

**Craters of the Moon National Monument and Preserve
The Vegetation Management Program
A Historical Perspective and Comprehensive Evaluation**



Photo by: Gina Pearson

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Fulfilled by: Gina Pearson,
Research Assistant, University of Montana
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INTRODUCTION

The vegetation management program at Craters of the Moon National Monument and Preserve is a multi-faceted program that includes:

- 1) Invasive Non-native Plant Control,
- 2) Native Plant Restoration,
- 3) Inventory & Monitoring of Key Vegetation Communities/ Vital Signs and Special Status Species,
- 4) Hazard Tree Program,
- 5) Partnership Collaboration, and
- 6) Collateral Duties of the Vegetation Ecologist, including but not limited to: operations program management/supervision and air quality.

This report summarizes the vegetation program over the past 15 years when the first Full Time Equivalent (FTE) Vegetation Ecologist position was hired at CRMO), and provides an evaluation of where the program is today. It also includes desired future conditions identified in previous planning documents and potential scenarios to achieve those futures with a consideration of current needs.

Note: non-native plants, noxious weeds, invasive species, and exotics mean the same in this document. Part of fulfilling the National Park Service mission is to: manage exotic species so that “they will not be allowed to displace native species if displacement can be prevented,”¹ or if it is in keeping with the enabling legislation of the NPS unit.

A. Current Conditions

1. Invasive Non-native Plant Program

a) Historical Perspective

Craters of the Moon National Monument and Preserve (CRMO) began documentation of manual and chemical treatments on non-native plants in 1994 when the monument consisted of only 53,420 acres. Management priorities consisted mostly of removing weeds along a few roads, facilities, and developed trails. Mapping and manual control of mullein and nonnative thistles began in 1998. The CRMO weed management program has evolved over the years from primarily a species based focused effort to more of an “integrated - place based” program.

Historically, the park's highest priorities for invasive weed treatment were spotted and diffuse knapweed, leafy spurge, rush skeletonweed, Dyer's woad, field bindweed, scotch thistle, and Canada thistle (NPS 2016b). Other nonnatives including mullein, bull thistle, smooth brome, and sweet clover were treated as time allowed, but were not a high priority. Cheatgrass was chemically and mechanically treated around park facilities and hiking trails where local eradication was still possible. Controlling cheatgrass on a large scale has been limited because of the monument's Wilderness and wilderness study area (WSA) designations, rocky terrain, and other logistical challenges, but was considered a priority for post wildfire rehabilitation efforts (CRMO 2013).

¹ National Park Service Policies. 2006. Management of Exotic Species, 4.4.4, pg. 47.

Table 1. Common Targeted Weed Species		Date Began Treatment
Diffuse knapweed	<i>Centaurea diffusa</i>	2001- roads adjacent to hwy 93
Spotted knapweed	<i>Centaurea maculosa</i>	2001- roads adjacent to hwy 93
Rush skeletonweed	<i>Chondrilla juncea</i>	2007-Laidlaw Park; Kipukas
Canada thistle	<i>Cirsium arvense</i>	1998 – Original Monument
Leafy spurge	<i>Euphorbia esula</i>	2007 w/BLM – Raven’s Eye WSA
Common Mullein	<i>Verbascum thapsus</i>	1998 - Original Monument
Dyer’s woad	<i>Isatis tinctoria</i>	2008 – w/BLM- South Wapi Flow
Cheatgrass	<i>Bromus tectorum</i>	1998 – Original Monument

2000-2015 years

Before the Monument was expanded in 2000, 30 exotic plant species were known to occur in CRMO; however, after the expansion that number was approximately 101 species (NPS 2011:18). The weed management program prior to the year 2000 was supported by .1 FTE and two or three full time volunteers from June-August with an annual average budget of approximately \$9,000 (NPS 2011:18).

In **2000** the monument expanded to include an additional 410,000 acres of National Preserve; lands formerly managed by the BLM. An additional 274,000+ acres became designated as BLM National Monument and part of the National Landscape Conservation System (NPS 2007). It became clear that a more comprehensive and integrated approach was needed to control approximately 101 non-native plant species covering over 185,000 acres in the new monument and preserve (NPS 2011:23). As a result, noxious weed control became the number one natural resource priority for CRMO in 2000.

In **2001**, 1 FTE was established as a vegetation ecologist and also became the lead for the weed management program. National Park Service staff began writing project proposals to acquire funding in order to more aggressively and systematically treat nonnative invasive plants across a complex and extensive network of roads and the expansive jagged lava fields interspersed with vegetated lands. Traditionally, a 3-5 person field crew was hired to meet weed management objectives, but they also conducted other vegetation management projects.

From **2001 to 2005** weed management efforts focused on diffuse and spotted knapweeds, leafy spurge and rush skeletonweed (RSW). The management objective for knapweed was to contain and reduce infestations within 31 miles of the Highway 93 corridor and 30 miles of secondary roads through the northern portion of the monument and preserve. The management objective for leafy spurge was to control and contain within WSAs on the monument and preserve and the Carey flow. The BLM used helicopter detection and spot treatment, which they had conducted over the previous 20 years. Rush skeletonweed was the main NPS priority in 2004, with a focus on treating interior BLM Monument-Parks (for example: Laidlaw Park) and NPS kipukas (NPS Weed Reports on CRMO’s W: drive). An extensive inventory of RSW was conducted in 2005 by a five person SCA crew.

Table 2. Weed Acres Surveyed and/or Treated (2001-2015)					
Year	CRMO Chemical	CRMO Manual	CRMO Inventory	EPMT Inventory/Infested Acres	EPMT Treated Acres
2001	90	7	125		
2002	117	6	111		
2003	172	89	40		
2004	290	87	128	896.4/53.6	39.8
2005	79	313	189	792.6/ 30.2	18.2
2006	7.8		1,700	1779.3/12.8	9.5
2007	17.69			4239.3/24.1	19.1
2008	110			2476/24.7	8.6
2009	24.54		117.23	1049/6.4	6.4
2010	51.54			8237/43.3	21.1
2011	78			2389/2.9	2.4
2012	128			4.0/3.9	3.9
2013	132			80/3.0	3.0
2014	5.6			30/2.45	2.45
2015	8.54			2.03	2.03
2016	25.5	6			3.28

Note: the NRM-EPMT is included here to give a better picture of weed treatments within CRMO. EPMT first full year began 2004.

Other work priorities from 2001-2005 included inventory and monitoring; mapping; education and weed awareness; BLM/NPS monument-wide weed management coordination efforts (jointly funded projects on mapping and treatments, and data sharing); Cooperative Weed Management Area (CWMA) participation; and Idaho Weed Coordinating Committee representation.

In 2003 education/prevention was such a high priority that CRMO hosted and taught a session on noxious weed history, prevention and identification in cooperation with the Sawtooth Science Institute/ Idaho State University based out of Ketchum, ID. According to conversations with the Environmental Resource Center Director, the Sawtooth Science Institute is no longer operational.²

The **2006** weed summary report stated that the weed crew used the Polaris 6 wheeler to survey, spray or pull weeds along secondary roads, which made for more efficient use of resources. This Off-Highway Vehicle was used extensively in the past to aid in weed control efforts. The Polaris is located within the CRMO headquarters area. It was not used in either the 2015 or 2016 field season, but is a tool to consider for future vegetation management projects.



Figure 1. Spraying rush in Paddelford Flat. NPS 2007, Mule Days Report

Rush Skeleton Weed

In **2006 and 2007**, CRMO used mules to conduct chemical treatments and inventory/map weed infestations in remote areas. The 2006 Paddelford – rush skeleton weed cooperative spray project (NPS, BLM, and Blaine County CWMA) cost \$2,200 over a two day period, including all contractor fees for the mules and contract labor. A similar project was conducted in 2007 for five days. Use of mules are logistically difficult to implement, and not necessary.

² Blaine County CWMA Meeting. Fall 2016. Conversation with Environmental Resource Center Director, Hadley DeBree.

Leafy Spurge

The year **2007** marked the initiation of a “five year” Cooperative Agreement between with NPS and BLM to locate, map and treat leafy spurge infestations in and adjacent to CRMO. The BLM agreed to conduct helicopter surveys (BLM had been doing surveys and treatments for spurge since 1985³) over a 400 square mile area to treat “a limited number of particularly remote leafy spurge infestations as appropriate.” The BLM was to use GPS while in the air to map weed infestations so that the NPS could conduct follow-up ground treatments. To accomplish this effort, the NPS agreed to reimburse the BLM \$20,000 in FY 2007⁴. The NPS also provided monetary assistance in FY2008, but beyond that date funds were not available on a regular basis. According to conversations with the BLM Weed Specialist, the NPS continued to support BLM aerial surveys for several years.⁵ Funding was carried over into future years to assist with aerial surveys.

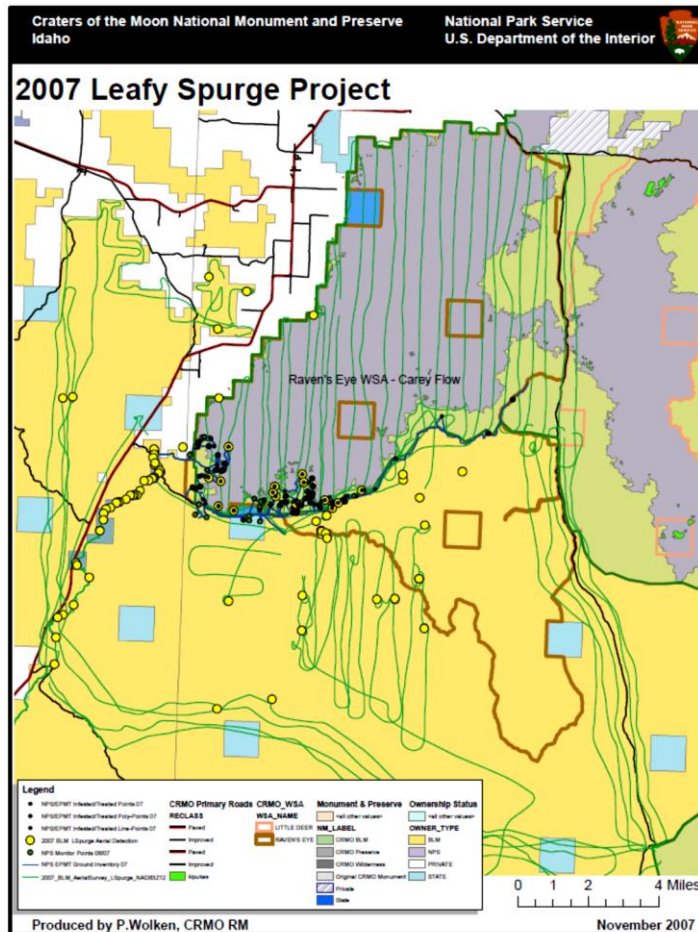


Figure 2. 2007. Leafy Spurge Project – NPS and BLM

Leafy spurge is an invasive weed that requires constant vigilance. As stated in the NPS Northern Rocky Mountains Invasive Plant Management Plan: “Leafy spurge population changes indicate that infestations are doubling every 10 years and in some cases every five years (Anderson, et al 1999 in NPS 2011:201).” This statement is in reference to the entire western United States, not specifically to CRMO.

During the 2007 survey, experienced BLM spotters located 92 infestations and treated 52 sites/points using backpack sprayers. Half of the remaining 40 infestations spotted by the aerial crew were treated by the NPS ground crew and the other half were located in particularly remote areas targeted for biocontrol efforts. After 2007, the BLM scaled back on chemical treatments for spurge and decided to primarily use biocontrol agents⁶. The NPS objective was to keep spurge out of the Carey lava flow and stop its northward advance. Yearly surveys and herbicide treatments has proven to keep spurge at bay. These efforts, as well as all invasive plant control treatments are recorded on the GIS database.

³ W:_Resources\Vegetation Program\Weed Mgmt\2007\Euphorbia esula_project summary_2007_10.zip

⁴ W:_Resources\Vegetation Program\Weed Mgmt\2007\NPSCRM0_BLM_Interagency Agreement.doc

⁵ BLM Meeting. Fall 2016. Shoshone Field Office. Conversation with BLM Weed Management Specialist, Tony Owens.

⁶ W:_Resources\Vegetation Program\Weed Mgmt\2007\Euphorbia esula_project summary_2007_10.zip

Dyer's Woad

The most time consuming and costly NPS weed management project to date has been the eradication of Dyer's Woad, a perennial state-listed noxious weed in the mustard family. The Northern Rocky Mountain Exotic Plant Management Team (NRM EPMT) defines eradicate "as a weed management approach where survey efforts are exhaustive and all known plants are aggressively and permanently removed and efforts are continued until the seed bank is exhausted (NPS 2016a:10)." In a CRMO 2008 weed report, Steve Dewey was quoted as saying that "the key to eradication of Dyer's woad is to prevent any seed to set over 7-15 years." This report also emphasized the need to revegetate within 2-3 years or other invasive plants will dominate.

A five acre Dyer's woad infestation was first discovered in CRMO in 2007 during an observational survey of Sand Kipuka Research Natural Area on the Wapi Lava Field (NPS 2016a). In 2008, surveys in the same region revealed 14 other infestations spread over 2,500+/- acres with a total of approximately 15 infested acres. For nine years CRMO has worked to eradicate Dyer's woad (*Isatis tinctoria* L.).

