



Plant Community Composition and Structure Monitoring at Mount Rushmore National Memorial *2019 Data Report*

Natural Resource Data Series NPS/MORU/NRDS—2019/1243



**ON THIS PAGE**

Plant Community Composition and Structure Monitoring plot MORU_PCM_011 at Mount Rushmore National Memorial, July 2019.

Photograph courtesy of the National Park Service.

ON THE COVER

Plant Community Composition and Structure Monitoring plot MORU_PCM_007 at Mount Rushmore National Memorial, July 2019.

Photograph courtesy of the National Park Service.

Plant Community Composition and Structure Monitoring at Mount Rushmore National Memorial

2019 Data Report

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Abstract

This report presents the results of vegetation and forest structure monitoring efforts in 2019 at Mount Rushmore National Memorial (MORU) by the Northern Great Plains Inventory and Monitoring Network (NGPN).

During the tenth full year of field work at MORU, the NGPN field crew visited six long-term plant community monitoring (PCM) plots to collect plant community data. Crews collected data relating to species richness, herb-layer height, native and non-native species abundance, tree density, ground cover, and site disturbance from each of these plots. These collective efforts are part of long-term monitoring to help better understand the condition of the plant communities and forests at MORU.

Our 2019 findings can be summarized as follows: Monitoring crews identified 85 vascular plant species in plots, of which 13 were exotic species. Average absolute cover of exotic species ranged from 0%-17%. Three species considered rare on the Black Hills National Forest state species list were observed. Seedlings ($DBH < 2.54$), poles ($2.54 \text{ cm} \leq DBH \leq 15 \text{ cm}$), and trees ($DBH > 15 \text{ cm}$) were found in all six plots. Disturbances were observed in three of six plots, with soil disturbance as the most common.



Field work at Mount Rushmore National Memorial (© NPS)

Acknowledgments

We thank the authors of the NGPN Plant Community Monitoring Protocol, particularly A. Symstad, for outstanding guidance on data collection and reporting. Thank you to the staff at MORU, particularly Z. Martin and the dispatch office for providing logistical support and safety checks. We also thank M. Bynum for assistance in the field. The 2019 NGPN vegetation field crew of R. Manuel, M. Davis, and E. Duda collected all the data included in this report.

Introduction

Mount Rushmore National Memorial (MORU) is located in the central Black Hills and was established in 1941 with a mission to preserve and protect the sculptured visages of George Washington, Thomas Jefferson, Theodore Roosevelt, and Abraham Lincoln, as well as the surrounding land. Though it is a relatively small area (517 ha, 1278 ac), MORU contains the second-largest area of old-growth ponderosa pine forest in the Black Hills (Symstad and Bynum 2007). Ponderosa pine is the dominant plant throughout the park, and there are 452 vascular plant species listed on the park's certified species list (NRinfo: <https://irma.nps.gov/NPSpecies/>). Plant diversity is highest in the small areas of the park that contain wetlands and deciduous canopy cover. There is a lower diversity of plants found under the closed canopy of ponderosa pines, but the pristine condition of the older forest stands provides a valuable reference condition for Black Hills forests (Hoffman and Hansen 1986).

The Northern Great Plains Inventory & Monitoring Program (NGPN) began two vegetation monitoring efforts in MORU in 2010: one program to monitor understory vegetation annually (Ashton et al. 2013) and another program to survey of forest conditions that is repeated every five years (Ashton et al. 2019). Vegetation monitoring protocols and plot locations were chosen to represent the entire park and to coordinate efforts with the Northern Great Plains Fire Ecology Program (NGPFire; Figure 1). In this report, we provide summaries of the data collected at six plots visited at MORU in 2019.

