoration is the critical next step to management of invasive plants, Northeast-EPMT plans to increase its involvement in appropriate restoration work at its parks.

# Florida Caribbean Partnership

## Exotic Plant Management Team




**Partner Parks:** *Big Cypress NP, Biscayne N PRES, Buck Island Reef NM, Canaveral NS, Castillo de San Marcos NM, Christiansted NHS, DeSoto N MEM, Dry Tortugas NP, Everglades NP, Fort Caroline N MEM, Fort Matanzas NM, Gulf Islands NS, Salt River Bay NHP & EPRES, Timucuan EH PRES, Virgin Islands NP*

In Florida, exotics infest over 1,500,000 acres of the state's natural areas and have rapidly dominated native plant communities, minimized biological diversity, disrupted natural processes

| 2006 Accomplishments | |
|---|---|
| **Inventoried Acres** | 33,832 |
| **Gross Infested Acres** | 24,291 |
| **Infested Acres** | 7,312 |
| **Treated Acres** | 7,311 |
| **Monitored Acres** | 0 |
| **Retreated Acres** | 0 |
| **Restored Acres** | 0 |

such as fire regimes and water flow, and changed the landscape both visually and ecologically. Over 400,000 acres of approximately 2,000,000 acres of National Park Service lands in Florida are infested with exotic pest plants.

The Florida and Caribbean EPMT (FLC-EPMT) supports National Park Service units in Florida and the Caribbean by augmenting existing exotic plant control efforts including inventory and monitoring, control, education and research. The FLC-EPMT is a partnership with the Florida Department of Environmental Protection's Bureau of Invasive Plant Management and the South Florida Water Management District as well as many other federal, state and local governments and non-government organizations working toward the control and management of invasive exotic plants. The FLC-EPMT consists of resource managers from each partner park and representatives from the FDEP, the South Florida Water Management District, US Fish and Wildlife Service and the US Army Corps of Engineers. The Team identifies and prioritizes exotic plant control projects and function as the Team's steering committee. Exotic plant control is done primarily through private contractors using Indefinite Delivery/Quantities contracts (either NPS or the Florida Department of Environmental Protection). Small parks maintenance control projects are done by the FLC-EPMT small parks hit squad. The squad consists of the Team liaison/leader and volunteers from each park.

In 2006, the Team continued efforts to support National Park Service Units in Florida and the Caribbean. The Team completed the initial treatment of the Brazilian pepper tree on the Western Mainland Tract of Canaveral National Seashore. This 4,000 acre tract, jointly managed by Canaveral National Seashore and the Merritt Island National Wildlife Refuge, is habitat for the federally listed Florida Scrub jay. This species requires open pine flat woods. These flat woods were rapidly disappearing due to the encroachment of the invasive Brazilian pepper tree.

Figure 53: Private Contractor cutting Guinea Grass on Henley Cay, US Virgin Islands.

In Everglades National Park, two projects were completed including the aerial treatment of over 1,000 acres of Old World Climbing fern in the western coastal marshes as well as the continued initial treatment of the invasive Australian tree species, Melaleuca, from the East Everglades. At Big Cypress National Preserve, the Team continued to assist in the controlling the Brazilian pepper tree and old world climbing fern in the northern lands. In addition to the initial control projects the Team conducted several scheduled re-

treatments including re-treatments projects at Canaveral National Seashore and Desoto National Memorial.

In the Caribbean, the Team conducted the third year of re-treatment on Buck Island, a 176-acre tropical dry forested island within the Buck Island Reef National Monument off the island of St. Croix in the US Virgin Islands. Other Caribbean projects accomplished included initial treatment of the America Hill site in Virgin Islands National Park which contains the ruins of an 18th century Danish sugarcane plantation great house, and six small islands or "Cays" off the island of St. John which are critical nesting habitat for several species of federally listed sea turtles and birds.

Figure 54: America Hill Project, Virgin Islands NP, before and after treatment.

Identifying and accurately mapping the location and distribution of invasive plant species is the first step in successfully managing invasive plant species. Systematic Reconnaissance Flights is a simple, accurate and cost effective method for mapping the distribution of invasive plants. These flights perform an aerial survey in which observers in an aircraft flying at a fixed height and spacing transverse the study area while observers detect invasive plants in a strip of land on either side (long thin quadrat). Depending on the distance between transects, the survey can be a complete census or a sample count.