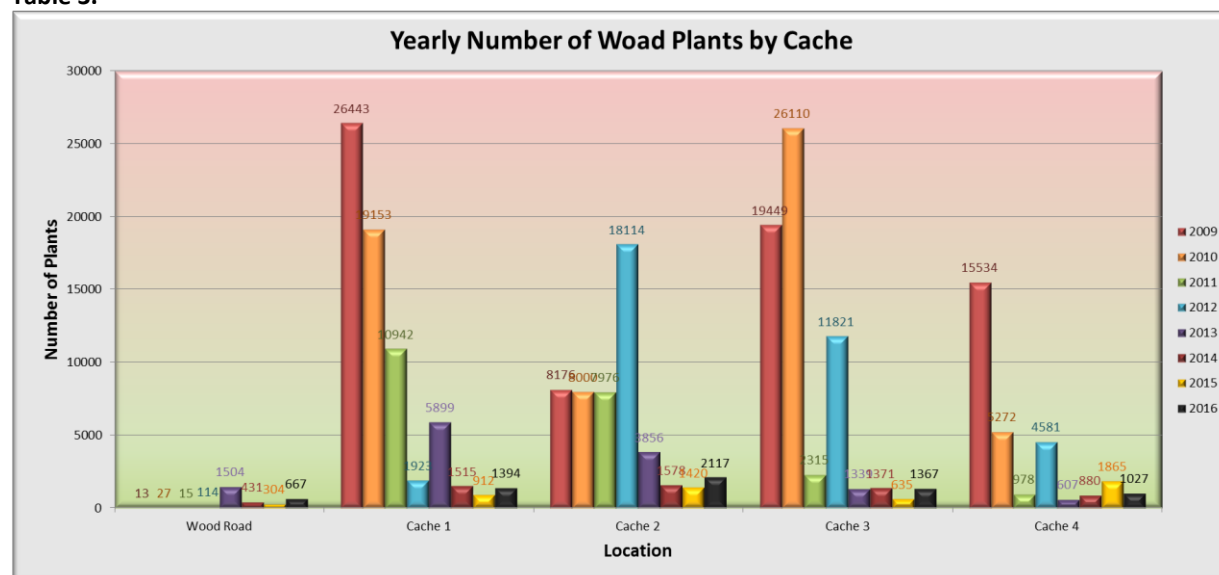


Figure 3. Dyer's woad

Initially, NPS and EPMT crews went out to the Wapi five times per summer, involving complicated water cache trips using mules through Blaine County CWMA assistance. From 2010-2012, the "Woad be Gone" project was implemented in an attempt to eradicate dyer's woad, costing \$83,000 over the three year period. Currently, NPS and EPMT crews visit the Wapi on foot at least three times during the growing season. An NPS crew hikes out as the end of the season to cache water for mixing chemicals.

It is believed that this weed invaded from the railroad along the park's southern boundary. Over 320 infested acres have been documented across the several thousand acres of the Wapi. Treated areas have shown a significant reduction since initial control started in 2008; however, in 2016 new infestations were found outside the treated plots.

Table 3.



Note: Cache refers to the Water Cache Areas on the Wapi.

The year 2007 also saw the finalization of the NPS/BLM Monument Management Plan (GMP) which provided general direction as to what interagency weed management actions would be pursued. Using this plan as a foundation, park staff continued to prioritize aggressive treatment of all state listed noxious weeds encountered and look for opportunities to address other non-natives like cheatgrass.

Biological Control (Bio-Control)

NPS staff has made one purposeful introduction of biological control. In 2009, two study sites for a new rush skeletonweed bio-control agent trial were established on BLM Craters of the Moon Monument lands. More than 300 larvae of the root feeding moth, *Bradyrrhoa gilveolella*, were released over 100 rush plants; however, only one mature larvae was found two months later.⁷ The two release sites were south of Paddelford Flat and South of the Carey lava field. Per discussion with BLM-Shoshone Field Office personnel in 2016, the BLM currently uses bio-control agents for leafy spurge. The NPS is not currently using bio-control agents. Blaine County CWMA and partners use bio-control agents. The Environmental Resource Center has worked with the USFS to establish a bio-control hatching site (insectary) at the Sawtooth National Recreation Area headquarters. Success has been limited due to bug die off during winter and the program is in its infancy.

The use of bio-control agents for weed control has been used in Idaho and the Pacific Northwest for many years. The Nez Perce Bio-Control Center (NPBC) was established in 1999 and has been working with Tribes, private and public landowners since then.⁸ The NPBC partners with the Idaho State Department of Agriculture, University of Idaho, and U.S.D.A. Animal Plant Health Inspection Service in addressing biocontrol of invasive/noxious weeds and rearing/providing insects “agents” to help control/manage targeted weeds.⁹

Invasive Plant Management Plan

Completed in 2011, The Northern Rocky Mountains Invasive Plant Management Plan and Environmental Assessment (IPMP) guides weed management efforts in ten national park units, including CRMO. This plan outlines a decision making process based on the following:

- Identify high priority invasive species for treatment (i.e. on State Noxious Weed list)
- Determine what treatments are feasible to reduce the number of or populations of plants
- Identify the most reasonable management strategy or strategies
- Select the most appropriate treatment option or combination of treatments to minimize potential impacts and maximize overall management success (NPS 2011:117).

In order to implement this process the IPMP identified the following methodology (NPS 2011:116).

1. Prevention and Early Detection (EDRR - early detection and rapid response)
2. Implement 7-step Decision Making Tool (NPS 2011:118-119)
3. Recordkeeping
4. Interpretation/ Education
5. Partnerships
6. Adaptive Management
7. Measures to Avoid, Minimize or Mitigate Impacts
8. Consistency Analysis for Site Specific Plans

⁷ R:\Resource Info\Vegetation\Weeds\Reports\Biocontrol Efforts

⁸ <http://nezpercebiocontrol.com/>

⁹ <http://www.thenmiway.com/bio-control-of-noxious-weeds-the-nez-perce-bio-control-center/>

The IPMP identified 18 high priority species to control, 13 of which are listed on the State of Idaho Noxious Weed List. Due to limited resources the monument has focused on the following species:

- Dyer's woad
- Leafy spurge
- Canada thistle
- Scotch thistle
- Spotted knapweed
- Diffuse knapweed
- Rush skeletonweed
- Cheatgrass, and Common mullein (NPS 2011:76).

Cheatgrass and mullein are not on the state noxious weed list, but are of great concern on a landscape level for both the NPS and BLM, especially on disturbed lands such as construction sites and post fire areas. Cheatgrass has so altered wildlife habitat and replaced native plants that it is an ecosystem health issue for the entire western/arid United States (see Pg. 11; 2c: Habitat Improvement).

Place Based Management Approach

In 2013 CRMO internally developed a "Place Based Management" approach as a means to implement the IPMP and help make difficult management choices in a time decreasing budgets. Park staff ranked different weed management objectives across six distinct management areas/zones. These zones were then prioritized by:

- Threat posed by weed species (state listed/invasiveness – Alien Plant Ranking System)
- Resources at risk (research natural areas, kipukas, etc.)
- Accessibility of the area, and
- Probability of success (NPS 2016a).

Table 4. Place Based Weed Management Units and Objectives (Source: 2013b). NOTE: The 7th unit is BLM lands.

<u>Management Unit</u>	<u>Objective</u>	<u>Priority</u>
Wapi Lava Field	Eradicate Dyers Woad	High
VC, Housing, Loop Road, and Parking	Eradicate Weeds on Park Trails	High
VC, Housing, Loop Road, and Parking	Eradicate Weeds around Park Facilities	High
North End	Eradicate Canada Thistle	High
Internal Lava Fields	Survey / Eradicate Weeds from "Park Special" Kipukas	High
Internal Lava Fields	Survey / Eradicate Weeds from Other High Priority Kipukas	High
North End	Survey and Eradicate Weeds from Highway / Spur Roads	High
CRMO Wilderness / CRMO Lava – East	Survey and Eradicate Weeds from Buttes and Cinder Cones	medium
North End	Mechanically Eradicate Weeds in Big Cottonwood	medium
Carey Lava Field / CRMO Lava – West	Eradicate Leafy Spurge from the boundaries of CRMO	medium
CRMO Wilderness / CRMO Lava – East	Survey and Eradicate Weeds from Wildfire Areas	medium
BLM Monument Lands	Suppress Noxious Weeds from the Little Park Fire	medium
VC, Housing, Loop Road, and Parking	Suppress Cheatgrass around Park Facilities	medium
North End	Suppress Highway Sweet Clover	Low
Wapi Lava Field	Eradicate Other Noxious Weeds in Wapi Kipukas	Low
North End	Eradicate Biennials in Little Cottonwood / Leech Creeks	Low
BLM Monument Lands	Survey and Eradicate Weeds from Monument Roads	Low
BLM Monument Lands	Survey / Eradicate Weeds from Eastern Monument lands	Low
Wapi Lava Field	Detect and Eradicate New Invaders	Low

The primary strategy for invasive non-native plant management up to this point in time was to eliminate or eradicate weeds, not necessarily to contain or suppress them. However, the 2013 strategy acknowledged the reality of the overwhelming weed problem and the challenge of complete eradication.

“... the harsh reality of weed management today is not every weed can be controlled everywhere. Scarce resources have to be strategically allocated so that high priority areas and plants can be effectively addressed (NPS 2013b).”

In 2014 the Vegetation Ecologist, that had been at CRMO for six years, relocated to another assignment. A vegetation ecologist was hired in 2015, but in 2016 the program was again without a leader. An acting vegetation program manager assumed responsibilities of the program during the summer of 2016.

b) 2016 Weed Summary

From mid-May thru September 30 2016 a field crew of five (3-NPS Biological Technicians and 2-Student Conservation Association Interns who worked thru September 2), implemented weed management objectives as part of the overall Vegetation Management Program at CRMO.

2016 marked the ninth year of surveying and seventh year of aggressively treating Dyer’s woad out on the Wapi. Three trips were made with the NPS field crew and the NRM-EPMT. Although few woad patches were found in the old treatment plots, a new infestation (about 535 plants) was found outside one of the plots. It was treated and was added to the GIS map and database.

A fourth trip to the Wapi via foot and backpack was made later in the season to replenish water caches. Neither mules nor horses are used anymore for caching water and/or treating weeds due to the reduction in woad plants and chemicals needed for treatment, and loss of state cost-share funding for any weed control efforts. Table 5 summarizes weed species treated by CRMO staff in 2016.

Table 5. Craters of the Moon National Monument & Preserve – 2016 Weed Treatment Summary					
Target Species	Location	Method Used	Chemical Quantity Used	Approx. Acres Treated	Work Days* (# people x # days)
Dyer’s Woad (I. tinctoria)	Wapi Lava Field (Southern Great Rift Wilderness SA)	2,4D Escort	22.125 oz. 2.62 oz. (74.13 g)	10	5 people x 18 days = 90 work days
Scotch thistle (O.acanthium)	Same as above	Escort	3.5 g (.124 oz.)	< 1	< 1
Rush skeletonweed (C.juncea)	Lave Lake, Carey Kipuka, Little Park, Echo Crater and South (Wilderness)	Milestone	27.279 oz.	10	5 x 7 = 35
Cheatgrass (B. tectorum)	Loop Road, VC, Housing Area (pre-emergent - fall)	Plateau	42.5 oz.	4	3 x 3 = 9
Cheatgrass (B. tectorum)	Developed areas around HQ and loop rd. (spring)	Hand pulled	None	4	6 x 3 = 18
Common mullein (V.thapsus)	Along highway, Tomcat Hill, North End	Hand pulled	None	2	5 x 4 = 20
Leafy spurge (E. esula)	Carey Lava Flow	Tordon	9.5 oz.	1	5 x 1 = 5
			Total: 104.5 oz.	Total: 31.5 ac	177 work days

*work days are only for CRMO staff, does not include EPMT. EMPT files annual reports in IRMA.

All weed treatments, as in past years, were entered into the park's GIS, and maps were updated to show existing conditions for weed points/polygons. An SCA organized the GIS maps and created a Help Guide for ArcMap and ArcPad that can assist future crews and increase efficiency. The guide is part of the *2016 Vegetation Management Binder*, which includes other guides, reports, and documentation of all the vegetation projects completed by the crew. The binder is located in the IRM Office and includes links to digital references.

2016 Borrow Pit Evaluations/ Inspections

The Phenix Construction Pit in Arco was evaluated by the vegetation program manager, vegetation crew, and the Acting Chief of Integrated Resources Management. There were several noxious weeds found on the gravel mounds and surroundings. The site was being evaluated as a gravel/fill material source for the CRMO campground rehab project. The Arco pit was a concern because of all the weeds present. Also, the Butte County Weed Superintendent confirmed that the pit had not been treated. After much research, including investigating borrow pits in Blaine County, consulting with the former CRMO vegetation ecologist and the Yellowstone National Park weed specialist, the Hendricks Pit in Fremont County was chosen as the site for gravel extraction. The pit was evaluated by two CRMO weed crew members and found to be "clean." The pit was sprayed and certified by the Fremont County Weed Superintendent prior to NPS use for fill material for the 2016 campground rehab project.

It is not known to what extent CRMO weed specialists have evaluated borrow pit sources in the past. Conversations with the CRMO Chief of Facilities Maintenance stated that the Arco pit was used in the past for fill material on many construction projects. It is also known that a cinder pit along the north end road was used in the past for fill material. Evidence of an old road to the cinder pit is still visible as is cheatgrass that has invaded the surrounding area, including the adjacent north end road. Another cinder pit within the park that was used in the past for construction fill material is off the loop road.

2. Native Plant Restoration Program

a) Post fire rehabilitation

The native plant restoration program is funded through fire rehab sources and sometimes is incorporated into construction projects. Between 1970 and 2002, approximately 300,000 acres (40%) burned within the expanded monument lands, primarily on BLM lands (NPS 2004:93).

Table 6. CRMO-Fire Summary, NPS lands only (2000-2016).

Fire Name	Year	Acreage – NPS
Echo Crater	2000	631
Golden Chariot	2000	166
Purple	2006	179
Little Park	2008	1,788 (BLM)
Lava Tube	2012	520
Flat Top	2012	1,150
Wapi	2012	68
Laidlaw	2012	57
Cox's Well	1996, 2012	219,437 (BLM), 7,793 (BLM)

Point Well	2015	70 (Wapi flow)
Laidlaw	2016	297
MacRae	2016	69
Paddelford	2016	358
Moon	2016	24

A CRMO Vegetation 2013 staff report stated that:

“The Little Park fire burned in 2008 and has been monitored every year since to evaluate post fire effects and mainly to control weed infestations. The primary weed found here is rush skeletonweed. “An increase of this weed was found in 2011, but in 2012 the numbers had decreased. Overall, this area seems to be somewhat pristine as there are not a lot of other weeds so it should continue to be monitored yearly.”