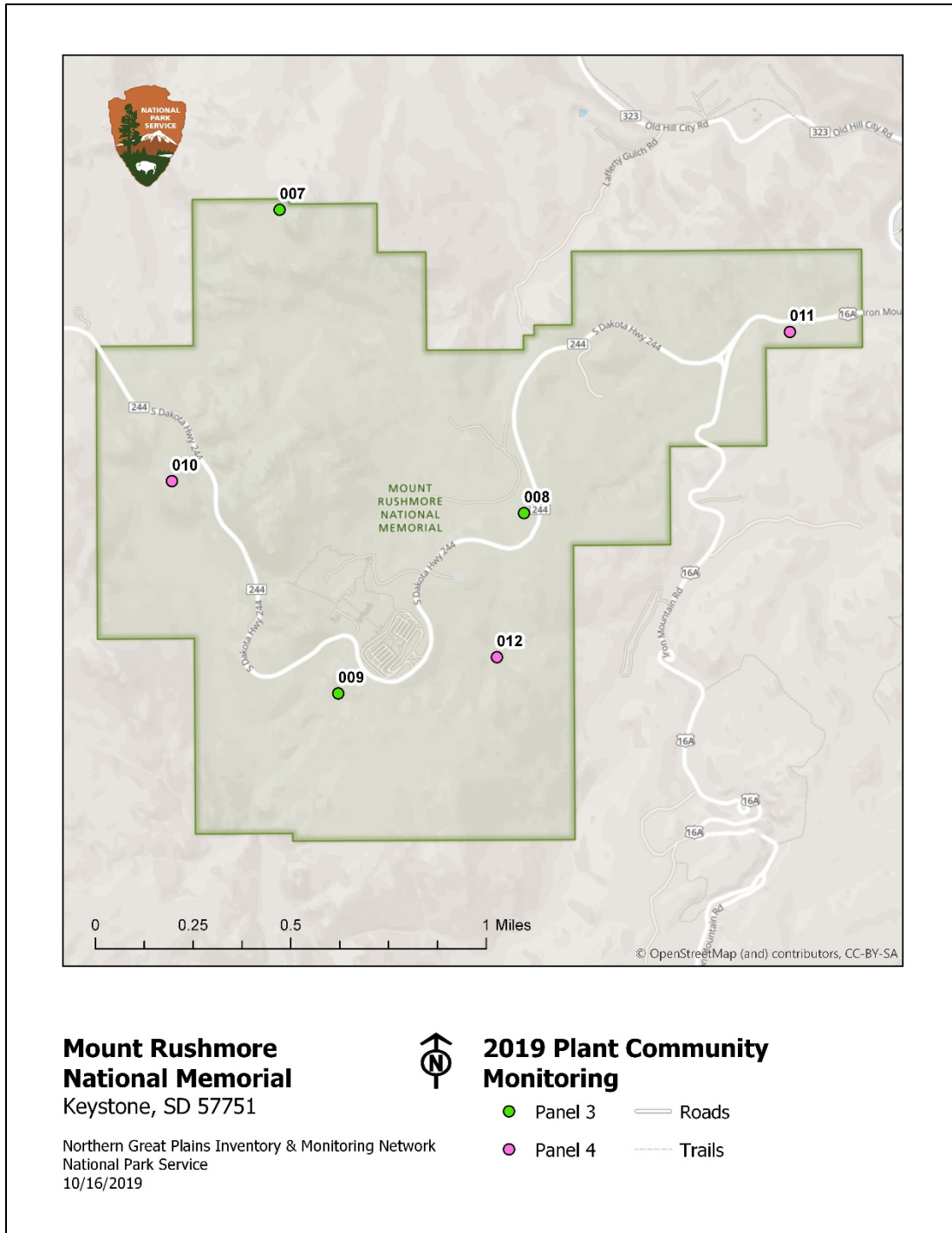


Figure 1. Map of Mount Rushmore National Memorial long-term monitoring plots visited in 2019. Three Panel 3 and three Panel 4 Plant Community Monitoring plots were visited by the Northern Great Plains Inventory & Monitoring crew.

Methods

The NGPN Plant Community Composition and Structure Monitoring Protocol (Symstad et al. 2012b, a) describes in detail the methods used for sampling long-term plots. Below, we briefly describe the general approach. For those interested in more detail, please see the protocol publications cited above, and available at <https://www.nps.gov/im/ngpn/plant-communities.htm>