Prior to 2001, the South Florida Water Management District and the National Park Service conducted separate exotic species Systematic Reconnaissance Flights surveys. The Management District conducts region wide surveys every two years and the NPS, as part of an operational control program, conducts Systematic Reconnaissance Flight surveys of the Park annually. In 2001, at the recommendation of the south Florida Ecosystem Restoration Task Force and through a Memorandum of Agreement the NPS and Management District combined resources to implement a Systematic Reconnaissance Flights survey program. By combing resources both agencies can maximize efficiency and ensure compatible data sources. Since 2001, the program resulted in comprehensive distribution maps of invasive plant species such as melaleuca (*Melaleuca quinquenervia*), Brazilian pepper (*Schinus terebinthifolius*), Australian pine (*Casuarina spp.*),

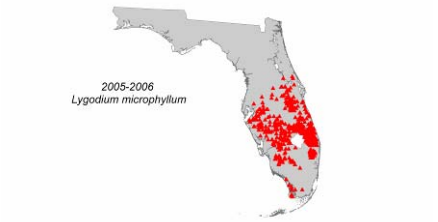



Figure 55: Distribution of Old World Climbing Fern in Florida, Results of 2005- 2006 SRF.

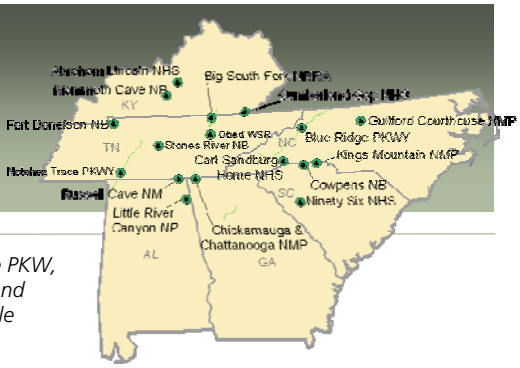
and Old World climbing fern (*Lygodium microphyllum*) for south Florida (4 million acres). Through the Areawide Evaluation and Management of Melaleuca Program (http://tame.ifas.ufl.edu/), the Systematic Reconnaissance Flight boundaries were extended to include central Florida and the Bahamas. In 2005, through cooperative efforts the boundaries were further expanded to include the majority of peninsular Florida (16 million acres), creating comprehensive distribution maps for melaleuca, Brazilian pepper, Australian pine and Old World climbing fern.

Figure 56: An herbicide trial plot.

The FLC-EPMT in cooperation with the South Florida Inventory and Monitoring Network has developed a protocol to test exotic plant treatment efficacy. The protocol establishes permanent plots prior to exotic treatment. Then resampling occurs annually post treatment. Sampling consists of composition/ coverage (trees, shrubs, vines and herb layer) and the light environment using a spherical densiometer. The primary goal of this program is to: 1) determine how well the exotic removal treatment preformed, 2) follow the recovery of the native plant community, and 3) determine if additional treatment or restoration management action is required.

# Southeast

## Exotic Plant Management Team




**Partner Parks:** *Abraham Lincoln Birthplace NHS, Big South Fork NRRA, Blue Ridge PKW, Carl Sandberg NHP, Chickamauga and Chattanooga NMP, Cowpens NB, Cumberland Gap NHP, Fort Donelson NB, Guilford Courthouse NMP, Kings Mountain NMP, Little River Canyon N PRES, Mammoth Cave NP, Natchez Trace PKWY, Ninety Six NHS, Obed WSR, Russell Cave NM, Stones River NB*

The Southeast Exotic Plant Management Team (SE-EPMT), established in 2003, provides support to 16 National Park Service units located within the Cumberland Plateau, Appalachian Highland,

| 2006 Accomplishments | |
|---|---|
| **Inventoried Acres** | 9,798 |
| **Gross Infested Acres** | 3,385 |
| **Infested Acres** | 1,394 |
| **Treated Acres** | 874 |
| **Monitored Acres** | 0 |
| **Retreated Acres** | 25 |
| **Restored Acres** | 0 |

and Piedmont physiographic provinces of the southeastern United States. These partner parks, ranging in size from 200 acres to 50,000 acres, frequently exist as islands of natural communities, or lands protected in a specific historical state, surrounded by a disturbed landscape. This disturbance, coupled with a temperate climate similar to that found in portions of China and Japan, contributes greatly to the often devastating success of plant introduced, intentionally and accidentally, from those Asian countries.