Although the Little Park fire (1,788 ac.) was almost entirely on BLM lands, monitoring on NPS lands was a priority to keep weeds from invading the Carey Kipuka. Little Park also burned in 1980 and 1990. Adjacent to Little Park is Laidlaw Park, which in 2008 was reported to have an extensive rush skeletonweed infestation. The entire Laidlaw Park, Paddelford Flat, and Little Deer South complex have had fires since 1977, including the 2016 Laidlaw fire that burned over previously treated areas (chemical and biological control). Big sagebrush steppe post fire succession data shows that it takes 10 years for sagebrush vegetation to regenerate naturally, without the aid of human restoration.¹⁰

Four wildfires (MacRae, Laidlaw, Paddelford and Moon) occurred in CRMO the summer of 2016. Most of the burned lands were BLM managed; however, approximately 800 acres of NPS lands burned. The Moon Fire was entirely on NPS lands (approximately 24 acres). The Moon fire was surveyed for noxious weeds by the CRMO veg crew and new weed points were added to the GIS. The veg crew conducted a rapid assessment of the other three fires, including GPS and visual surveys. All the fires jumped the lava edge and burned vegetation within. A Burn Area Rehabilitation Plan was submitted to the NPS Regional Office for the 2016 Fires. Funding would allow the NPS to survey, treat, and monitor the burned areas in order to prevent invasive non-native plants from becoming established in the fire areas. The funding request also includes needs for native plant restoration and monitoring.¹¹



Figure 4. Paddelford fire. Source: BLM 2016

In 2010, the BLM's Shoshone Field Office began participating in the Seeds of Success program and is now in the process of increasing several different species of plants for use in restoration and rehabilitation of rangelands (*as well as fire impacted habitat*) with locally-sourced plant materials.¹²

¹⁰ Lesica, P., S. V. Cooper and G. Kudray. 2005. Big sagebrush shrub-steppe postfire succession in southwest Montana. Report to Bureau of Land Management, Dillon Field Office. Montana Natural Heritage Program, Helena, MT. 29 pp. plus appendices.

¹¹ The full description of the three year BAR project can be found on the R: drive.\Fires 2016\Final 2 CRMO BAR Plan 9_28_2016.docx

¹² <https://www.blm.gov/programs/natural-resources/native-plant-communities/native-plant-and-seed-material-development/collection/idaho>

b) Loop Road Rehabilitation Project

In 2013, funds were acquired to rehabilitate areas impacted from the loop road restructuring project. The project included: hundreds of hours of seed collection, thousands of container plants planted via contract work, and three years of SCA interns that watered native plantings and controlled weeds. There have been several other construction projects over the years that have required revegetation work that are not listed here.

c) Conversion of Lawn at Headquarters and Residence Areas to Native Plants

In 1958 the NPS embarked on a vegetation planting project with the assistance from the regional Landscape Architect. Native plant species mixed with non-native species of grasses, shrubs and trees were planted in front and back of all residential housing and visitor center areas (E-Tic drawing 1958). Over the years the non-native grass species dominated the native grasses. Big bluegrass was one of the native species planted in 1958, and references state that once established it competes well with cheatgrass,¹³ and this seems to be the case in the existing visitor center lawn and picnic table area.

Over the past 30-40 years most of these exotic grass plantings have been replaced with all native plantings, and annual manual and chemical control of cheat grass. Today the landscape is a combination of: 1) concrete or paving stones have replaced all vegetation behind all residential areas, 2) native plant restoration occurred in front of all residential areas and most of VC areas, and 3) complete domination of non-native grasses in front of the overflow visitor parking area (picnic table site). The non-native grasses planted in 1958 included: Canada bluegrass, Hard fescue, and Tall fescue.¹⁴ Hard fescue is a native to Europe, long lived, persistent and competitive with other grasses and weeds.¹⁵ Popular uses for hard fescue include: turf grass, parks, and golf courses because it is low maintenance, low growing, and less water use than other turf grasses. Tall fescue is now known as a noxious weed and is toxic to domestic livestock as well as wildlife and at least 20 insect species.¹⁶

In 2013, the Maintenance Division submitted a project titled: "Rehabilitate Visitor Center Lawn for Water Conservation and Accessibility." The project was Region reviewed in 2014. The objective of this project was not to restore native vegetation, but rather to improve the use of the non-native lawn by establishing accessible paths. The proposal states: "...visitors very much enjoy this small "green" area in the sea of black volcanic rock..." Through construction of accessible paths, some non-native lawn would be removed, but approximately 3000 square feet of lawn would still remain.¹⁷ The cost to maintain a non-native lawn and improve access was estimated at approximately \$50,000. This project was slated for 2018 implementation.

d) Habitat improvement

Sagebrush steppe habitat comprises 60 percent of the monument's vegetated lands (NPS 2007:22). The CRMO 2009 vegetation survey determined that over 25 percent of the monument is cheatgrass infested (NPS 2016b). Within big sagebrush communities, cheatgrass-fueled changes in wildfire patterns have emerged as the greatest threat to the Greater sage grouse (EE 2015). This has resulted in a decrease in

¹³ https://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/wapmcrb9826.pdf

¹⁴ e-TIC document, National Park Service. Craters of the Moon National Monument and Preserve. Seeding and Planting. TIC Drawing: 3117. 1958

¹⁵ https://plants.usda.gov/factsheet/pdf/fs_febr7.pdf

¹⁶ https://plants.usda.gov/plantguide/pdf/pg_loar10.pdf

¹⁷ PMIS 205791: Rehabilitate Visitor Center Lawn for Water Conservation and Accessibility Compliance. 2014.

the quality of sage grouse habitat, habitat fragmentation, elimination of large areas of sagebrush, and/or converting sagebrush communities to grasslands (cheatgrass).

The importance of protecting sagebrush steppe habitat has been elevated throughout the western United States to a priority level because of the Greater sage grouse (GSG). This species was recently evaluated as a candidate species for listing under the Endangered Species Act (ESA), but was determined not eligible in 2015.

According to a U.S. Fish and Wildlife Service press release:

“After a thorough analysis of the best available scientific information and taking into account ongoing key conservation efforts and their projected benefits, the FWS has determined the bird does not face the risk of extinction now or in the foreseeable future and therefore does not need protection under the ESA.”¹⁸

The Monument contains large tracts of Greater sage grouse habitat including: suitable lek, nesting, brood rearing, and wintering areas. In the winter, sage grouse feed almost exclusively on sagebrush leaves, requiring canopy cover that remains above snow level (Connelly 2000). When necessary, the grouse will migrate many miles to find suitable winter range with exposed sage (NPS 2004:105).

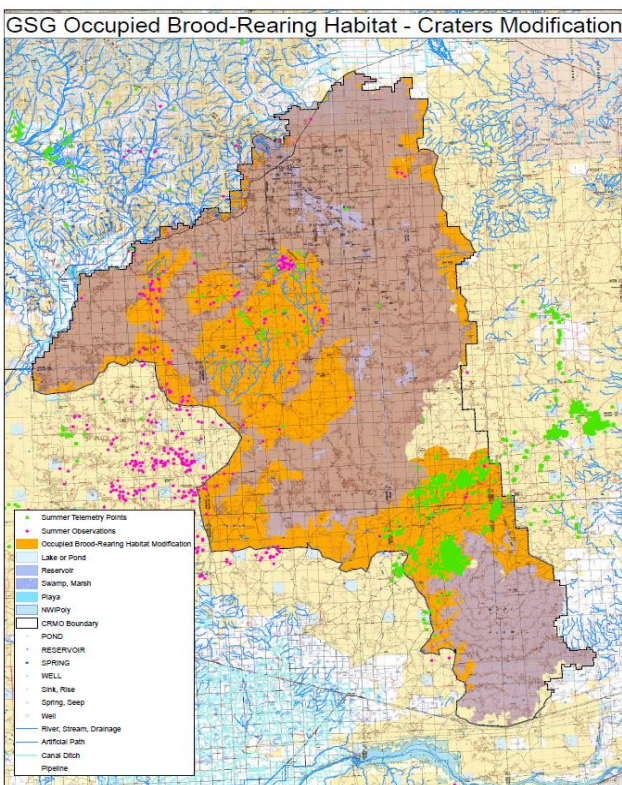


Figure 5. R:\Resource Info\Wildlife\Birds\Sage Grouse\Maps.

The CRMO wildlife biologist coordinates and conducts annual monitoring of the Greater Sage grouse. Recent lek counts indicate the population is stable or slightly increasing; however, habitat loss due to wildfires may reflect a decrease in future population trends (NPS 2016b).

Other sagebrush obligate wildlife species (restricted to sagebrush habitats year-round or during the breeding season) include the sagebrush sparrow, Brewer's sparrow, sage thrasher, sagebrush vole, pygmy rabbit, and sagebrush lizard (NPS 2011:222). Also, these at risk sagebrush communities provide year-round habitat and crucial winter range for elk, mule deer and pronghorn.

There is a regional effort underway by other land management agencies, including the BLM, USFWS, USFS, and Idaho Fish and Game to improve and restore Greater sage grouse habitat.

¹⁸ U.S. Fish and Wildlife Service. 2015. Historic Conservation Effort Protects Greater Sage-grouse. <https://www.fws.gov/news/ShowNews.cfm?ID=F5B7455D-0824-997C-47667F8ABBFFBA86>

For example: The Idaho BLM-USFS Conservation Plan emphasizes the importance of reducing habitat fragmentation by:

- Providing the highest levels of protection in Sagebrush Focal Areas, which are landscapes with high breeding population densities of sage-grouse, high-quality sagebrush habitat and a preponderance of federal ownership or protected areas that serve to anchor the conservation value of the landscape (BLM 2016). *Craters of the Moon is one of these “anchor” areas.*
- Focusing protection in Priority Habitat Management Areas, which are managed to avoid and minimize further disturbance; such as cheatgrass invasion.
- Working in close coordination with state and local partners, as well as through continued collaboration with the Sage Grouse Task Force and local working groups (BLM 2016).

The NPS has stronghold Greater sage grouse habitat and our staff conducts annual sage grouse lek counts, using IDF&G protocols. CRMO does not currently play an active role in the interagency Sage Grouse Task Force nor are they identified in the BLM-USFS plans as a working partner. However, during the Conservation Plan development, the NPS was listed as a cooperating agency and the CRMO wildlife biologist sat in on monthly calls.

3. Inventory and Monitoring (see also Partners - UCBN)

Vegetation inventories, monitoring, and classification efforts have been conducted over the years by many researchers. In 1985 the University of Idaho published a report that identified and mapped 26 different vegetation types in the monument (Day and Wright 1985). Below is a table that is commonly referenced in CRMO documents.

See - [W:\Resources\Vegetation Program\Presentations\INPS presentation 2014.pptx](#) for an overview of the vegetation inventory and status at CRMO.

Table 7. Vegetation type and approximate acres in Monument (NPS 2005)

Low-Elevation Sagebrush Steppe	157,000
Annual Grassland (exotic)	31,000
Perennial Grassland (seeding and native)	153,000
Mid-Elevation Sagebrush Steppe	9,400
Lava (bare and vegetated)	399,000
Mountain Shrub	400
Aspen	60
Conifer (Douglas fir)	140
Riparian	670

In 2009 a four year vegetation inventory project resulted in the identification of about 701 species of vascular plants, 93 distinct plant associations, 47 plant alliances, and 38 vegetation types (Bell et al 2009). The project also produced a digital vegetation map and descriptions, digital photos, metadata, and a final report.

Long term trend vegetation transect monitoring was initiated at CRMO in 1991 in cooperation with the University of Idaho and Dr. Gerald Wright. *Eight permanent vegetation transects* were established, including Carey Kipuka. These permanent transects were consistently surveyed and monitored by CRMO staff yearly until 2010, according to digital files at CRMO.

a) Kipukas

Kipukas, approximately 590 identified thus far in the monument, ranging in size from one acre to several thousand acres are “isolated” islands of sagebrush steppe vegetation surrounded by large lava fields.

The expansive surrounding rugged lava has protected the kipukas from people, animals, and in some cases exotic plants and fire. As a result, these kipukas represent some of the last *nearly* pristine and undisturbed vegetation in the Snake River Plain, including 700-year-old juniper trees and relict stands of sagebrush plant communities and associated soils. This unique kipuka ecosystem has been researched since the 1950s. Within the big sagebrush communities, cheatgrass-fueled changes in wildfire patterns and intensity are one of the greatest threats to the sagebrush steppe ecosystem. There is a growing concern that many kipukas, even those that are extremely remote and difficult to access, are being threatened by noxious weed invasion, such as cheatgrass (NPS 2013b).

Carey Kipuka

Carey Kipuka was discovered in the fall of 1955 by ecologists from the University of Idaho, who were looking for relict areas on the Snake River Plain to use as reference for the study of climax sagebrush vegetation (Mosley 1989). This discovery led to a series of research and surveys over a 30 year period by scientific principle investigators from the Columbia Plateau Region, University of Idaho, the National Park Service, and other cooperators.



Figure 6. Carey Kipuka. Source: <https://www.nps.gov/crmo/learn/nature/kipukas.htm>

In 1962 Carey Kipuka was added to the original Monument on the assumption that the kipuka contained pristine and undisturbed grasslands. However, it was later confirmed through observations by early Superintendents that the Carey Kipuka was used historically by grazing sheep and sheepherder camps, as well as Native Americans before that (Louter 1992). Although Carey kipuka has been historically impacted by grazing on a short term basis, an evaluation to determine its eligibility in the National Natural Landmark Program (NNL) was conducted in 1989. The evaluation report concluded the following:

“Early low sagebrush communities occurring in Carey Kipuka are outstanding examples of the Low Sagebrush/Idaho fescue Subtheme of the Low Sagebrush Theme. The NNL is considered the best known example of this subtheme in the Columbia Plateau Natural Region...Carey Kipuka has had a 30 year history of ecological research. It has been used as an ecological reference area for soil - vegetation correlation by the University of Idaho and the Soil Conservation Service, and has had permanent monitoring plots established since 1957... In my opinion, the site appears to be nationally significant and I recommend that it be designated as a National Natural Landmark (Mosley 1989).”