Sample Design

The NGPN and NGPFire implemented a survey to monitor plant community structure and composition at Mount Rushmore National Memorial using a spatially balanced probability design (Generalized Random Tessellation Stratified [GRTS]; Stevens and Olsen 2003, 2004). Using the GRTS design, NGPN selected 15 randomly located sites within MORU to install Plant Community Monitoring (PCM) plots. These 15 sites are organized into five panels containing three sites each. NGPN crews visit two panels (6 sites total) every year using a rotating sampling scheme, so that after five years all 15 sites will have been visited twice. Data from these randomly selected sites can be used to estimate condition of vegetation communities for the whole park and over time, can be used to discern trends in condition. The NGPN crew visited six sites, three in panel three and three in panel four during the week of July 8-11 (Table 1). The crew commuted from Rapid City to MORU daily. Sampling was completed by a three person NGPN crew and one contractor (Mike Bynum) in approximately 80 working hours. This total does include weather delays and drive time between Rapid City and MORU.

Table 1. Field journal for Northern Great Plains Network (NGPN) plant community monitoring at Mount Rushmore National Memorial in 2019..

Date Visited	Plot Name	Field Notes
7/8/2019	PCM_007	–
7/8/2019	PCM_008	–
7/9/2019	PCM_009	–
7/9/2019	PCM_010	–
7/10/2019	PCM_011	New plot points collected with Arrow 100
7/11/2019	PCM_012	New plot points collected with Arrow 100

Plot Layout and Sampling

At each site visited, the NGPN crew recorded plant species cover and frequency in a rectangular, 50 m x 20 m (0.1 ha), permanent plot (Figure 2). Data on ground cover, herb-layer height (≤ 2 m), and plant cover were collected on two 50 m transects (the long sides of the plot) using a point-intercept method (Figure 3). Species richness data from the point-intercept method were supplemented with species presence data collected in five 1 m² quadrats located systematically along each transect (Figure 2). The NGPN crew measured species presence at ten quadrats per plot. If a plant species was identified in the plot but was not included on the verified park species list, a voucher plant specimen was collected when possible and submitted to a botanist for independent verification.