Working year around in 2006, the SE-EPMT treated 33 invasive exotic plant species totaling an area of 874 acres as documented in the Alien Plant Control and Management database. Treatment was conducted in 15 of our16 partner parks and a section of the Appalachian Trail in Virginia and North Carolina. Although no treatment was conducted on site in 2006, Shiloh National Military Park and Andrew Johnson National Historic Park were engaged as new partner parks bringing the total number of parks to be served in 2007 to 18.

The most commonly treated species in 2006 were princess tree (*Paulownia tomentosa*), tree of heaven (*Ailanthus altissima*), Japanese privet (*Ligustrum sinense*) and Japanese honeysuckle (*Lonicera japonica*). Using an Integrated Pest Management strategy, control techniques range from hand pulling of invasive herbs like garlic mustard (*Alliaria petiolata*) to the use of power tools and herbicides on woody species such as Bradford pear (*Pyrus calleryana*). By using a varied "toolbox" of control techniques and operating year around, the Team is able to adapt operations to fit a particular season and environmental situation. Although overwhelming at the onset, our partner parks and we have seen significant success in treatment as evidenced by the natural reestablishment of native species in many treatment areas. Limited re-treatment of sites is usually the result of new plants sprouting from the existing seed bank.

Figure 57: Treating Princess tree (Paulownia tomentosa) in tight places along the Blue Ridge Parkway.

Sixty of the SE-EPMTs reported 874 treated acres were accomplished through an unexpected partnership. Reassigned from Texas to the Big South Fork National Recreation Area after the devastating hurricanes of fall 2005, a Student Conservation Association Native Plant Corp worked with the SE-EPMT for three months. This drastic change of plans did not hinder the enthusiasm or effectiveness of this Team of four

as they were quickly brought up the speed on the species to be treated and the techniques to be employed. They were instrumental in the establishment of more than 25 acres of native warm season grasses on a site adjacent to rare mussel habitat in the South Fork of the Cumberland River. The site was overrun with exotic plants having previously been leased for soybean production. The establishment of the native grasses will greatly reduce runoff and enhance native upland bird populations such as quail.

Figure 58: SE- EPMT and SCA Native Plant Corp treat multiflora rose (Rosa multiflora) covered in Japanese honeysuckle (Lonicera japonica) at Big South Fork NRA in Tennessee.

Opportunities to provide outreach to the general public, focused interest groups, and professional resource managers have continued to expand for the SE-EPMT. During 2006, the Team provided classroom and hands on training to many groups including the Tennessee Exotic Pest Plant Council, Eastern Band of the Cherokee Indians, Tennessee State Parks staff, Southern Appalachian Man and the Biosphere, The Nature Conservancy, and Warren Wilson College student volunteer program. Workshop topics included plant identification, safe and effective use of herbicides, treatment techniques, planning and prioritizing strategies, and prevention of spread and new introductions. In an effort to focus more on prevention and early detection, a partnership has been established with the North Carolina Native Plant Society with the goal of developing a pilot 'park neighbors' program at Guilford Courthouse National Military Park in Greensboro, North Carolina. This project will enable the development of a method to engage and inform adjacent property owners about invasive exotic plant management activities occurring on the neighboring park lands. The primary product will be the development of protocols and templates necessary to implement a similar program at other NPS units and on other public lands. The SE-EPMT also provides a monthly "Have You Seen This Plant" submission to the regional e-newsletter in an effort to solicit early detection from all parks in the NPS Southeast Region.

Figure 59: SE- EPMT Conducts training for the Eastern Band of the Cherokee Indians.