National Natural Landmark

Although Carey Kipuka was never added to the NNL, the Great Rift System was designated as part of the NNL in 1968 for its geological significance. It contains 171,999 acres, and is 62 miles in length, including major NPS managed lands (Kings Bowl and the Wapi).¹⁹ In 1980 the NNL was expanded to recognize its

¹⁹ <http://imnh.isu.edu/digitalatlas/geo/greatrift/grztext/grzmain.htm>

biological significance (NPS 2004:299). The Great Rift represents a fracture in the earth's crust and displays primary vegetation succession on very young lava flows.²⁰

Research Natural Areas

The importance and long-term value of kipukas was recognized by designating four Research Natural Areas (RNA); Brass Cap, Big Juniper, and Sand Kipuka – recommended 1983 BLM, and Carey Kipuka (NPS 2007:23). An RNA is permanently established as an example of an ecological community type, usually having little disturbance in the past and where natural processes are not impeded. The RNA is managed exclusively for approved non-manipulative research; i.e. research that measures, but does not alter existing conditions.²¹

Kipuka Monitoring

Although a select few kipukas had been researched since the 1950s through BLM cooperative efforts, NPS monitoring began in earnest in **2002** (two years after the monument expansion which added many kipukas to NPS jurisdiction). Using aerial imagery, 590 kipukas were discovered by NPS staff of which approximately 90 percent had never been visited by researchers. In 2003, a cooperative agreement between CRMO and Idaho State University was initiated to inventory these kipukas. The research was conducted by Dr. Nancy Huntly as Phase I: **2004-2005** (88 distinct kipukas) and Phase II: 2007-2008 (150 kipukas).²² By 2011 only 85 percent of the products on this project were delivered (phase I). The final report for phase I can be found in IRMA. Within the 88 kipukas, 174 plant species were identified, and percent cover was evaluated on 12 randomly selected kipukas. No state listed noxious weeds were found on any of the kipukas; however, 17 non-native species were documents, with cheatgrass being the most common and widespread. Research results concluded that neither kipuka size nor isolation from sagebrush steppe landscape had a significant correlation to species diversity. Some kipukas that were small had just as much species diversity as large kipukas. Also, kipukas that were far from landscape level sagebrush steppe plant communities did not show less plant diversity as expected, but rather more diversity (Huntly 2009).

The intent of this inventory by ISU professor Huntly was to assist CRMO in developing a geodatabase for kipukas that would be a dynamic and practical tool for future management. The database was to be populated with baseline information gathered by the ISU research, and contain links to representative photos and specific resource data (e.g. plant lists *and plant photos*, vegetation community data, etc.).²³

In **2010**, CRMO staff started surveying kipukas with a focus on detecting and treating noxious weeds. Kipuka monitoring was included as part of the Place Based Weed Management Approach in order to achieve the desired future condition: "Kipukas in the Pristine Zone are free of noxious weeds (NPS 2007:26)."

In **2013**, CRMO developed a strategy to inventory "special park" and high priority kipukas. A "special park" kipuka was defined as one that has a special designation such as a research natural area, national natural landmark, or one that has been uniquely defined and/or carefully researched. Other high priority kipukas were ranked based on ecological importance and four criteria:

- 1) Existing vegetation characteristics (unique or relatively pristine),

²⁰ <https://www.nps.gov/subjects/nnlandmarks/site.htm?Site=GRRI-ID>

²¹ <https://nature.nps.gov/rm77/specialdesignations/RNA.cfm>

²² W:_Resources\Vegetation Program\Kipukas\Geodatabase\Kipuka Geodatabase Status and Comments_12_10

²³ Ibid

- 2) Potential for resilience from disturbance (showing preference to higher elevation and precipitation),
- 3) Ability of park staff to effectively survey the kipuka with a high degree of confidence, and
- 4) Degree of kipuka isolation (NPS 2013b).

The prioritization effort resulted in 10 special and 36 high priority kipukas identified for monitoring. CRMO staff spent 30 work days monitoring “park special” kipukas in 2013. A rotation schedule for kipuka monitoring was developed by Steven Bekedam, former vegetation ecologist for CRMO, and has been followed since 2014.

The idea of a Kipuka Geodatabase was picked up again in 2013 by the UCBN. A draft SOP and DRAFT Natural Resources Report was assembled by Meghan Lonneker, but was not finalized.

In **2014**, approximately 31 kipukas were surveyed and in **2015**, 14 kipuka complexes (a total of 29 individual kipukas) were surveyed.

In **2016**, 14 kipuka complexes (a total of 27 individual kipukas) were surveyed using the prioritization table. The vegetation crew wrote a new kipuka survey form, including a data sheet for each kipuka, name of plant species found, percentage of each species (which is consistent with how the UCBN displays data), and notes. Thomas Bradder, a CRMO vegetation crew member, assembled a Kipuka Plant Guide with photos to assist future field crews in identification of plants. This guide is in digital and hard copy format, can be used as a reference in the field and office, and can be linked to a future kipuka geodatabase. In the summer of 2016 another kipuka research project was conducted, but no report has been submitted as of this writing.

b) Rare Plants

In 1995, Steve Popovich, former BLM Botanist, conducted an aerial flight of remote kipukas to survey for rare plants. Only one rare plant was found, *Eriogonum douglasii* (Douglas’ buckwheat) (Popovich 1995 – see IRMA). This species is state listed as critically imperiled per NPSpecies.²⁴

Two sensitive species within the Monument include, *Astragalus oniciformis* (Picabo milkvetch) and *Phacelia inconspicua* (Obscure phacelia). The Picabo milkvetch, an endemic to Idaho and CRMO, is listed globally and statewide as rare or uncommon but not imperiled (typically 21 to 100 occurrences). A conservation status report states the following:

“Any conservation strategy developed to assure the long-term persistence of Picabo milkvetch as a viable evolutionary unit must take into account the decline of the sagebrush-steppe ecosystem on the Snake River Plain (Mosley and Papovich 1995).”

Threats to the Picabo milkvetch include loss of habitat (decline of sagebrush steppe vegetation community) and herbicide use, especially along roads and right of ways (Mosley and Papovich 1995).

Obscure phacelia is a sensitive plant within the monument, and its conservation rank is listed as State-Critically imperiled because of extreme rarity or because some factor of its biology that makes it especially vulnerable to extinction (typically 5 or fewer occurrences, and Globally-Imperiled because of rarity or because other factors demonstrably make it very vulnerable to extinction (typically 6 to 20 occurrences).²⁵ The first confirmed sighting of Obscure phacelia in the monument occurred in 2010,

²⁴ <https://irma.nps.gov/NPSpecies/Search/SpeciesList/CRMO>

²⁵ <https://idfg.idaho.gov/species/taxa/44757>

north of Sunset Cone. In the summer of 2016, Idaho Fish and Game conducted a survey for Obscure phacelia in the North End of the monument; however, it is not known if any plants were found.²⁶

c) Endemic Plants

In 2013 Drs. Don Mansfield and James Reveal confirmed that CRMO has a new variety of endemic buckwheat, *Eriogonum ovalifolium* var. *focarium* (Craters of the Moon Wild Buckwheat). For many years this variety was thought to be var. *depressum* and identified as such in CRMO documents, plant lists, and general information given to the public. A personal email in 2016 between the Acting Vegetation Ecologist and Dr. Mansfield from College of Idaho confirmed the validity of their 2013 research.

Mansfield stated that: “all of what you (and others, including me) have been calling *E. ovalifolium* var. *depressum* for years—the one that is all over the cinders—is now recognized as a distinct variety endemic to the cinders at CRMO”²⁷



Figure 7. Craters of the Moon Wild Buckwheat.
Photo: G .Pearson

“Craters-of-the-Moon wild buckwheat, *Eriogonum ovalifolium* var. *focarium* (Latin *focarius*, of the oven), is restricted to black volcanic cinder flats and slopes that dominate the monument...the var. *focarium* is found some 2000 feet below populations of var. *depressum* found on the nearby mountains just to the north.”²⁸

The Craters of the Moon wild buckwheat is listed as Globally - widespread, abundant and secure, but this particular subspecies is rare or uncommon, and Statewide - rare or uncommon, but not imperiled.

4. Hazard Tree Program

The hazard tree monitoring program is conducted every year using standardized NPS regional forms. Hazard tree locations are in the IRM/GIS database, which is used to print maps to conduct the surveys. A 2009 Hazard Tree Monitoring SOP was developed, revised in 2012. However, CRMO does not have a Hazard Tree Management Plan. In 2015 the NPS Pacific West Region issued guidelines for Hazard Tree Planning and Management. The monument’s Hazard Tree Monitoring SOP needs to be updated to reflect these new guidelines.

Hazard tree Job Hazard Analysis (JHAs) were updated in 2016, but have not been signed by the monument’s superintendent. Per the 2015 Regional Hazard Tree Policy, the Superintendent is responsible for designating a person to develop, implement, and keep up to date a hazard tree program

²⁶ Ibid

²⁷ Personal Email Conversation between Dr. Mansfield and Acting Vegetation Program Manager, Gina Pearson. August 12, 2016.

²⁸ Reveal, J.L. and D.J. Mansfield. 2014. Two new varieties of *Eriogonum ovalifolium* (Polygonaceae) from the Intermountain West, USA. *Phytoneuron* 2014-1: 1–8. Published 6 January 2014. ISSN 2153 733X.

and to ensure individuals involved in monitoring and removal of hazard trees obtain proper training. There is one chainsaw certified operator in the monument (Karl Pearson, Chief Ranger).

In the past, the Facilities Maintenance Division was notified of a hazard tree needing removal and they would take care of it; however, personnel have not received proper training in chainsaw certification and hazard tree removal.

5. Partners

a) Northern Rocky Mountain Exotic Plant Management Team (NRM EPMT)

Created in 1996, today the NPS Exotic Plant Management Program is comprised of 18 regionally located teams servicing National Park units in all Regions.²⁹ In 2000 a proposal was written to create the NRM EPMT, with the intent as described below.

“A major threat to the integrity of plant communities within the region is the invasion, establishment, and spread of non-native plants. Some visitors’ enjoyment of the outdoors is diminished in areas dominated by noxious weeds in river corridors, along trails, and in meadows where weeds have displaced native vegetation. Exotic plant species pose a barrier to understanding the natural processes of plant and animal succession in these special habitats. For some users, the loss of wildlife habitat also decreases value of park lands. Native vegetation is a critical component of many cultural landscapes, upon which the presence of non-native noxious weeds may be an intrusion (NPS 2000:2).”

The strategy of the EPMT was to “assist parks with control and management of high priority exotic plants (NPS 2000:8).” The approach was modeled after fire crews. For example: highly trained veg crews could be dispatched to assist parks in controlling non-native invasive plants.

In 2003 the NRM EPMT was officially established to serve 14 partner parks, totaling about 4 million acres. The team was divided into three satellite unit crews based out of YELL, GLAC and CRMO. Each crew consisted of two seasonal staff members and one permanent GS-07/8/9 crew leader.³⁰ The first field season began with \$300,000 in program funding and focused on acquiring equipment and supplies, and developing the team infrastructure. The three person CRMO spike crew was housed in the park for nine years (2003-2011). The CRMO vegetation ecologist served as the park liaison for the CRMO based EPMT crew that conducted control efforts primarily in CRMO, Hagerman Fossil Beds National Monument (HAFO), Minidoka Internment National Historic Site (MIIN), City of Rocks National Reserve (CIRO), Fossil Butte National Monument (FOBU), and Golden Spike National Historic Site (GOSP).

In 2011, CRMO requested the NRM EPMT consider no longer having a spike team based at the park. The 3-person spike team was becoming difficult for the EPMT to support financially (the crew leader position was vacant at the time), there were park concerns about providing supervisory controls (with the YELL liaison serving as their official supervisor), and providing local housing to crew members. After the 2011 season, through steering committee concurrence, the EPMT spike team no longer was based at CRMO. The team is now based out of Yellowstone National Park.

²⁹ Beard R and App R. 2013. Exotic Plant Management Team Program: 2012 Annual Report. Natural Resource Report. NPS/NRSS/BRMD/NRR—2013/674. National Park Service. Fort Collins, Colorado

³⁰ W:_Resources\Vegetation Program\Old EPMT Files\Reports\End-of-Year\FY2003

In January 2017, the NRM EPMT added seven parks in Colorado and one in New Mexico. The EPMT now services 25 national park units in six different states. Theoretically, this additional workload is not intended to significantly impact the support the NRM EPMT currently provides to CRMO. However, in the future CRMO may need to articulate their invasive plant management needs to the NRM EPMT in a project proposal type format in order for the overall EPMT workload to be prioritized, coordinated, and effectively implemented.³¹

b) Upper Columbia Basin Monitoring Network (UCBN) – National Park Service

The purpose of the UCBN is to:

“...work collaboratively with park staff, university cooperators, and other federal agencies to plan and conduct inventory and monitoring (I&M) projects in the UCBN parks, track status and trends in resource conditions, and communicate results to park managers, partners, and the public.”³²

The UCBN established 14 vital signs for long term monitoring. Vital signs are indicators of ecosystem health which represent a broad suite of ecological phenomena operating across multiple temporal and spatial scales. Vital signs were selected to meet the needs of park management and to detect responses to unanticipated environmental conditions and potential future issues. Each vital sign monitored has associated Standard Operating Procedures (SOPs). For example for Sagebrush Steppe the SOPs include:

- SOP 1: Preparation for the Field Season
- SOP 2: Training Observers
- SOP 3: Finding GPS Waypoints
- SOP 4: Locating and Establishing Sampling Quadrats
- SOP 5: Measuring Sagebrush Steppe Community Attributes
- SOP 6: Data Management
- SOP 7: Data Summary, Analysis, and Reporting
- SOP 8: Protocol Revision
- SOP 9: Field Safety
- SOP 10: Field Reference Manual

Vegetation monitoring protocols currently established for CRMO include aspen, limber pine, and sagebrush steppe communities.

• Aspen

Thirty years ago Dr. Gerald Wright from the University of Idaho conducted a photo landscape project in CRMO which compared aspen stands on the north end, using photos taken in the 1950s and repeat photography of the same aspen stands in the 1980s. According to the report, the stands of aspen were not significantly different from the 50s to the 80s (Wright, et.al. 1994). It is now thirty years later, and it may be valuable for long term monitoring purposes to conduct the same repeat photography project.

Researchers have noted that “although aspen communities are one of the most biologically rich in the Intermountain West, quaking aspen is declining rapidly in many areas, with an estimated loss of 61% in Idaho (Bartos 2001).” Aspen stands are found in just a few places within the Monument, such as Little Cottonwood, Leech Creek, Big Cinder, and in Snow Drift Crater (BLM, Laidlaw Park), thus are a unique resource in a sea of lava.

³¹ Personal Conversation with Steven Bekedam, Northern Rocky Mountain Exotic Plant Management Team Liaison. 12/2/2016.

³² <http://science.nature.nps.gov/im/units/ucbn/parks/crmo.cfm>

Monitoring of aspen by the UCBN at CRMO began in 2007. The UCBN protocols were developed in 2009 with objectives that include monitoring for: aspen abundance, conifer encroachment, and aspen regeneration. The last aspen monitoring report stated that “the majority of aspen stands at CRMO are regenerating and contain a distribution of age classes (UCBN 2011).”