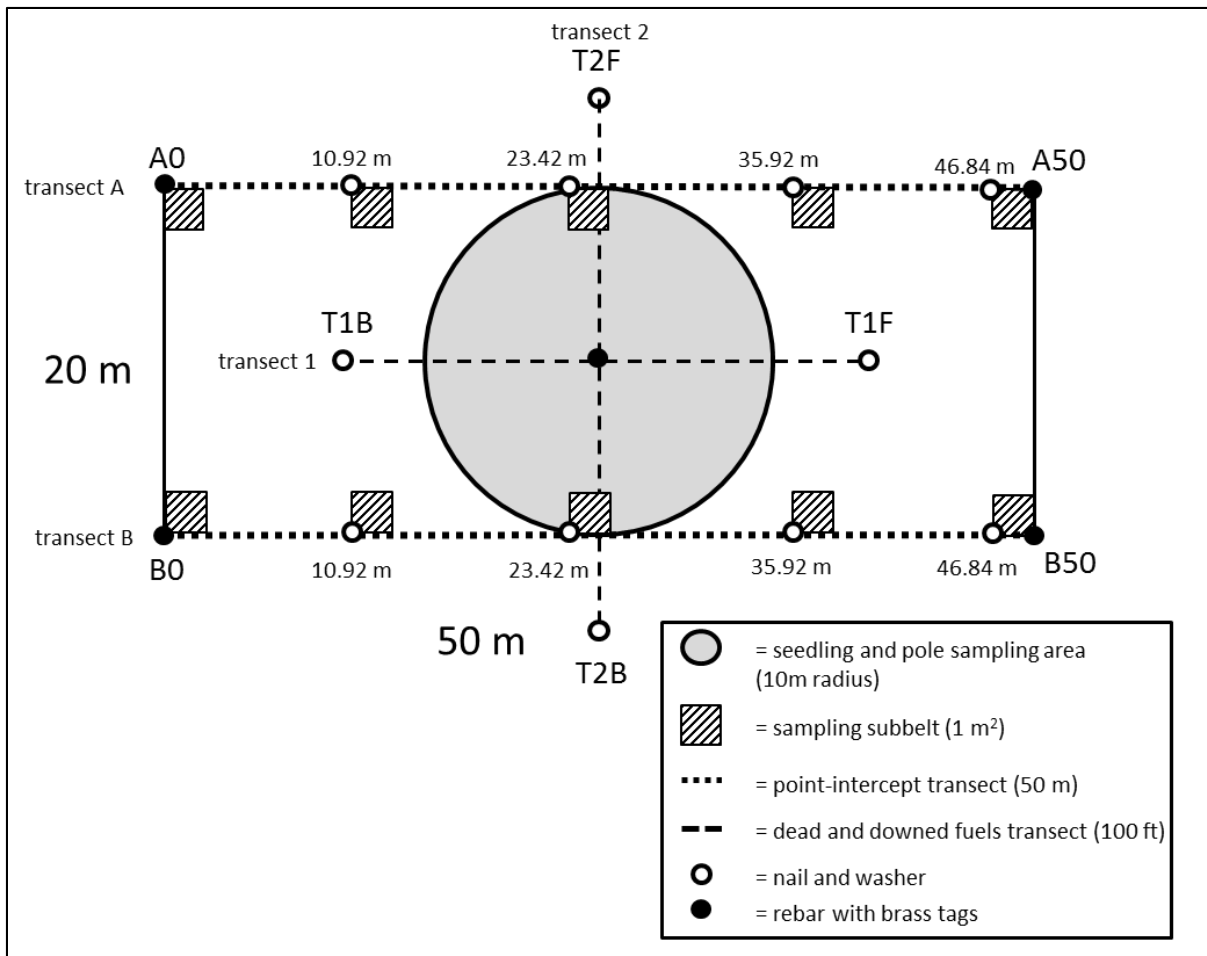


Figure 2. Long-term monitoring plot layout used for sampling vegetation used by the Northern Great Plains Inventory and Monitoring vegetation crew.

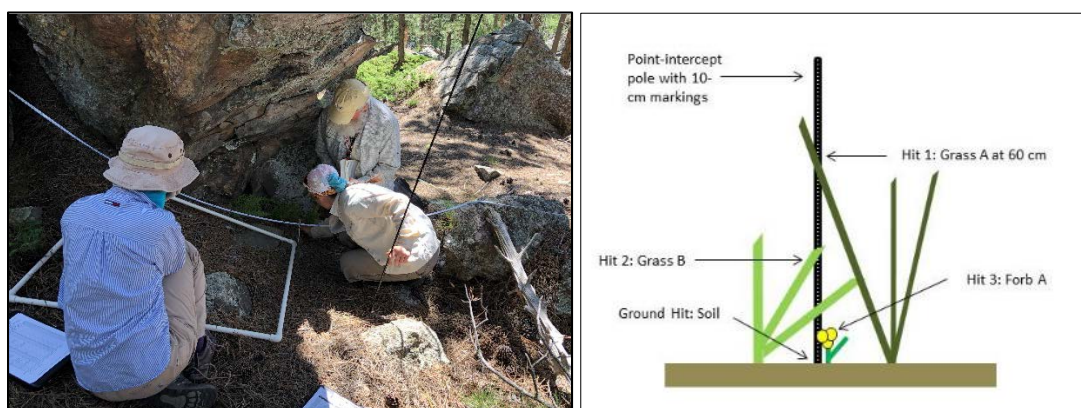


Figure 3. The Northern Great Plains Inventory & Monitoring vegetation crew used point-intercept (left and right panel) and quadrats (right panel) to document plant diversity and abundance.

When woody species were present within 38 m of plot center, monitoring crews collected tree regeneration and tall shrub density data within a 10 m radius subplot centered in the larger 50 m x 20

m (0.1 ha) plot. Trees with diameter at breast height (DBH) > 15 cm, present within the 0.1 ha plot were mapped and tagged. For each tree, the species, DBH, status (live or dead), and condition (e.g., leaf-discoloration, insect-damaged, etc.) were recorded. For all poles ($2.54 \leq \text{DBH} \leq 15$ cm) located within the 10 m radius subplot, only DBH and status were recorded. Tree and tall shrub species with DBH < 2.54 cm (seedlings) were tallied by species within the 10 m radius subplot. In 2019, NGPN changed the way these seedling counts were made. Previously, stump sprouts (stems originating between ground level and 137 cm on the bole of trees that have died or been cut) were tallied individually, often resulting in a high number of stump sprouts counted. As of 2019, only one sprout per stump is counted. Dead and downed woody fuel load data were collected along two perpendicular, 100 ft (30.49 m) transects (fuel lines) with midpoints at the center of the plot (Figure 2), following Brown's Line methods (Brown 1974, Brown et al. 1982). Fuel load data were only collected if at least one piece of woody litter or fuel intersected a fuel line.