The SE-EPMT has enjoyed several successes during 2006, but none more significant than the completion of the third year of scheduled work without an accident or injury. Because the Team uses a variety of power equipment tools and numerous chemicals, as well as logs approximately 22,000 miles on the road each year, safety is the primary focus. This success is not taken for granted as new and better ways to insure safe operational strategies are constantly sought, reviewed, and revised. Examples for 2006 include a review and revision of Job Hazard Analyses, implementation of post work activity safety briefings in addition to the standard pre-work briefing, obtaining advanced chainsaw operation and safety certification (C-feller) for the Team Leader, and implementing a vehicle and trailer pre-trip safety check-list to enhance safe travel.

Throughout 2006, the SE-EPMT has continued to adapt to the needs of partner parks while stressing safe and efficient operations. As we persist in making headway in controlling the invasive exotic plants currently present in our partner parks prevention, early detection and rapid response to new introductions are playing increasingly important roles in our long-term success.

# Appendix A 2006 EPMT Program Participants

The Exotic Plant Management Teams (EPMT) do not function in isolation. The achievements of the Teams are due in large part to the time, resources and contributions of many. The EPMT program and the EPMT Team is coordinated effort made up of park leadership, park staff, seasonal and permanent Team members, the Student Conservation Association, Americorp and hundreds of volunteers. Following is a partial list of people who contributed to the 2006 achievements described in the report.

**Alaska EPMT**
Admin: Jeff Heys (Liaison), Whitney Rapp (Data Manager)
Crew: Wendy Mahovlic, Nat Wilson, Heather Wetherbee, Dan Schultz, Kitty LaBounty, Lil Gilmore
Crew Partners: Christina Gladmon (AK Conservation Foundation), Peter Ewan (Youth Conservation Corps)
Volunteers: Niki Quester, Tribal Civilian Community Corps, Serve Alaska Youth Corps, AK Department of Natural Resources Forestry Interns
Steering Committee: Susan Boudreau (GLBA), Page Spencer (LACL), Eric Veach (WRST), Jennifer Allen (AKRO Fire Ecologist) Sara Wesser (AKRO I&M Coordinator), Tim Hudson (AKRO Assoc. Regional Director), Michael Shephard (USFS), Jeanne Standley (BLM), Larry Johnson (AK DOT)
Park and regional contacts, fieldwork assistance, and various types of technical assistance:
Roy Wood, Jobe Chakuchin, Mary Beth Cook, Pat Owen, Russ Kucinski, Joel Cusick, Greg Daniels, Bud Rice, Troy Hamon, Peter Neitlich, Carl Roland, Tom Liebscher, Lewis Sharman, Shelley Hall, Meg Hahr, Christina Kriedeman, Theresa Thibault, Geof Smith, Andrew McCarthy

**California EPMT**
Admin: Bobbi Simpson (Liaison), Daniel Boughter (Crew Leader), Andrew Georgeades (Data Manager), Adam McClure (Data Manger/Admin Support)
Crew: Lisa Barnes, Matt Below, Beth Points, Ryan Rupert
Park and Regional Contacts: Jay Goldsmith
Student Conservation Corp : Morgan Cromwell, Laura Fieselman, Katherine Ross, Rachael Rowland, T.Scott Smeltz, Rachel Durling, Aaron Darden, Caitlin Feather, Bryan Powell, Stephen Bush, Emily Jablonski, Dan Pulver, Maia Beh, David Allen, Adam Erickson, Aidan Hutchins, Ryan Tietjen, Lindsey Scholl, Chase Bodkin
Steering Committee: John Randall (The Nature Conservancy), Jay Goldsmith (Pacific West Regional Office) Athena Demetry (Sierra Network), Christy Brigham (Mediterranean Network), Sue Fritzke (San Francisco Bay Area Network), Michelle Cox (Klamath Network), Paul Reeburg (PWR)

**Chihuahuan Desert / Shortgrass Prairie EPMT**
Admin: Luis J. Florez (Liaison), Kelly Mathis (Crew Leader)
Crew: Amorita Brackett, Lee Duff
Park and Regional Contacts: Gerald McCrea
Student Conservation Corp Interns: Jarred Shaw , Heather Carson, Mike Messier, Eric Walker, Chris Cornett
Steering Committee: Hildy Reiser, Gopaul Noojibail (CAVE), Diane White (WHSA), Fred Armstrong (GUMO), John Heiner (FODA), Karl Zimmermann (BEOL), Vidal Davila (BIBE) Mike Davin (LAMR/ALFL), Bruce Robinson (CAVO)