- Limber Pine

Monitoring of limber pine (*Pinus flexilis*) is closely associated with the monitoring of the white-pine blister rust (*Cronartium ribicola*) disease, a non-native fungus. Blister rust was first documented at CRMO in 2006 and the infection has persisted in a few trees on the northern edge of the park. UCBN monitoring of limber pine began in 2011 (Stucki 2015). To date the disease does not appear to have spread south into the sparse pine woodlands that occur across the vast lava flows in the Preserve.³³

Monitoring will help researchers and monument staff understand changes in limber pine populations at the local and landscape level, and “detect trend data needed to assess current outbreak status and develop an appropriate management response to blister rust infection and mountain pine beetle outbreaks (UCBN website).”³⁴



Figure 8. White Pine Blister Rust

The limber pine monitoring objectives at CRMO include the status and trend of the following:

- Tree species composition and structure
- Tree species birth, death, and growth rates
- Incidence of white pine blister rust (*Cronartium ribicola*) and level of crown kill
- Incidence of pine beetle (*Dendroctonus spp.*) and severity of tree damage
- Incidence of dwarf mistletoe (*Arceuthobium spp.*) and severity of tree damage
- Cone production of white pine species

Note: In the 1960s approximately 6,000 limber pine trees were removed by the NPS at CRMO (within original monument). This was done under an assumption that dwarf mistletoe was “bad” and would kill all the trees. It is now known that dwarf mistletoe is a native parasite that has been part of the CRMO ecosystem for thousands of years (NPS 2007).

- Sagebrush Steppe Vegetation

Sagebrush steppe occupies over 90% of the vegetated lands (81% of total land cover is bare lava rock) of CRMO and has been identified as a high priority vital sign for the UCBN (Yeo, et.al. 2009:1). The long term vegetation monitoring program at the Idaho National Laboratory, adjacent to CRMO, has researched extensive periods of drought and its effect on the natural landscape, including the relationship to fire frequency, non-native plant invasion, and changes in the sagebrush steppe plant community (Yeo, et al. 2009:1).

Monitoring the health of the sagebrush steppe on a landscape level will inform other protocols such as the Greater sage-grouse and non-native invasive plants (which has not been developed yet for CRMO). Understanding positive and negative changes (type and frequency) in the sagebrush steppe will help

³³ UCBN Website. Accessed 12/9/2016. http://science.nature.nps.gov/im/units/ucbn/monitor/limber_pine.cfm

³⁴ Ibid

managers, including our BLM co-managers, develop cooperative management strategies to protect and restore this vegetation community that several wildlife and insect species are dependent upon.

The UCBN identifies the importance of sagebrush steppe monitoring as follows:

“Plant invasion and shifting community composition and species abundance is the overarching concern for Network park managers. Indicators of sagebrush steppe biotic integrity, hydrologic function, and soil/site stability are the focus of the protocol, which will provide managers with information necessary to evaluate progress in activities related to maintaining and restoring native plant communities.”³⁵

UCBN monitoring of sagebrush steppe at CRMO began in 2008 with protocols established in 2009. Because of the significance and overall importance to ecosystem health, the sagebrush steppe plant community is a vital sign. Below are I&M objectives for sagebrush steppe:

- Determine the status (current condition) and trends (change in condition over time) in the composition and abundance (cover) of principal native plant species in UCBN sagebrush steppe communities.
- Determine the status and trends in composition and abundance (cover) of principal invasive plant species, including annual grasses, in UCBN sagebrush steppe communities.
- Determine the status and trend in the amount of exposed soil (cover), a fundamental indicator of soil stability.

According to the 2013 UCBN report for CRMO sagebrush steppe monitoring, several areas within the monument are in exceptionally good ecological condition (few weed species), particularly Brass Cap Kipuka and Sunset Cone area (seven plots are within kipukas), while other areas like the Wapi Flow are degraded because of invasive non-native plant species, principally cheatgrass (Esposito, et al 2014).

c) Cooperative Weed Management Areas (CWMAs - Butte and Blaine County)

Historically, CRMO was a more active partner with Butte and Blaine County CWMAs. Lack of a consistent long term vegetation ecologist has in part hindered actively partnering with the counties as well as elimination of state cost share funding to federal agencies. Both counties have active weed control programs. An example of a previous cost-share projects was dyers woad water caching from 2008-2012. Traditionally, two CWMA meetings are held yearly, one in the fall (review summer project accomplishments, updates from each partner, and new policies/changes) and one in the spring (discuss potential collaborative projects for the summer).

Butte County stores the Monument’s herbicides for free. Both County Weed Superintendents have expressed a desire to improve communications with the Monument and conduct some collaborative weed control work for 2017.



Figure 9. Blaine Co., Bugs at Work Sign.
Photo: Gina Pearson, 2016.

The counties conduct an integrated approach to weed management, including chemical, mechanical, and biological control, and outreach via social media, flyers, events/activities. Their efforts have shifted

³⁵ UCBN Website. Accessed 1/10/2017. <https://science.nature.nps.gov/im/units/ucbn/monitor/sagebrush.cfm> (includes video).

to working more with private landowners and non-profits. In 2016 Blaine County released a biological control agent for Dalmation toadflax at Slaughterhouse Canyon, a canyon in the Wood River Valley.

d) BLM (Co-managers of Monument)

Noxious weed management is a priority for the NPS and BLM, and is a key component in the Monument Management Plan of 2007. For over 30 years the BLM has surveyed and treated leafy spurge within the monument via helicopter support. The NPS funding proposal initiated in 2004 (realized '07) to assist on spurge project included:

- Fostered Cooperative Management of high priority weed issue
- Limited NPS involvement/support for the leafy spurge project from 2002 – 2006
- Supported expansion of existing helicopter program (\$20,000 FY07; \$10,000 FY08) to detect and GPS new leafy spurge infestations.
- BLM successful with individual infestations/ containment within project area
- Follow-up ground treatments by NPS

Note: Former vegetation ecologist, Steven Bekedam, also confirms that NPS and BLM contributed funds to this project up to about 2015. According to conversations between the Acting Vegetation Ecologist and the BLM Weed Management Specialist in 2016, funds were rolled over from previous years.³⁶

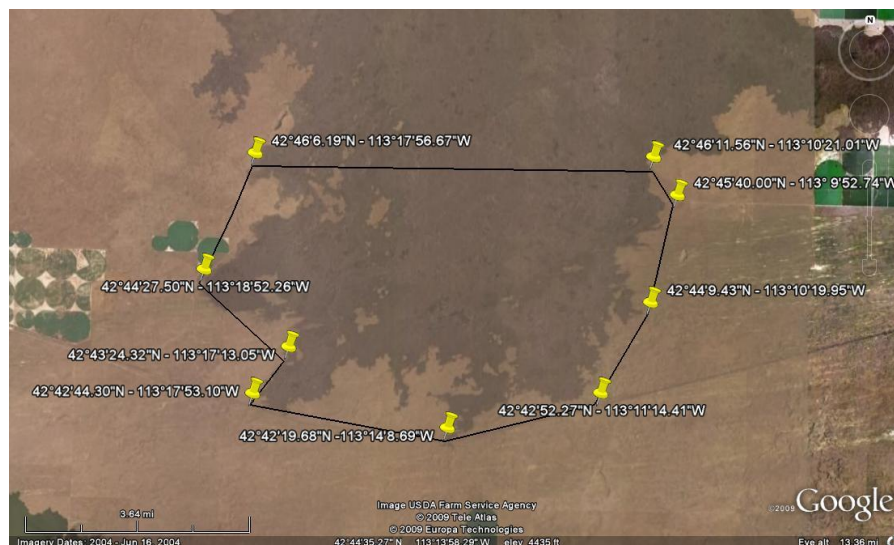


Figure 10. BLM flight area on Wapi, 2009. Currently, 2016, the BLM treats north of the horizontal line and NPS responsible for area within the polygon. Source: BLM

The BLM has conducted annual aerial surveying, mapping and spot treatment of Dyer's woad on the Wapi from 2009 to the present. The survey area map above shows the horizontal line where NPS/BLM work together to keep woad from invading north. The NPS treats south of the line and BLM treats north. According to the BLM weed specialist, there were few to no woad plants north of the line as of 2016.³⁷

³⁶ BLM Meeting. Fall 2016. Shoshone Field Office. Conversation with BLM Weed Management Specialist, Tony Owens; Fire Specialist, Joseph Russell; and CRMO Acting Vegetation Ecologist, Gina Pearson.

³⁷ Ibid

6. Collateral Duties of Vegetation Ecologist

a) Park Air Quality Coordinator

Air quality monitoring at CRMO began in 1980 and has grown to an extensive program. There are three main components to weather and air quality monitoring at CRMO: NOAA daily weather monitoring, Air Resources (NPS-WASO) monitoring, and IMPROVE/AMon/NADP monitoring. There should be two additional trained operator in case the primary operator is unavailable to do all the monitoring and servicing of equipment. We receive \$5,000 annually from WASO to implement this program. Currently, the tasks are being split by a GS-11 Wildlife Biologist and a GS-9 Acting Vegetation Ecologist. The cost of keeping this program going is much more than \$5,000 annually.

1) Daily Weather (National Weather Service-Pocatello)

Weather is **taken 4pm daily** at IRM office and rain/snow is measured across the street. Data is entered into *WxCoder.org*; *username: craters*; *code: basalt2*. It is best to enter data on Super Form under My Observations daily, weekly, or at least monthly. When resource staff are unavailable to take the daily weather, other divisions are asked to assist with this task. During the winter of 2016/17 often times nobody was available.

Data collection includes:

- Min/max temperature for the past 24 hours
- Temperature at time of observation
- Precipitation (rain or melted snow)
- Daily snowfall and current on the ground snow depth

2) NADP/AMon/IMPROVE (Program based out of Champaign, IL)

These readings are taken every Tuesday.

The site is located above the boneyard utility road to the north at the top of the hill. SOPs and instructions for how to change out filters, record data, and send off samples can be found at: W:_Resources\Resource Info\Air quality\SOPs.

Data collection includes:

- Precipitation (acid rain)
- Ammonia
- IMPROVE (particulate matter)



Figure 11: NADP Site, CRMO. Photo: G.Pearson, 1/2017.

3) NPS Gaseous Pollutant Monitoring Network (NPS-WASO Air Resources Division)

Air Resource Specialists from Ft. Collins is the NPS contractor and our direct contact for the instruments and monitoring station located at the Visitor Center (VC). The vegetation ecologist assisted an Air Resources technician in the fall of 2016 to re-calibrate the measuring instruments on the VC roof. During this visit we discussed the age of the instruments and the future of this program at CRMO. According the Air Resources, the NPS may not want to invest anymore into this site (upgrades to old equipment).³⁸

The air quality station checks are conducted every Tuesday. The laptop, instruments, and instruction binder are located in the VC closet behind the pika exhibit. Every two weeks the

³⁸ Personal conversation. 2016. Gina Pearson, CRMO and Mike Farinacci, Air Resource Specialists at CRMO site, November 15, 2016.

ozone filter is changed out. Only wind readings are calibrated weekly, all other measurements are calibrated remotely by Air Resources.

Data collection includes:

- Ozone
- Solar radiation
- Wind direction and speed
- Relative humidity
- Temperature

NOAA-USCRN Station

CRMO also has a NOAA weather station that was established in July 2003 and is part of the U.S. Climate Reference Network (USCRN), which can be accessed online (see Appendix B). The USCRN program adheres as closely as possible to climate principles endorsed by the National Academy of Sciences and the Global Climate Observing System in choosing these sites, while also meeting engineering and logistical requirements.³⁹ Operational stations have spatial representativeness and temporal stability as their primary goals and are located in areas that are unlikely to change much in the next several decades.

NOAA Technicians come out annually to service the site and it is operated remotely from Tennessee. NPS staff are not required to service this station; however, in the fall of 2016 the Acting Vegetation Ecologist changed a data logger for NOAA. Also, in the winter of 2017, the rain gauge was filled with snow and had to be serviced by CRMO staff which was challenging.



Figure 10. NOAA USCRN Site. Snow 5ft. deep. Photo: G. Pearson 1/2017

Data collection includes:

- Air Temperature
- Precipitation
- Wind direction and speed
- Solar radiation
- Surface temperature
- Soil moisture/temperature
- Relative humidity

NOTE: Behind the VC is a station operated by the Idaho State Department of Environmental Quality. They monitor INL radiation and other weather data. It is operated remotely, but occasionally the park calls DEQ because loud noise emits from the equipment. In total: **five air quality/weather stations** are operated at CRMO, three are serviced regularly by the NPS.

b) Park Integrated Pest Management Coordinator

The vegetation ecologist is also the Pesticide Use Proposal System (PUPS) coordinator. A proposal is required annually for each pesticide used in the park, which must be submitted to the Regional Integrated Pest Management Coordinator for approval before use. This includes all herbicides used, but should also include insecticides, rat poisons, etc. Checks need to be made with other divisions to see if

³⁹ <https://www.ncdc.noaa.gov/crn/overview.html>

they are using any type of pesticides. Proposals need to be entered into PUPS toward the beginning of the calendar year. All pesticide use records must be entered into PUPS at the end of the calendar year.

Records must be maintained of all herbicides used (when, where, who, etc.). A blue folder labeled “pesticide use log” is located on the IRM office shelf. Occasionally it may be necessary to consult Idaho Department of Agriculture for reporting requirements/updates. The log records all information currently required by the state.

c) Herbarium Manager

The monument’s curator is responsible for the management of the herbarium. However, because the curator is not duty stationed on-site, the vegetation ecologist and wildlife biologist help oversee the use and upkeep of the herbarium and collections. The curator still makes the final call on any use outside of the collections room, which requires prior authorization. There are old copies of user guides for the herbarium collections (v. 2003 and 2006).

Documents that reference the status of the herbarium collection can be found at:

W:_Resources\Vegetation Program\Inventory and Monitoring\Vascular Plant Inventory and Herbarium\VPInventory2006. These documents reference the status of the herbarium collection. For example, there are believed to be about 26 plant species present in the monument that do not have vouchers specimens, some plant species need more vouchers, and other plants are suspected to be in the monument but need survey and collection of voucher specimens.