The NGPN crew assessed and documented common disturbances at each plot. The type, which included rodent mounds, animal trails, and fire, and the approximate area (m^2) of each disturbance was recorded. For disturbances that were likely to affect the whole area (e.g. wind storm) we recorded 'present' rather than a defined area. Plots were also assessed for the presence and abundance of target exotic species (Table 2), which is critical for early detection and rapid response to exotic species threats. These species were chosen in collaboration with the Midwest Invasive Plant Network, Northern Great Plains Exotic Plant Management Team, park managers, and local weed experts. Each target species was assigned an abundance class from 1-5, based on an ocular estimate of cover, where 1 = one individual, 2 = few individuals, 3 = cover of 1-5%, 4 = cover of 5-25%, and 5 = cover > 25% of the plot.

Table 2. Exotic species included in the Northern Great Plains Network's early detection and rapid response program.

Habitat	Scientific Name	Common Name
Riparian	<i>Alliaria petiolata</i>	garlic mustard
	<i>Polygonum cuspidatum</i> ; <i>P. sachalinense</i> ; <i>P. x bohemicum</i>	knotweeds
	<i>Pueraria montana</i> var. <i>lobata</i>	kudzu
	<i>Iris pseudacorus</i>	yellow iris
	<i>Ailanthus altissima</i>	tree of heaven
	<i>Lepidium latifolium</i>	perennial pepperweed
	<i>Arundo donax</i>	giant reed
	<i>Rhamnus cathartica</i>	common buckthorn
	<i>Heracleum mantegazzianum</i>	giant hogweed

Table 2 (continued). Exotic species included in the Northern Great Plains Network's early detection and rapid response program.

Habitat	Scientific Name	Common Name
Upland	<i>Centaurea solstitialis</i>	yellow star thistle
	<i>Hieracium aurantiacum</i> ; <i>H. caespitosum</i>	orange and meadow hawkweed
	<i>Isatis tinctoria</i>	Dyer's woad
	<i>Taeniatherum caput-medusae</i>	medusahead
	<i>Chondrilla juncea</i>	rush skeletonweed
	<i>Gypsophila paniculata</i>	baby's breath
	<i>Centaurea virgata</i> ; <i>C. diffusa</i>	knapweeds
	<i>Linaria dalmatica</i> ; <i>L. vulgaris</i>	toadflax
	<i>Euphorbia myrsinites</i> & <i>E. cyparissias</i>	myrtle spurge
	<i>Dipsacus fullonum</i> & <i>D. laciniatus</i>	common teasel
	<i>Salvia aethiopis</i>	Mediterranean sage
	<i>Ventenata dubia</i>	African wiregrass

Data Management and Analysis

FFI (FEAT/FIREMON Integrated; <http://frames.gov/ffi/>) was the primary software environment used for managing our sampling data. FFI is used by a variety of agencies (e.g., NPS, USDA Forest Service, U.S. Fish and Wildlife Service), has a national-level support system, and generally conforms to the [Natural Resource Database Template](#) standards established by the Inventory and Monitoring Program. Species scientific names, codes, common names, and native status are from the USDA Plants Database (USDA-NRCS 2017). However, nomenclature follows the [Integrated Taxonomic Information System](#) (ITIS). In the few cases where ITIS recognizes a new name that was not in the USDA PLANTS database, the new name was used, and a unique plant code was assigned. In the case where there is not enough evidence for genus and species identification, a special code for the unknown species was created. These unknown species are designated as an exotic species for cover calculation, but omitted from species counts.

After data were entered in the database, 100% of records were verified with the original data sheets to minimize transcription errors, followed by a 10% review of records to confirm accuracy. After all data were entered and verified, automated queries were used to check for any remaining errors in the data. When errors were identified by the crew or the automated queries, corrections were made to the original datasheets and the FFI database.