**Colorado Plateau EPMT**
Admin: Diane Dobos-Bubno (Liaison), Brennan Hauk (Crew Leader), Robert Gaunt (Asst. Crew Leader), Adam Heberlie (Asst. Crew Leader)
Crew Partners/Contractors: Coconino Rural Environmental Corps, Rocky Mountain Youth Corps, Southwest Youth Corps, Olathe Spraying Service
Park and regional contacts, fieldwork assistance, and various types of technical assistance:
Terry Nichols, Karen Beppler-Dorn, Lee Baiza, Pat Thompson, Danguole Bockus, BLCA Ranger Staff, Elaine Leslie, Brad Shattuck, Kirk Petersen, Dave Price, Liz Rodgers, Lou Lorber, Dan Miller, Joe Wolfman, Tamara Naumann, Emily Spencer, Herschel Schulz, Lori Makarick, Kate Watters, Melissa McMasters, Nancy Stone, Anne Worthington, George San Miguel, Yvonne Marlin, Dennis Casper, Steve Mitchelson, John Spence

# Appendix A 2006 EPMT Program Participants

**Florida / Caribbean Partnership EPMT**
Admin: Tony Pernas (Liaison), Daniel Clark (Crew Leader)
Steering Committee: Jonathan Taylor (EVER), John Stiner (CANA), Jim Burch (BICY), Shelby Moneysmith (BISC), Richard Bryant (TIMU), Riley Hoggard (GUIS), Andrew Rich (FOMA), Clif Kevill (DESO), Dan Thayer (South Florida Water Management District), Jon Lane (US Army Corp of Engineers), Greg Jubinsky (FL Department of Environmental Protection)
Park and regional contacts, fieldwork assistance, and various types of technical assistance:
Jim Burch, Jimi Sadle, Jonathan Taylor

**Great Lakes EPMT**
Admin: Carmen Chapin (Liaison), Sarah Pratt (Data Manager), David VanderMeulen (Crew Leader)
Crew: Kate Thompson, Marlon Opelt, Michael Olson
Park and Regional Contacts: Steve Cinnamon
Student Conservation Corp Interns: Brandon Kemp, Matt Koski, Katrina Putnam, Irina Afanasyeva, Phil Hahn, Kate Schindler
Steering Committee: Jean Battle (ISRO), Nancy Duncan (MISS), John Kwilosz (INDU), Bruce Leutscher (PIRO), Robin Maercklein (SACN), Julie Stumpf (Midwest Regional Office), Teri Tucker (VOYA), Julie Van Stappen (APIS), Steve Yancho (SLBE)

**Gulf Coast EPMT**
Admin: Eric Worsham (Liaison), Pat Wharton (Crew Leader)
Crew: Scott Szabo, Suanne Bacque, Genevieve Skora, Jarret LeJeune
Park and Regional Contacts: Jerry McCrea, Chris Furqueron, Curtis Hoagland
Volunteers: McDaniel College, National Wildlife Federation, AmeriCorps

**Lake Mead EPMT**
Admin: Curt Deuser (Liaison), Bonnie Waggoner (Data Manager), Ian Torrence (Crew Leader), Tarl Norman (Asst. Crew Leader), Angela Sokolowski, (Asst. Crew Leader), Sean Haile (Special Project Leader)
Crew: Jamie Alvesteffer, Josh Brown, Joe Castello, Sarah Cech, Dwayne Coleman, Garrett Dickman, Brad Dodson, Quentin Ford, Zeph Friedman-Sowder, Eric Kelley, Brian Lumley, Felipe Mendez, Chris Overbaugh, Michelle Reilly, Steven Rericha , James Roberts, Chris Starkweather , Frank Szajko, Katie Walsh
Park and Regional Contacts: Jay Goldsmith
Steering Committee: Matt Brooks (USGS Research Botanist), Ron Hiebert (NAU/CPSU), Todd Esque (USGS Research Ecologist), Pam Benjamin (NPS/IMR Plant Ecologist), Gayle Marrs-Smith (BLM Plant Ecologist)