As of 2003, all current plant specimens had been verified and appropriately annotated by regional expert botanists, Dwayne Atwood and Steve J. Popovich, using regional/intermountain naming conventions and ITIS (Integrated Taxonomic Information System). Popovich was the District Botanist for the BLM, Shoshone Office.

d) Administration/Supervision (approx. 20% of time)

The vegetation ecologist is responsible for writing grant proposals, PMIS projects, cooperative agreements, burn area rehabilitation plans, etc. in order to accomplish all the program responsibilities. Other program management responsibilities include attending meetings, conferences, collaborating with other local, regional, and federal weed managers, restoration and fire ecologists, Universities, CWMAs and members, the UCBN, the NRM-EPMT, and BLM (co-managers).

Supervision of NPS seasonal and intern staff can be year round, but mostly during the field season (late April through the end of September at minimum). Prior to the season much work needs to be done to hire and prepare for the summer crew and work projects. Supervision not only includes the hiring process (hiring packets to SHRO by October for the following summer season), but also writing EPAPs for NPS employees, conducting evaluations, and counseling if necessary.

Administration and supervision also includes training, writing SOPs, ordering supplies and equipment for the programs and crew, maintaining equipment and vehicles, and budgeting for these needs every year. The collateral duties also have their associated administrative responsibilities not listed here.

B. Statements in Foundation Document, General Management Plan and Invasive Species Plan - Relevant to the Vegetation Management Program.

Table 8. Selected Desired Futures, Goals and Objectives (Needs) Related to Vegetation Management

Document	General Vegetation Management:
Foundation Document 2014. M=medium priority	• CRMO needs a comprehensive strategy to protect, preserve, and prioritize management of cultural and natural resources due to limited funding and staffing for resource management activities. • <i>Need to evaluate</i> status of species most impacted by changes in native plant communities due to wildfire and nonnative invasive species (sage steppe dependent species) and likely climate change scenarios (M). • A Resource Stewardship Strategy and Fire Management Plan were identified as needs. • Identifying a fire management strategy to protect unique sagebrush steppe vegetation communities and sage grouse habitat is critical to perpetuating these resources. • Identify research needs (Low priority)
GMP 2007 (NPS & BLM) Pg. 25-26	• The high ecological condition of the vegetation of North Laidlaw Park and Bowl Crater is maintained. • There is no net loss, and preferably a net gain, of sagebrush steppe communities over the life of the plan. • Native plant communities sustain biodiversity and provide habitat for native wildlife. • Woodland communities (e.g., limber pine, aspen, and juniper) are maintained as healthy mixed-age communities within their natural range and distribution. • Natural ecological processes are the dominant factor in determining the composition and distribution of plant communities in the Preserve and Wilderness areas
Document	Non-native Plants:
CRMO State of the Park Report 2016	• Continue monitoring and treatment of invasive plant species. • Natural vegetation conditions are a fundamental component of wilderness character. Critical threats to these natural conditions include nonnative invasive plants, which transform native plant communities.
Foundation Document 2014	• The highway is a source of weed seed, which is continually reintroduced into disturbed roadside areas. • Need to better understand extent of cheatgrass (<i>invasion</i>) and state-listed noxious weeds (M, <i>but maybe should be high priority</i>).
NPS-NRM Invasive Plant Mgt Plan & EA 2011	• Implement 7-step decision making tool. 1) ID Non-Native Plants, 2) Monitor for Invasiveness and Determine if Meet Action Thresholds, 3) ID Species Mgt. Priorities, 4) ID Mgt. Strategy and Select Treatment Methods, 5) Conduct NEPA Compliance, 6) Implement Selected Treatment, and 7) Monitor Treatment to Assess Control Efficacy. Pg. 18 • Respect no spray zones on NPS lands adjacent to Lava Lake Land and Livestock organic lands. Pg. 137-136 • Require preparation of minimum requirement analysis in Wilderness Study Areas. Pg. 137 • Until a FMP is developed, prescribed fire only authorized for weed control around park facilities. Pg. 143
GMP 2007 (NPS & BLM) Pg. 26-27	• Integrated weed management principles will be applied proactively throughout all zones and include an analysis of the tradeoffs involved in herbicide use versus non-chemical methods of weed control. • The areas dominated by invasive annual species (cheatgrass and other similar plants) are minimized. • Weed infestations in wilderness areas will be controlled by methods consistent with minimum tool ... • Only certified weed-free hay, straw, and mulch will be permitted within the Monument.
Document	Inventory and Monitoring:
Foundation Document 2014 M=medium priority L=low priority	• More information is needed to understand how to best protect the limber pine ecosystem from white pine blister rust and climate change impacts. • Need for conservation plan for limber pine (PMIS 166309), including adding trigger points for management actions associated with vital signs (M). • Need to monitor projections of changes in annual and seasonal precipitation (M). • There is little understanding of the extent of resource impacts occurring within the expansion area. Twenty miles of unauthorized off-highway vehicle trails have been mapped on the Wapi Lava Field. • Update existing rare plant inventory (L)
GMP 2007 (NPS & BLM) Pg. 18	• Resource inventories and surveys documenting the condition and extent of natural resources including geologic features and processes, kipukas, and sensitive species are given sufficient emphasis... • Monitoring programs are developed and implemented to track changes in the condition of key resources serving as "vital signs" of ecosystem health or to fulfill other purposes of enabling proclamations and laws. • The agencies will seek opportunities with the tribes and state and federal agencies for partnering in long-term monitoring of the Monument's natural resources.

Document	Kipukas and Wilderness Areas
Foundation Document 2014	- Kipukas are a fundamental resource and value for the monument... if fundamental resources and values are allowed to deteriorate, the park purpose and/or significance could be jeopardized. - Expand current kipuka inventory (Low priority)
GMP 2007 (NPS & BLM)	- Protect kipukas and remnant vegetation areas, and preserve important habitat for Greater sage-grouse, a sensitive species (<i>park purpose</i>). Pg. 6 - Kipukas in the Pristine Zone are free of noxious weeds. Pg. 26
Document	Fire Management
GMP 2007 (NPS & BLM) Pg. 27-28	- All plant communities are in or making progress towards Fire Condition Class 1 (least departure from historic fire regime). - Fire is allowed to function as a natural process in the Wilderness and Preserve except when incompatible with resource management objectives or danger to life or property. - Limited prescribed fire (< 500 acres) will be used in the aspen, conifer, and mountain shrub vegetation types to improve wildlife habitat and invigorate plant communities while protecting the Little Cottonwood watershed. - Cooperative agreements with the BLM, local and rural fire districts will continue. - The BLM and the NPS will develop a joint fire management implementation plan for the Monument.
Document	Restoration/Revegetation and Soils
GMP 2007 (NPS & BLM) Pg. 21-22 & 26	- Soils will be protected from accelerated or unnatural erosion from ground-disturbing activities. For example, post-fire stabilization efforts will protect erosion-prone soils through natural and assisted revegetation. - The potential for, or presence, extent and condition of, biological soil crusts will be investigated to provide specific management guidance. - Biological soil crusts will be considered in management decisions where appropriate. - Areas classified as poor to fair biotic integrity will be highest priority for restoration treatments. - Restoration projects will be prioritized relative to locations of key Greater sage-grouse habitats and population strongholds. - Annual grasslands and highly degraded sagebrush steppe communities will be restored to achieve a mosaic of shrubs, forbs, and grasses capable of sustaining native animal populations. - Proactive management activities will be undertaken to mitigate potential effects of public use (<i>this possibly referring to off-road vehicle damage and thus need for restoration</i>). Pg. 18 - In the event of wildland fire, burned areas will be rehabilitated when necessary to restore the appropriate mosaic of sagebrush species and subspecies, along with a diverse perennial understory, and to suppress invasive and noxious weeds. Pg. 28
Document	Special Status Species
GMP 2007 (NPS & BLM) Pg. 26-27	- Continuity of habitat for special status species and general wildlife are emphasized. - National and Idaho state habitat guidelines for Greater sage-grouse and sagebrush steppe obligate species will be adopted to guide sagebrush steppe management. - All special status species in the Monument will be inventoried with monitoring plans established, particularly when and where adverse impacts may occur.
Document	Air Quality
GMP 2007 (NPS & BLM)	- The Craters of the Moon Wilderness Area (43,243 acres) is a mandatory Class I area per the Clean Air Act. - Class I areas deserve the highest level of air quality protection (no significant deterioration). Pg.34
Document	Partners/Outreach to Public:
GMP 2007 (NPS & BLM)	Information gained (<i>through natural resource inventory/monitoring</i>) will be disseminated to the public and used in management decisions. Pg. 18
Document	Planning /Compliance and Tribal Consultation
GMP 2007 (NPS & BLM)	- Planning criteria are based primarily on standards prescribed by applicable laws and regulations and agency guidance; consultation with federally recognized tribes; coordination with other federal, state, and local agencies; input from the public; analysis of information pertinent to the planning area; and professional judgment. Pg. 7 - Agencies will consult with Native American tribes prior to taking actions that will affect natural and cultural resources that are of interest and concern to them. Pg. 41 - Hunting, gathering, and use of certain natural resources as sacred objects for religious use will continue on the Preserve and expanded areas of the Monument. Pg. 41 <i>This plan's</i> (GMP) implementation strategy should contain a schedule for development of following implementation plans: NPS Resource Stewardship Strategy, Fire Management Plan, etc. Pg. 67

C. Future Needs and Strategies/Pathways to Accomplish

1. Invasive Non-native Plant Program

a) Place Based Management Approach for CRMO

- Consider using the all-terrain vehicle for weed spraying along dirt roads, right of ways, north boundary road, Goodale's cutoff, and along boundaries between NPS and private landowners.

b) Implement Northern Rocky Mountains Invasive Plant Management Plan

- Use guidelines, Best Management Practices, and seven step management approach identified for all parks, and adapt for CRMO needs. For example: see Table 9 below.

Table 9. Selecting a Treatment Method (NPS 2011:135).

Management Strategy	Eradicate	Contain	Suppress
Treatment Methods	Hand-pulling	Mechanical	Prevention (from expansion beyond current borders)
	Grubbing	Livestock (where permitted)	Cultural
	Chemical	Reseeding	Reseeding
		Chemical	Manual
		Biological	Chemical
		Fire	Biological
			Fire
Area of Infestation	< 1 percent	1-25 percent	> 25 percent

Management Strategy

Treatment Method

c) EPMT and CRMO Working Relationship

- The ideal working relationship with the NRM-EPMT is for the EPMT to serve in a support capacity for CRMO. Unlike small parks that have no vegetation program manager, CRMO has the ability to determine their weed control goals and objectives as outlined in existing and future management plans, research, inventory and monitoring reports, and other documentation in the extensive weed control program.
- The EPMT can aid CRMO in accomplishing yearly goals, i.e. their highest priority weed control efforts, as well as providing input on determining yearly priorities, and other bigger picture goals such as: 1) Native Plant Restoration Plan and 2) Outreach Efforts.

d) CWMAs & County Weed Superintendents

- Although state cost share funding can no longer be provided to federal agencies, it would benefit CRMO to continue to work with Blaine County and Butte County CWMAs in order to attend meetings, coordinate weed work days and outreach events.
- Improve communications with Minidoka and Power County Weed Superintendents, which covers parts of the Wapi area (Blaine Co is major part of Wapi).

e) Trespass grazing near Blizzard Mountain Road

- Work with adjacent landowner and/or BLM as necessary to develop agreement and strategy to keep livestock from entering the monument, which has been an ongoing issue for many years.
- The Administrative History for CRMO includes an extensive discussion on how trespass grazing near the northern boundary began, grazing management policies evolved, the evolution of trying to work with adjacent private landowners and BLM grazing permittees (the Barker Case), and fence projects paid for by the NPS that began in 1976. Below is an excerpt from this discussion:
“...with the enlargement of the monument in July 1928, Craters of the Moon acquired more than two thousand acres of hill country for its administrative water supply, and with this lands grazed by livestock. And so began a long history of mitigation policies for trespass grazing (Louter 1992).”

f) Prevention and control of invasive weeds on Moon Fire and other 2016 fire scarred areas

- Use BAR monies to implement invasive weed control efforts per BAR Plan.
- Coordinate weed control efforts with BLM since most of fire rehab on BLM lands.
- The snowpack of 2017 may provide excellent environmental conditions for cheatgrass to invade the Moon Fire. Crews will need to survey and treat weeds when the snow melts.
- Coordinate work days with BLM (weed treatments, spray days?)
- BLM mapping data show where weed treatment and fire scar areas overlap. These overlay maps should be obtained from BLM and incorporated into the NPS database.

g) Revise Safety Data Sheets (SDSs) and submit PUP requests annually

- The SDS updates is a task that seasonals can perform.
- Pesticide Use Proposals must be written by Vegetation Ecologist/ IPM coordinator and submitted to Region each calendar year (earlier the better).

h) Consider Using UTV for Weed Control

- This was used in the past to increase efficiency of treating for weeds along roads, especially north end road and others easily accessible and used frequently by visitors.

i) Other Options for Weed Control Funding and Strategies

- Union Pacific Railroad gives money to BLM for weed control along Railroad Right of Way. Dyer's woad is found along the railroad in the southern portion of the Wapi. This could be something to investigate as a funding source for weed control.
- Look into the Department of Agriculture (Natural Resource Soil Conservation District) or Department of Transportation to partner with for weed control just like the Union Pacific RR does for BLM. The highway that bisects the monument is a huge vector for spreading weed seeds, especially when hay trucks accidentally dump their loads within the right of way, adjacent to the monument.
- Although BLM states that drones must be within line of sight for surveys, explore new technologies coming out almost daily. Using drones for surveys would help narrow/focus treatment areas and prioritize based on species and distribution.
- Work more cooperatively with BLM on helicopter surveys and treatment. Maybe put NPS person onboard to do spot treatments on ground.

- Submit funding proposals for NR Cyclic Maintenance Weed Control – Developed areas, roads, trails, campgrounds, etc.
- Evaluate costs and benefits of switch to NISIMIS electronic data collection system. Set up informational meeting with NISIMS database coordinators.
<https://www.blm.gov/wo/st/en/prog/more/weeds/nisims.html>

2. Revegetation/Native Plant Restoration Program

a) Goals as outlined in Finalized Planning Documents

- CRMO does not have a native plant restoration plan, but rather is conducted on case by case basis; i.e. after construction projects or wildfires.
- Develop native plant restoration/revegetation management plan

b) Restoration of Moon Fire and other 2016 fires that jumped into vegetated lava

Same as 1e.