Data summaries were produced using the FFI reporting and query tools and R software (R version 3.6.1). The number of species encountered in each plot was calculated using data from point-intercept, quadrat, woody species, and target species protocols. Absolute cover was calculated using point-intercept data and is the total number of vegetation intercepts. This is often greater than 100% because more than one species can be intercepted per point due to overlapping vegetation.

The conservation status rank of plant species observed at MORU in 2019 was determined by cross-referencing with the NatureServe conservation status list, the Black Hills Forest Service rare plant species list, as well as the South Dakota rare plant species list. For the purpose of this report, a species was considered rare or of conservation concern if its state or global conservation status rank was critically imperiled (S1/G1), imperiled (S1/G2), or vulnerable (S3/G3). More information on conservation ranks can be found at the [NatureServe](#) website. The 2019 species list was also cross-referenced with the list of noxious weeds for the entire state and specifically Pennington County, maintained by the [South Dakota Department of Agriculture](#).

Results

There are 452 vascular plant species on the MORU species list, and monitoring crews found 85 of these species in 2019 (Table 3). Of these plant species, 13 are exotic species at MORU. A majority of exotic plants identified were either forbs or graminoids (grasses, sedges, and rushes). There were three species found at MORU that are considered rare in the state of South Dakota or specifically the Black Hills Forest Service state rare plants list. These species are indicated with either UR - (unranked due to lack of information or due to substantially conflicting information about status or trends) or S4 – (Apparently secure). S4 is considered a fairly low risk of extirpation in the jurisdiction due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors.

Table 3. A list of all plant species identified in Mount Rushmore National Memorial's long-term plant community monitoring plots in 2019. 'Exotic' in the notes column indicates that the species is invasive, or non-native. If a species is considered noxious in an individual county within the state, it is indicated in the notes column as Noxious – County name. 'UR' indicates potentially rare but unranked. 'S4' indicates potentially rare but has a secured low risk.

Family	Symbol	Scientific Name	Common Name	Notes
Anacardiaceae	TORY	<i>Toxicodendron rydbergii</i>	western poison ivy	–
Apocynaceae	APAN2	<i>Apocynum androsaemifolium</i>	spreading dogbane	–
Araliaceae	ARNU2	<i>Aralia nudicaulis</i>	wild sarsaparilla	–
Asteraceae	ANNE	<i>Antennaria neglecta</i>	field pussytoes	–
Asteraceae	ANPA4	<i>Antennaria parvifolia</i>	small-leaf pussytoes	–
Asteraceae	COCA5	<i>Conyza canadensis</i>	horseweed	–
Asteraceae	HICA3	<i>Hieracium canadense</i>	Canadian hawkweed	–
Asteraceae	LACA	<i>Lactuca canadensis</i>	Canada lettuce	UR
Asteraceae	PACA15	<i>Packera cana</i>	woolly groundsel	–
Asteraceae	PSMA11	<i>Pseudognaphalium macounii</i>	Macoun's cudweed	–
Asteraceae	SERA	<i>Senecio rapifolius</i>	openwoods ragwort	–
Asteraceae	SOCA6	<i>Solidago canadensis</i>	Canada goldenrod	–
Asteraceae	SOMI2	<i>Solidago missouriensis</i>	Missouri goldenrod	–
Asteraceae	SONE	<i>Solidago nemoralis</i>	gray goldenrod	–
Asteraceae	SOSP2	<i>Solidago speciosa</i>	showy goldenrod	–
Asteraceae	SYLA3	<i>Symphyotrichum laeve</i>	smooth blue aster	–
Asteraceae	TAOF	<i>Taraxacum officinale</i>	common dandelion	Exotic
Asteraceae	TRDU	<i>Tragopogon dubius</i>	yellow salsify	Exotic
Betulaceae	BEPA	<i>Betula papyrifera</i>	paper birch	–
Boraginaceae	CRFE3	<i>Cryptantha fendleri</i>	sanddune cryptantha	–

Table 3 (continued). A list of all plant species identified in Mount Rushmore National Memorial's long-term plant community monitoring plots in 2019. 'Exotic' in the notes column indicates that the species is invasive, or non-native. If a species is considered noxious in an individual county within the state, it is indicated in the notes column as Noxious – County name. 'UR' indicates potentially rare but unranked. 'S4' indicates potentially rare but has a secured low risk.