**Mid Atlantic EPMT**
Admin: James Åkerson (Liaison), Norman Forder (Crew Leader)
Crew: Kate Jensen, Dale Meyerhoeffer
Park and Regional Contacts: Wayne Millington
Student Conservation Corp Interns: Andrea Norris, Ben Richey (crew leader), Isadora Albert, Jennifer Van Wyk, Jennifer Zane, Casey O'Keeffe, Miles Boiko, Adam Volz, Jarred Shaw (crew leader), Kim Gronas (crew leader), Jacqueline Klenk (crew leader), Jennifer Lasee (crew leader), Gina Nauman (crew leader), Ivy Roberts, Meghan Caldwell, Rebecca Hamil
Volunteers: Unnamed 402 individuals contributing 1,640 hrs at SHEN
Steering Committee: Brian Eick (APCO), Timothy Sims (BOWA), Dorothy Geyer (COLO), Gregg Kneipp (FRSP), Randy Krichten (GETT/EISE), Rijk Morawe (GEWA/THST), Paul Bitzel (HAMP), Steven Ambrose (HOFU), Dave Shockley (PETE), Kristen Allen (RICH), Gordon Olson (SHEN), Kristina Heister (VAFO)
Park contacts, fieldwork assistance, and various types of technical assistance:
Robert Tillotson, Cheryl Tanner, Gary Thomas, Cindy Copp, Adam (GETT), Mark S (GETT), Vicki Stewart-Hill, Nathan Irwin, Meghan Carfioli

# APPENDIX A 2006 EPMT Program Participants

**National Capital Region EPMT**
Admin: Sue Salmons (Liaison), Ron Dean (Crew Leader), Trouper Snow (Data Manager)
Crew: Eric Johnson, Martin Kraemer, Matthew Fagan
Park and Regional Contacts: Dan Sealy (Deputy Chief of Natural Resources and Sciences)
Student Conservation Corp Interns: Ben Richey (crew leader), Miles Boiko, Jenny Vanwyk, Isadora Albert, Casey O'Keefe, Jarred Shaw (crew leader), Kim Gronas (crew leader), Jacqueline Klenk (crew leader), Jennifer Lasee (crew leader), Gina Nauman (crew leader)
Volunteers: Scott Hax, Earth Conservation Corps, Gary Sikora
Steering Committee: Jim Sherald (NCR Chief of Natural Resources and Sciences), Diane Pavek (NCR Botanist and Research Coordinator), Jil Swearingen (NCR Integrated Pest Management Specialist), Shawn Carter (NCR I&M Regional Coordinator), Ed Wenschof (ANTI), James Voigt (CATO), P. Scott Bell (CHOH), Brent Steury (GWMP), Bill Hebb (HAFE), Brian Gorsira (MANA), Andrew Banasik (MONO), Steve Syphax (NACE), Steve Lorenzetti (NAMA), Paul Petersen (PRWI), Joe Kish (ROCR), Duane Erwin (WOTR)
Park Contacts, technical and field assistance: Joe Calzarette (ANTI), Becky Loncosky (CATO), Melissa Kangas (GWMP), Dale Nisbet (HAFE), Susan Rudy (NACE), Tony Magliocci (NACE), Geoff Clark (ROCR), Betsy Chittenden (WOTR)

**North Cascades EPMT**
Admin: Todd Neel (Liaison), Dan Campbell (Crew Leader)
Crew: Alison Fawcett, Valerie Taylor, Daniel Lucero
Student Conservation Corp Interns: Sarah Waldo, Eric Gassner-Wolwage
Steering Committee: Jack Oelfke (NOCA), Mignonne Bivin (NOCA), Regina Rochefort (Network Science Advisor), Steve Acker (OLYM), Julie Hover (MORA), Scott Stonum (LEWI), Leigh Smith (EBLA), Bill Gleason (SAJH), Erv Gasser (IPM coordinator)