- BLM is hoping to plant approx. 100,000 shrubs on 2016 fire rehab lands.
- The BLM is or will be working on a Landscape Restoration Environmental Assessment, with the focus on cheatgrass control. It would behoove the NPS to be a partner in this effort and involved in the EA planning process.

c) Close, revegetate and restore old roads and off-road damaged areas within expanded monument, in particular Wapi South, Cache 4, Wood Road, and the Kings Bowl area.

- Investigate NRM-EPMT assistance in developing restoration plan for this area.
- Work with Facilities Management to transition maintenance of capital assets in restoration projects to FMSS system and seek future funds for cyclic maintenance.

d) Seed collection, growing saplings/greenhouse?

- Investigate opportunities to work with partners such as Montana Conservation Corp, Northwest Conservation Corp, and Utah Conservation Corp (CRMO has worked with these organizations in past) to collect seeds, grow and plant saplings.
- Investigate further BLM's Shoshone Field Office native plant restoration program. Lucky Peak Nursery and prisons have grown plants for BLM in the past. BLM has state seed warehouse in Boise (Tricia Roller, seed warehouse manager).
- Investigate potential to partner with Shoshone-Bannock Tribes to develop greenhouse for native plant restoration. See example: "BLM Partners with Shoshone-Paiute Tribes to Grow Sagebrush and Native Plants." <https://www.youtube.com/watch?v=5SduAfQv58w>

e) Take a "hard look" at the PMIS project #205791: Rehabilitate Visitor Center Lawn for Water Conservation Accessibility Compliance.

- The project as written does not propose any rehabilitation or restoration of native vegetation. If re-written the proposal could truly protect resources and conserve water, and restore native plants as has been accomplished in front of the visitor center and Mission 66 houses, while still providing visitor services and accessibility for picnicking.

3. Inventory and Monitoring

a) Landscape Cover and Use (vital sign protocol satellite imagery: maybe partner with NASA)

- Explore drone use by NASA – very high quality and already use on ISU-BLM project.

- b) UCBN vital signs needing protocols: 1) kipukas, 2) invasive/exotic plants, 3) rare plants, and 4) non-vascular plants.**
 - Although kipukas have been researched, monitored, and surveyed for non-native weed species for many years, there has never been an NPS I&M protocol established for them. This protocol has been identified as a need by the UCBN (Slaton and Novey 2007).
 - The Kipuka Geodatabase project initiated by the UCBN in 2013 needs to be re-evaluated, completed, and implemented as a living working tool for management.
 - The UCBN has identified a need for monitoring protocols for exotic plants, rare plants, and non-vascular plants. The NRM-IPMP covers the exotic plant monitoring needs for the monument, but the other two categories need attention.
 - Do Research Natural Areas need protocols? Explore this idea with UCBN.
- c) Evaluation of Environmental Change (Repeat Photography of Wright and Bunting Report.)**
 - Discuss with UCBN the idea of conducting this photo point study again. Photo documentation of vegetation changes by Wright and Bunting from University of Idaho (UI) was done at a 30 year interval. We are now at the next 30 year interval.
- d) Need to obtain 2016 Kipuka research project report and any other deliverables in permit.** Possibly evaluate research permit process with monument coordinator (wildlife biologist) and identify potential improvements. How to ensure deliverables are delivered on-time?
- e) Craters-of-the-Moon wild buckwheat, *Eriogonum ovalifolium* var. *focarium* needs to be verified in the herbarium and if vouchers do not exist they need to be developed.**
 - If the plant is in the herbarium and mislabeled, it needs to be corrected in the collections through proper CRMO Collections Management Plan procedures. Endemic, new subspecies need to properly be labeled as such, including re-labeling/corrections made if necessary.

4. Hazard Tree Program

- a) Update CRMO 2009/2012 Hazard Tree Plan to reflect 2015 PWR Directive PW-062 Hazard Tree Management policies and guidelines.**
- b) JHAs need review by Chief of Integrated Resources Management (IRM) and signature by Superintendent**
 - Job Hazard Analysis for Hazard Tree Program was developed/ updated in summer 2016.
 - 1) Chainsaw & Basic Tree Felling Operations, and 2) Cutting, Pulling, and Stacking Branches of Larger Plants and Trees.
- c) Hazard Tree Program Remain a Natural Resource Program in IRM Division**
 - It is important that hazard tree management program remain in the IRM Division to analyze tree health, protect natural and cultural resources, and ensure proper compliance prior to conducting hazard tree removal. Ensure proper disposal of wood.

5. Planning and Compliance

- a) Through appropriate levels of funding, provide adequate planning and compliance on any federal project that has the potential to impact the environment.**

- Learn more about CRMO's Environmental Management Plan (EMP) and participate in annual update. Title is a bit misleading if is geared toward strict *conservation of resources USE*. Maybe it should be called: "*Energy Conservation Management Plan?*"
- Ensure EMP has allocated adequate time and funding for planning and compliance of proposed projects identified in EMP.
- Follow-up on Group Campground Rehab Proposal. Concerns include:
 - Campground never planned, just evolved over time: no delineation of boundary and individual site boundaries. No tent pads, so visitors make sleeping area wherever.
 - Hazard trees
 - No accessibility sites
 - Visitors spreading into other upland sites that are on steep slope. Cutting away at vegetation and into soils.
- CE for post fire rehab actions – ensure is completed per new BAR policy.

b) Fire Management Plan (FMP funded for FY17)

Vegetation ecologist participate in planning process and implementation

c) Resource Stewardship Strategy (RSS funded for FY17)

Vegetation ecologist implement RSS, and participate in planning process if still ongoing.

d) Native American Tribe Consultation

Assist IRM Chief, or designated NEPA coordinator for CRMO.

e) Park Projects – approved in PMIS (evaluate if have adequate NEPA Compliance)

- IRM staff needs to ensure that borrow pits are evaluated prior to any construction projects beginning (either in-house or contract). This is essential to reduce the introduction of weeds species.
- Consider having a dedicated borrow pit that is known to be weed free (work with operator, open communication and coordination to ensure pit adequate for NPS).

6. Records Management and Data Management

a) Establish a point of contact for park to coordinate with UCBN I&M Data Manager

b) Designate GIS Coordinator for division and park contact

- Ensure Vegetation Ecologist is properly trained in GIS and keeps current in latest.
- Ecologist responsible for keeping GIS veg layers, attributes, and other data up to date.
- Weed map point data needs to be updated: is old and not accurate with ground-truthing data. Some of this was done summer of 2016.
- GPSs are maxed out on data, running slow, and need to be replaced.

c) Update Herbarium Use Protocols (they are out of date); coordinate with Park Curator.

d) Organize hard copy and digital files – vegetation docs, reports, reference material

- Implement DO-11d guidance to organize and manage veg records (determine what hard copies keep on-site vs. what can send to NARA, DSC, or other Central Long Term storage – park wildlife biologist has completed some of this).

- DO-11d will help determine big bucket categories: 1) keep hard copy, 2) scan, 3) shred/recycle, or 4) box up for long term storage at NARA or DSC (see Appendix B.).

7. Administration and Operations

a) Hire Vegetation Ecologist ASAP. Some Options:

- GS-9/11 FTE, plus NPS seasonals and youth interns
- GS-9/11 subject to furlough, plus NPS seasonals and youth interns
- GS-11 term, NPS seasonals and youth interns
- GS-9 term, NPS seasonals and youth interns
- GS-7/9/11 permanent career development position could encourage new hire to stay.
- Hire an interim GS-7 or GS-9 term or seasonal for summer of 2017 to oversee the vegetation program, conduct supervisory functions, and coordinate all weed control efforts with field crew. This individual could serve as the crew lead and acting program manager, but would need displayed experience in such; very capable in both field and supervisory responsibilities.

b) Trainings/Certifications for Vegetation Ecologist

- **Certified BAER Botanist.** This certification would benefit the park and partners as fires in the shrub-steppe are predicted to only intensify in the future. 2012 qualifications for a BAER botanist are found at W:_Resources\Vegetation Program\Fire and BAER\BAER_Fire rehab. Ecologist will have to research updates and current NPS requirements for this certification.
- **Certified Chainsaw Operator, Specifically for Hazard Trees**
- **Certified Herbicide Applicator License for State of Idaho** (required for ecologist; highly recommended for crew lead because of future funding uncertainties).

c) Hiring/Training seasonal workforce, including herbicide applicators license

- **Seasonal staff fully aware of expectations and environmental conditions prior to hire.**
 - Must be able to hike in extreme environmental conditions on extreme terrain
 - Must have experience in camping
 - Watch Leave No Trace online video and complete online basic Intro. Course.
- **Update EPAP for seasonal biological technicians.** One EPAP is used for both the crew lead and crew members; some evaluation elements are redundant, while others are lacking. Need two separate EPAPs, one for lead and one for members. Also, maybe combine Safety and Communications, instead of Data Management & Comms.
- **Certified Herbicide Applicator License for State of Idaho** (crew lead required and as many members as possible)
- **Veg. Ecologist Conduct Session at Summer Seasonal Training**
- **Vegetation crew attends seasonal training, including Wilderness First Aid and CPR.**

d) Develop Wapi SOPs, including radio use (possibly incorporate with new NPS Remote Operations policy/directive).

e) Conduct annual evaluation of equipment needs, including herbicides, and make purchases as necessary.

- Dodge truck needs replacement before summer season 2017, including new rack and space booster to carry crew gear (sleeping bags, tents, personal gear, cooking gear, etc.) separate from chemicals and herbicide equipment.
- Dodge currently has recall on it – passenger side airbag. Chief Ranger vehicle the same. Part still not in.
- Consider purchasing a Satellite phone for Wapi trips because of spotty coverage, at best.

f) Participate in Updating Housing Management Plan

Plan needs to reflect current NPS policy, park existing conditions and future needs, options for housing outside the park, etc.

g) Assist in IRM Office and Storage Space Management and Re-Organization

- Develop work spaces in both IRM buildings
- Develop plan for permanent housing of fitness center equipment
- Emergency Operations Plan for IRM Office(s)

h) Update JHAs as needed.

- In addition to Hazard Tree JHAs mentioned above, ensure JHA for herbicide use, backcountry travel (remote operations JHA), vehicles use are all still valid.
- Ensure Monument's Remote Operations Plan is followed (Todd Stefanic, contact).

i) Participate in Updating CRMO Employee Handbook (1999 last version?)

List of possible updates to include in handbook (not inclusive):

1. On the Job Injury or Contracted Disease
 - If injured on the job, notify your supervisor immediately.
 - Per 2016 Regional Memo: In case of a work related injury *contact Mika Moore, PWR SHRO, at 360-569-6527*. Applies to NPS volunteers but not SCA's, NWYC, GIPs, UCC, etc. They are covered under respective organization.
2. Emergency Ops Plans (summer and winter). Section on Safety
3. Current phone lists and radio call numbers. Section on Radio Comms
4. Current Plant and Animal Species lists
5. History of CRMO
6. History of the NPS
7. Housing information
8. For Seasonals: nearby areas of attraction, shopping, towns, recreation and website links
9. Organization Chart – CRMO
10. Brief description on each Division and areas of responsibility
11. Map of facilities: what is open/ closed. VC operating hours.
12. Briefing statements: current research, projects in the park, planning processes, issues ...
13. Select Natural History Information

8. Education and Outreach (park staff, neighbors/communities, partners)

- a) Invasive Weed Exhibit for VC and Trailhead weed sign/boot brush. PMIS proposal written by acting vegetation ecologist and summer SCA, 2016.

- b) Partner with Shoshone- Bannock Tribes and possibly establish native plant restoration program like other agencies have in the Pacific Northwest.
- c) Coordinate with CRMO Chief of Interpretation on Park Website Updates (planning, plant, and fire regime links). For example: there is no CRMO FMP as website indicates. Add link to BLM FMP & Coop Agreement. Add links for RSS and FMP documents.
- d) Update CRMO plant list & publications to reflect new buckwheat species and other changes
- e) Update CRMO apps (wildflower – remove non-native invasive spp), add a weed app, lichens
- f) Reinstitute Weed Awareness Workshops at CRMO. “Plants and Human History of Craters.” One of the sessions focused on “noxious weed history, prevention and identification.” Source: part of 2003 Vegetation Ecologist Work Plan.
- g) BLM works with local schools to plant native vegetation and assist with restoration program, as well as assist with So. Idaho Biocontrol Program. Becky Freiburg, school teacher and BLM part-time employee, conducts this outreach and is the bridge between schools and BLM.⁴⁰ Would be great if NPS can do something similar?
- h) Re-Engage in State of Idaho Weed Awareness Week (display in local and regional venues); Lost River Weed Fair.
- i) Weed Awareness part of Seasonal staff training.
- j) Weed Awareness part of Permanent staff training.
- k) Continue to reach out to neighbors to control weeds (e.g. Lava Lake)
- l) Coordinate War on Weeds Day – do on days like National Public Lands Day or Earth Day. Use local groups such as schools, ERC, Boy and Girl scouts of America, etc. Invite BLM partners and CWMAs.

⁴⁰ BLM Meeting. Fall 2016. Shoshone Field Office. Conversation with BLM Weed Management Specialist, Tony Owens; Fire Specialist, Joseph Russell; and CRMO Acting Vegetation Ecologist, Gina Pearson.

Appendix A.

Craters of the Moon National Monument and Preserve Vegetation Resources Bibliography

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<https://www.nps.gov/crmo/learn/nature/plants.htm> (CRMO website with brief discussion on plant communities in Monument, link to Vegetation Inventory Project Files and Map, and link to INL Virtual Herbarium).

Cave Canyon Post-Fire Sagebrush Planting: <https://www.youtube.com/watch?v=R3MdXiR87rk>

Sage Grouse and Fire: <https://www.youtube.com/watch?v=vl7HYc75WSo>

IRMA: <https://irma.nps.gov/portal>

There are approximately 240 records in IRMA related to Plants/Vegetation and CRMO. Example of some of the files include:

- Non-native Plant Inventory from 2001 to 2013.
- 4 - Natural Resource Technical Reports related to vegetation, including vegetation mapping project 2009.

<https://irma.nps.gov/DataStore/Reference/Profile/2170231>

From IRMA (Integrated Resources Management Applications) datasets and reports are available in the following topics: 1) Natural and Cultural Resources, 2) Planning and Compliance (PEPC), 3) Visitor Use Stats, 4) Research Permits, and 5) NPS Species.