Family	Symbol	Scientific Name	Common Name	Notes
Boraginaceae	CYOF	<i>Cynoglossum officinale</i>	houndstongue	Exotic, Noxious – Pennington Co.
Brassicaceae	BOPA99	<i>Boechera pauciflora</i>	hairstem rockcress	–
Campanulaceae	CARO2	<i>Campanula rotundifolia</i>	bluebell bellflower	–
Caprifoliaceae	LODI2	<i>Lonicera dioica</i>	limber honeysuckle	–
Caprifoliaceae	SYOC	<i>Symphoricarpos occidentalis</i>	western snowberry	–
Crassulaceae	SELA	<i>Sedum lanceolatum</i>	spearleaf stonecrop	–
Cupressaceae	JUCO6	<i>Juniperus communis</i>	common juniper	–
Cyperaceae	CAREX	<i>Carex</i>	sedge	–
Cyperaceae	CARI	<i>Carex richardsonii</i>	Richardson's sedge	S4
Cyperaceae	CARO5	<i>Carex rossii</i>	Ross' sedge	–
Cyperaceae	CASI12	<i>Carex siccata</i>	dryspike sedge	–
Dryopteridaceae	WOSC	<i>Woodsia scopulina</i>	Rocky Mountain cliff fern	–
Elaeagnaceae	SHCA	<i>Shepherdia canadensis</i>	russet buffaloberry	–
Ericaceae	ARUV	<i>Arctostaphylos uva-ursi</i>	kinnikinnick	–
Fabaceae	ASLA27	<i>Astragalus laxmannii</i>	Laxmann's milkvetch	–
Fabaceae	LAOC2	<i>Lathyrus ochroleucus</i>	cream pea	–
Fabaceae	LOCO6	<i>Lotus corniculatus</i>	bird's-foot trefoil	Exotic
Fabaceae	MELU	<i>Medicago lupulina</i>	black medick	Exotic
Fabaceae	MEOF	<i>Melilotus officinalis</i>	yellow sweetclover	Exotic
Fabaceae	PEES	<i>Pedimelum esculentum</i>	large Indian breadroot	–
Fagaceae	QUMA2	<i>Quercus macrocarpa</i>	bur oak	–
Grossulariaceae	RIOX	<i>Ribes oxycanthoides</i>	Canadian gooseberry	–
Lamiaceae	GATE2	<i>Galeopsis tetrahit</i>	brittlestem hempnettle	Exotic
Lamiaceae	MOFI	<i>Monarda fistulosa</i>	wild bergamot	–
Liliaceae	MAST4	<i>Maianthemum stellatum</i>	starry false lily of the valley	–
Onagraceae	EPBR3	<i>Epilobium brachycarpum</i>	tall annual willowherb	–
Orchidaceae	COWI5	<i>Corallorhiza wisteriana</i>	spring coralroot	–
Oxalidaceae	OXST	<i>Oxalis stricta</i>	common yellow oxalis	–
Pinaceae	PIPO	<i>Pinus ponderosa</i>	ponderosa pine	–
Poaceae	ACNE9	<i>Achnatherum nelsonii</i>	Columbia needlegrass	–

Table 3 (continued). A list of all plant species identified in Mount Rushmore National Memorial's long-term plant community monitoring plots in 2019. 'Exotic' in the notes column indicates that the species is invasive, or non-native. If a species is considered noxious in an individual county within the state, it is indicated in the notes column as Noxious – County name. 'UR' indicates potentially rare but unranked. 'S4' indicates potentially rare but has a secured low risk.