**Northeast EPMT**
Admin: Betsy Lyman (Liaison), Brian McDonnell (Crew Leader)
Crew: Kelly Garrison, Steve Hatton
Student Conservation Corp Interns: Jeff Jerman
Park and Regional Contacts: Wayne Millington
Steering Committee (informal): Wayne Millington (NER IPM Coordinator), John Donahue (DEWA Superintendent), Doug Wallner (NER Prescribed Fire Specialist), Christina Marts (MABI Resource Manager), Sheila Colwell (northern NER parks) Senior Natural Resource Program Manager), Beth Johnson (NER I&M Coordinator), Chris Martin (SARA Integrated Resource Program Manager)
Park contacts, fieldwork assistance, and various types of technical assistance:
Ann Gibbs, Bruce Lane, Chris Davis, Chris Martin, Chris Olijnyk, Connie Ranson, Dave Taft, David Hayes, Doug Adamo, Geneva Langley, Greg Eckert, Jackie Duhon, Jamie Myers, Jeanne McArthur-Heuser, Jeff Shreiner, Jim Bean, Kathy Penrod, Keith Raymond, Kent Schwarzkopf, Larry Hilaire, Linda White, Marc Albert, Mike Byer, Rhonda Foley, Robert Masson, Sheila Colwell, Sherrie Hanson, Stephen M. Smith, Suzanne Greenlawn

**Northern Great Plains EPMT**
Admin: Chad Prosser (Liaison), Taryn Flesjer (Data Manager), Mark Slovek (Crew Leader)
Crew: Andy Christy, Ryan Murdoff, Ken Musick, Aaren Nellen, Nickolas Dressler, Jared Burian, Eric Vial
Steering Committee: Brian Kenner (BADL), Dan Foster (WICA), Bill Whitworth (THRO), Cody Wienk (NGP Fire Ecologist), Dan Licht (NGP I&M Coordinator), Steve Cinnamon (Midwest Regional Office)

# Appendix A 2006 EPMT Program Participants

**Northern Rocky Mountain EPMT**
Admin: Brenda Waters (Liaison), Gary Ludwig (Crew Leader), Martin Hutten (Crew Leader), Garrett Dickman (Crew Leader)
Crew: Gayan deSilva, Chris Overbaugh, Mickey Pierce, Daniel Thomas, Chris Starkweather, Nathan Wender
Park and Regional Contacts: Jerry McCrea, Daniel Reinhart, Paige Wolken, Dawn LaFleur
Steering Committee: Robert West (BEPA), Cassity Bromley (BICA), Tim Fisher (BIHO), Jodi Vincent (CIRO), Paige Wolken (CRMO), Clayton Kyte (FOBU), Dawn LaFleur (GLAC), Doug Crossen (GOSP), Ben Bobowski (GRKO), Kelly McCloskey (GRTE), Fran Gruchy (HAFO), Kelly McCloskey (JODR), Melana Stichman (LIBI), Fran Gruchy (MINN), Dan Reinhart (YELL)

**Pacific Islands EPMT**
Admin: Jeremy Gooding (Liaison),
Crew Leaders: Sean Grossman (HAVO, PUHO, PUHE, KAHO), Sam Akoi (Interagency Miconia Management Crew, MISC Hana Crew), Michael Ade (MISC Piiholo Crew), Adam Radford (MISC Peripheral Miconia and Vertebrate Crew)
Data Managers: David Benitez (HAVO, PUHO, PUHE, KAHO), Sean Birney (Interagency Miconia Management Program Maui Crew, HALE), Aaron Kogan (MISC)
MISC Field Technicians: Elisse Deleissegues, Imi Nelson, Brooke Mahnken
Steering Committee: Dr. Rhonda Loh (HAVO), Steve Anderson (HALE), Teya Penniman (MISC Manager), Lloyd Loope (USGS), Elizabeth Anderson (MISC Admin), Randy Bartlett (Puu Kukui Watershed Mgr Maui Pineapple Co, MISC Chair), Fern Duvall (Hawaii Division of Forestry and Wildlife, MISC Vice Chair), Pat Bily (The Nature Conservancy Hawaii, Maui Program)