Appendix B. Craters of the Moon National Monument & Preserve: Vegetation Management Program Contacts and Resources

Program Name	Contacts	Websites	File-Site Locations	Comments
Noxious Weeds	Steven Bekedam, NPS NRM-EPMT Liaison, 541-760-7289 steven_bekedam@nps.gov	https://www.nature.nps.gov/biology/invasivespecies/EPMT_teams.cfm http://nrintratest/brmd/restorationadaptation/ipp.cfm	<u>Reliable site</u> Inside NPS site- under construction	<u>Overview of EPMTs</u> Invasive Plant Prg.
	Erv Gasser, PWR IPM Coord. erv_gasser@nps.gov	https://irma.nps.gov/pups/		Submit PUPs to Erv early in year.
	John Cenarrusa, Superintendent Blaine County CWMA jcenarrusa@co.blaineid.us	http://www.co.blaine.id.us/index.asp?SEC=F29B59B0-FF48-4768-B461-62240C63B059&Type=B_BASIC	Blain County	
	Andrea Walton, BC CWMA Outreach Coordinator awalton@co.blaine.id.us	http://idahoweedawareness.com/netcenter/partners/partners.html http://invasivespecies.idaho.gov/noxious-weed-program/		ISDA – statewide noxious weed mgt. and control prg.
	Brad Gammett, Superintendent Butte County CWMA	208-527-8595, butteweeds@atcnet.net	Butte County	Store chemicals w/Butte Co. in winter
	Tony Owens, BLM Weed Management Specialist 208-732-7208, aowens@blm.gov	https://www.blm.gov/programs/natural-resources/weeds-and-invasives/weed-control-strategies/idaho http://invasivespecies.idaho.gov/biological-control/ Idaho's BLM and Idaho State Dept. of Ag Biological Control Program		Main BLM Idaho Weed website
	Joey Milan, State Bio-Control Specialist	https://eplanning.blm.gov/epl-front-office/projects/nepa/26903/42557/45329/TFD_VegEA_Scoping_Final_508.pdf https://www.blm.gov/wo/st/en/prog/more/weeds.html http://nezpercebiocontrol.com/		BLM Twin Falls District Weed EA
	Becky Freiberg, BLM/teacher	Becky - conducts So. ID BioControl with Students http://www.agri.idaho.gov/AGRI/Categories/Pesticides/licensing/indexPestLicenseMain.php In-Park network Drive Sites: W:_Resources\Vegetation Program\Weed Mgmt W:_Resources\Vegetation Program\Weeds W:_Resources\Vegetation Program\		Pesticide applicator license website These files need organization. Many folders within

Hazard Trees and Fire	Nelson Siefkin, Fire & Aviation Mgt., PNW Region Nelson_siefkin@nps.gov 510-207-7357 cell Joe Russell, Fire Ecologist, BLM. 208-732-7290 of 208-308-3965 cell	https://www.nps.gov/fire/wildland-fire/connect/regional-programs/pacific-west.cfm http://www.idahofireinfo.com/ https://www.blm.gov/wo/st/en/prog/fire.html In-Park network Drive Sites: W:_Resources\Vegetation Program\Hazard Trees\ W:_Safety\JHA's\Current JHAs W:_Resources\Vegetation Program\Fire and BAER R:\Resource Info\Fire		Fed & State website Danielle BLM Shoshone-fire rehab
Native Plants Restoration	University of Idaho Research Extension Center BLM Shoshone - Danielle BLM State Seed Warehouse Tricia Roller - Boise	208-397-7000 https://www.uidaho.edu/cals/aberdeen-research-and-extension-center/horticulture https://www.blm.gov/programs/natural-resources/native-plant-communities https://www.youtube.com/watch?v=5SduAfQv58w In-Park Network Drive Sites: W:_Resources\Vegetation Program\ W:_Resources\Vegetation Program\Seed Collection\GIS and Maps	Aberdeen, ID Video - BLM and Shoshone-Paiute Native Plants Prg.	Dr. Love status? Excellent website. Info on National Seed Strategy
Herbarium	JoAnn Blalack Joann_blalack@nps.gov CRMO Curator	http://www.gsseser.com/CMP/Herbarium/commonsearch.asp In-Park Network Drive Sites: W:_Resources\Vegetation Program\Inventory and Monitoring\Vascular Plant Inventory and Herbarium\ W:_Resources\Vegetation Program\Herbarium\PLEASE READ BEFORE USING THE HERBARIUM.doc		INL virtual herbarium This needs updating
UCBN and Inventory & Monitoring	Jeff Lonneker@nps.gov, UCBN I&M Data Manager Tom Rodhouse, Ecologist, 541-312-6425 tom_rodhouse@nps.gov Devin Stucki, Field Technician, 541-312-2323 devin_stucki@nps.gov Gordon Dicus, Program Manager, 208-885-3684	http://science.nature.nps.gov/im/units/ucbn/index.cfm https://science.nature.nps.gov/im/units/ucbn/parks/crmo.cfm?tab=1#products https://www.facebook.com/npsucbn/ https://irma.nps.gov/DataStore/DownloadFile/463325 (NRCA for CRMO) https://science.nature.nps.gov/im/units/ucbn/monitor/sagebrush.cfm In-Park Network Drive Sites: R:\Resource Info\Vegetation\Limber Pine\Limber Pine WPBR Surveys W:_Resources\Vegetation Program\Weeds\Kipuka Weed Surveys R:\GIS-CRMO\DATA\Vegetation\Kipukas	UCBN - Moscow, ID Field Staff-Bend, OR	Reports, monitoring protocols, IRMA docs, newsletter, and other publications found on UCBN website
Air Quality	Brian Kerschner, NADP amon@isws.illinois.edu 217-244-6417; 800-952-7353	http://nadp.isws.illinois.edu/AMoN/sites/data/ http://nadp.isws.illinois.edu/lib/dataReports.aspx	NADP Program out of IL	Collateral duty, but take 2-4 hrs/week.

NADP	Roger, NADP ISWS-nadp- precip@mx.illinois.edu nadp@isws.illinois.edu 217-333-7871	weekly NADP data from PDA email to Roger and save on W:drive. NADP Coordinator, David Gay Illinois State Water Survey; 2204 Griffith Dr.; Champaign, IL 61820	NADP bucket, Amon Filter, and raingauge up hill, left of boneyard rd.	PDA data (2 files) saved under Resources/resource info/air quality
Air Resources	Mike Farinacci, AR Technician MFarinacci@air-resource.com Matt Smith, AR Technician Msmith@air-resource.com 970-484-7941		Air Quality station inside VC- behind exhibits.	NPS Program – contractor Air Resource Specialists
IMPROVE	UC Davis Air Quality Research Center IMPROVE Air Quality Group improvehelpdesk@ucdavis.edu 530-752-1123	http://airquality.crocker.ucdavis.edu/improve/resources-operators/ (video resources for new operator training and equipment troubleshooting)	IMPROVE filters, machines inside AQ shed	
Weather	Michael Black, NOAA, TN m.d.black@noaa.gov Alex DeSmet, NOAA, Pocatello alex.desmet@noaa.gov nws.pocatello@noa.gov 208-233-0834 ID DEQ- Air Quality 208-538-2600	https://www.ncdc.noaa.gov/crn/station.htm?stationId=1021 Weekly weather data from log sheet goes to WxCoder.org User Name: craters; Code: basalt2. Station behind the VC, stairs leading up to it. We do nothing with this, but sometimes need to call because equipment making loud noise. In-Park Network Drive Sites: W:_Resources\Resource Info\Air quality\SOPs	NOAA site above NADP site. Program out of TN	Enter data on Superform Website for Idaho EQD Air Quality
Admin.	SCA – Boise contact Kari Mueller, 208-972-7137 kmueller@thesca.org NW Youth Corp – Jay Satz	In-Park Network Drive Sites: W:_Resources\Administration RM\Personnel\Seasonal Hiring W:_Resources\Administration RM\Agreements\Interagency\Interagency USFS W:_Resources\Administration RM\Agreements\Cooperative Agreements 206-550-5977		

Appendix C.

Recommendations: Vegetation Program Goals for next 3-5 years (2017-2022) (Based on existing needs and previous planning documents)*

Goals** (no priority order)	Strategy	How Implement
Develop priorities for weed monitoring and treatment (including monitoring for weeds on campground rehab project, along roads, trails, visitor use areas)	Use Place Based approach and evaluate annually to determine if H, M, L priorities need to be redistributed. Evaluate cost/ benefits of drones. Follow IPMP guidelines.	NR cyclic maint; partnerships; EPMT; PMIS for priority Kipukas; use UTV
Continue to monitor and treat weeds on the Wapi.	Annually evaluate efficacy of treatments. Look outside routine areas. Evaluate feasibility of working with BLM on helicopter survey and treatments.	EPMT; VIPs, seek outside funding (RR, State, Dept. Ag, etc.)
Develop Wapi SOP. (Wapi qualifies as increased risk ops)	Use Wapi Trip Report and Checklist 2016, Dyer's woad safety briefing and guidelines 2010, and new RM50B – Remote Operations.	Coordinate with park's safety officer.
Prevention and Control of Invasive Weeds on Moon Fire and other 2016 fires	Moon fire all on NPS – Veg. ecologist coordinate work starting 2017 as soon as snow melts. Work with BLM on other 2016 Fires.	BAR monies (3yrs funded)
Annually Review/Revise SDSs, PUPs, JHAs	Ecologist coordinate with wildlife biologist	Ecologist work plan.
Coordinate Weed Pull and Spray days (2 Annually – Earth Day, PL Day). Weed education sessions (War on Weeds).	Work with CWMAs on spray days. Coordinate with VIP Coord on weed pulls. Reach out to Shoshone Bannock Tribes	Ecologist work plan.
Eliminate North End Trespass Grazing	Meet with rancher and develop strategy to keep cows off NPS lands. Consult with BLM as needed.	Chief Ranger and Wildlife Biologist Coordinate
Native Plant Restoration Plan (restore sagebrush steppe habitat, address Kings Bowl, Wapi south, Wood Road, Cach 4 etc. off-road impacts)	Work with EPMT, BLM, UCBN, Tribes and 4x4 groups. Investigate opportunities to work with partners such as MCC, NWCC, UCC, and/or Tribes to collect seeds, grow saplings and plant.	Edit PMIS #166773 and submit; seek outside funding sources with partners.
Finish Restoring Native Vegetation in HQ Area, Specifically Replacing Lawn	Re-write PMIS #205791. Coordinate with Maintenance. Ensure proper compliance.	Use Fee monies. Identified 2018 project
Vegetation Rehab on North Crater Flow Trail Project - as Needed	IRM Lead, Coordinate with Maintenance Division	Part of project proposal/compliance.
Vegetation Rehab on Septic/Leach Field Upgrade/Expansion Project	IRM Lead, Coordinate with Maintenance Division. Ensure proper compliance	Part of project proposal/compliance.
Develop I&M Protocols for Kipukas and Finalize Kipuka Geodatabase.	Work with UCBN to develop protocols and finalize Kipuka Geodatabase and SOPs	UCBN or other Univ. agreement.
Herbarium Updates	Work with Monument Curator to update herbarium use SOPs. <i>Eriogonum ovalifolium</i> var. <i>focarium</i> vouchers (correct or obtain new).	Ecologist and Curator coordinate.
Update Hazard Tree Plan	Reflect 2015 PWR Directive PW-062. Coordinate w/ Region and consult other parks (GRCA, SEKI).	Ecologist work plan.
Assist in Development of RSS and FMP	Region lead; participate as needed in planning effort, meetings, data acquisition, etc.	Ecologist work plan.
Organize digital and hard copy files	This includes GIS files. Work with IRM staff to define protocols. Use DO-11D for guidance.	Ecologist and wildlife biologist coordinate.
Assist with Update of Housing Plan	Identify priorities for Veg Program, work with park staff on improving check in/out.	Ecologist work with park staff.
Assist with Update/Development of Employee Handbook	See C.7.i. above for suggestions on what to include in handbook.	Work with park staff.
Implement Invasive Weed Exhibit for VC and Trailhead weed sign/boot brush	Coordinate with Chief of Interpretation on development of VC exhibit. Small \$ project.	Follow up on 2016 PMIS or use fee monies.
Implement Education Actions – C.8.	Implement as many of these actions as can in 3-5yrs. Some conducted annually, such as talks.	Coordinate with Interp.

*Does not include basic Administrative functions (supervisory).

**Goals can be used to develop work plans

Appendix D.

Staffing Summary for Vegetation Program (2001 – 2016).

2001*	1 FTE GS-11 Vegetation Ecologist (VE). 1-3 interns (every year thru ~2006) = 4 max
2002	1 VE. 1-3 interns. 1 BioTech** = 5 max
2003***	1 VE. 1-3 interns. EPMT Spike Crew based out of CRMO: 2 Bio Techs, 1 FTE GS-7/8/9. = 7 max
2004	1 VE. 1-3 interns. 1 BioTech. 3 EPMT Spike Crew = 8 max
2005	1 VE. 1-3 interns. 3 EPMT Spike Crew = 7 max
2006	1 VE. 1-3 interns. 1 Bio Tech. 3 EPMT Spike Crew = 8 max
2007	1 VE. 5 SCAs. 3 EPMT Spike Crew = 9 max , plus possibly a BioTech?
2008	1 VE. 2 BioTechs. 3 EPMT = 6 , plus likely some interns?
2009	1 VE. 3 EPMT = 4 NPS , plus likely some interns and BioTechs?
2010	1 VE. 3 BioTechs. 3 EPMT = 7 NPS employees. Interns?
2011	1 VE. 3 BioTechs. 3 EPMT. 2 SCAs = 9 . EPMT assistance cut back to about 2 weeks
2012	1 VE. 5 BioTechs and Interns = 6
2013	1 VE. 4-5 BioTechs and Interns = 6 max
2014	1 VE. 4-5 BioTechs and Interns = 6 max
2015	1 VE. 2 BioTech and Interns = 3 total
2016	1 Temp GS-9 Natural Resource Specialist. 3 Bio Techs. 2 SCAs = 6

*Year first vegetation ecologist hired (year after Monument expanded to 750,000 acres)

**Every other year submitted/received Natural Resource Cyclic Maintenance for BioTech - weed control along highway/ roads (2002-2006).

***Year began EPMT spike crew based out of CRMO (2003-2011). Conducted 4-6 weeks of work each year when based from CRMO. After 2011, EPMT assistance to CRMO about 2 weeks each spring/summer.