*MISC: Maui Invasive Species Committee

**Southeast EPMT**
Admin: Nancy D. Fraley (Liaison), Tobin M. Obenauer (Crew Leader)
Park and Regional Contacts: Bambi Teague
Student Conservation Corp Interns: Andrew Gentry, Brett Forkner, Matt Beauregard, Wesley DeWitt, Jacob Rigby, Lisa Ferensak, David Christy, Nathan Wender, Jeffrey Mallinson
Volunteers: Warren Wilson College, Asheville Weed Team, Eastern Band Cherokee Indians, Tennessee Exotic Pest Plant Council
Steering Committee: Chiris Furqueron (SER IPM Coordinator), Kris Johnson (GRSM), Sandy Brue (ABLI), Jenny Beeler (CUGA), Mary Shew (LIRI & RUCA), Chris Revels (KIMO)

**Natural Resource Program Center, Biological Resource Management Division**
Jerry Mitchell (Division Chief)
Linda Drees (Invasive Species Branch Chief)
Rita Beard (Invasive Species Coordinator)
Ric Hupalo (Invasive Species Database Administrator)
Debi Reep (Administrative Assistant), Robin Berg (Administrative Assistant)

# Appendix B Glossary

### Gross Infested Area

Like *Infested Area,* it is the area of land occupied by a single weed species. Unlike Infested Area, the area is defined by drawing a line around the general perimeter of the invasive plant population not the canopy cover of the plants. The gross area may contain significant parcels of land that are not occupied by weeds.

Gross area is used in describing large infestations. Some infestations are very large or discontinuous and it is difficult or not useful to map these larger infestations based on the canopy cover of the plants (Infested Area). The increase in accuracy gained by plotting individual plants may not compensate for the increase in cost or manpower. The general location on the landscape and an estimate of land area may be sufficient to meet inventory, monitoring, and treatment requirements. For these larger infestations a line is drawn around the outer perimeter of general weeded area or the plant population, this is the *Gross Area* When a value is entered for gross area, the assumption is that the area within the perimeter of the weed population (area perimeter) is an estimate or the product of calculating the area within a described perimeter. It is *not* a measured value. If an infestation is mapped using *Gross Area*, a value for *Infested Area* must still be recorded. The value for *Infested Area* is derived from estimating the actual or percentage of land occupied by weed plants.

### Inventoried Area

An extensive point-in-time survey to determine the presence/absence, location, or condition of an invasive plant species. An area can be considered inventoried regardless of the whether an invasive plant is found or not. Inventoried Area is reported in acres.

### Infested Area

This is the area of land containing a single weed species. An infested area of land is defined by drawing a line around the actual perimeter of the infestation as defined by the canopy cover of the plants, excluding areas not infested. Areas containing only occasional weed plants per acre do not equal one acre infested. There is no lower or upper limit to the size of an infestation. An infestation can be 1/10,000 of an acre to several thousand acres. 1/10,000 or .0001 acres is approximately a 3' x 4' area and is equivalent to approximately one plant.

### Monitored Area

Monitored Area is the collection and analysis of repeated observations or measurements over time. The collection of information overtime by measuring changes in the density, distribution, abundance, or location of an invasive plant. Monitoring may include ecological factors such as soils and plant composition. Monitored area is reported in acres.

### Treated Area

Treated area is either the infested area or subset of an infested area that has received some form or treatment or control for invasive plants. Treatment area is calculated using the same standards as infested area and is reported in acres.

### Retreated Area

This term refers to areas that have previously been treated. The retreated are may be a portion or a subset of the original treatment area, or the entire original treatment area.

## Exotic, Invasive, Noxious and Weed

The terms exotic, invasive, noxious weed, and weed are used in this report and the literature. These are related terms with variations in meaning. Exotic refers to organisms including plants that are not native to an ecosystem. Not all exotic organisms are invasive. For this report, invasive species are exotic organism that can reproduce, persist, and even dominate ecosystems. The National Park Service along with others uses the term Invasive species as defined by Executive Order 13112; Plants that are: 1) non-native (or alien) to the ecosystem under consideration; 2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health ( Executive Order 13112). Weeds are the most general term with the broad definition of any plant out of place. Finally, noxious weed is a legal term referring to any plant that has been designated as noxious by a federal, state, or county entity. There is often a legal obligation to control, contain, or not distribute these plant species designated as noxious.

**National Park Service**

**U.S. Department of the Interior**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