Family	Symbol	Scientific Name	Common Name	Notes
Poaceae	AGSC5	<i>Agrostis scabra</i>	rough bentgrass	–
Poaceae	BRIN2	<i>Bromus inermis</i>	smooth brome	Exotic
Poaceae	BRTE	<i>Bromus tectorum</i>	cheatgrass	Exotic
Poaceae	DASP2	<i>Danthonia spicata</i>	poverty oatgrass	–
Poaceae	DICHA2	<i>Dichanthelium</i>	rosette grass	–
Poaceae	DILE2	<i>Dichanthelium leibergii</i>	Leiberg's panicum	–
Poaceae	ELCA4	<i>Elymus canadensis</i>	Canada wildrye	–
Poaceae	FESA	<i>Festuca saximontana</i>	Rocky Mountain fescue	–
Poaceae	KOMA	<i>Koeleria macrantha</i>	prairie Junegrass	–
Poaceae	MURA	<i>Muhlenbergia racemosa</i>	marsh muhly	–
Poaceae	ORAS	<i>Oryzopsis asperifolia</i>	roughleaf ricegrass	–
Poaceae	PIMI7	<i>Piptatherum micranthum</i>	littleseed ricegrass	–
Poaceae	PIPU7	<i>Piptatherum pungens</i>	mountain ricegrass	–
Poaceae	POPR	<i>Poa pratensis</i>	Kentucky bluegrass	Exotic
Poaceae	SCSC	<i>Schizachyrium scoparium</i>	little bluestem	–
Poaceae	THIN6	<i>Thinopyrum intermedium</i>	intermediate wheatgrass	Exotic
Poaceae	VUOC	<i>Vulpia octoflora</i>	sixweeks fescue	–
Pyrolaceae	PYCH	<i>Pyrola chlorantha</i>	greenflowered wintergreen	–
Ranunculaceae	ANPA19	<i>Anemone patens</i>	eastern pasqueflower	–
Ranunculaceae	THDA	<i>Thalictrum dasycarpum</i>	purple meadow-rue	–
Rosaceae	AMAL2	<i>Amelanchier alnifolia</i>	Saskatoon serviceberry	–
Rosaceae	DRFI3	<i>Drymocallis fissa</i>	bigflower cinquefoil	–
Rosaceae	PHMO4	<i>Physocarpus monogynus</i>	mountain ninebark	–
Rosaceae	PRVI	<i>Prunus virginiana</i>	chokecherry	–
Rosaceae	ROAC	<i>Rosa acicularis</i>	prickly rose	–
Rosaceae	SPBE2	<i>Spiraea betulifolia</i>	white spirea	–
Rubiaceae	GATR3	<i>Galium triflorum</i>	fragrant bedstraw	–
Salicaceae	POTR5	<i>Populus tremuloides</i>	quaking aspen	–
Salicaceae	SABE2	<i>Salix bebbiana</i>	Bebb willow	–
Scrophulariaceae	COPA3	<i>Collinsia parviflora</i>	maiden blue eyed Mary	–
Scrophulariaceae	VETH	<i>Verbascum thapsus</i>	common mullein	Exotic

Table 3 (continued). A list of all plant species identified in Mount Rushmore National Memorial's long-term plant community monitoring plots in 2019. 'Exotic' in the notes column indicates that the species is invasive, or non-native. If a species is considered noxious in an individual county within the state, it is indicated in the notes column as Noxious – County name. 'UR' indicates potentially rare but unranked. 'S4' indicates potentially rare but has a secured low risk.

Family	Symbol	Scientific Name	Common Name	Notes
Selaginellaceae	SERU	<i>Selaginella rupestris</i>	northern selaginella	UR
Unknown family	UNKFORB	<i>Unknown forb</i>	unknown forb	Exotic
Verbenaceae	VEST	<i>Verbena stricta</i>	hoary verbena	–
Violaceae	VIOLA	<i>Viola</i>	violet	–

Based on the total count of unique species observed in all plots in 2019, PCM_012 had the highest number with 49 total species, followed by PCM_009 with 42 species (Table 4). PCM_012 also had the most native species, totaling 43. Absolute cover calculations (Table 5) showed that plots visited by NGPN were more native than exotic. Two of six plots visited had no exotic species recorded using both the point-intercept and quadrat methods (Figure 4). Plot PCM_009 had the highest absolute cover of native species (76%). PCM_008 had the highest absolute cover of exotic species (17%).

Table 4. Total number of plant species identified in plots monitored at Mount Rushmore National Memorial in 2019. This is a count of all unique species identified in the plot using species data from point-intercept, quadrat, woody species, and early detection exotic species protocols.

Plot	Native Species	Exotic Species	Total Species
PCM_007	18	0	18
PCM_008	20	8	28
PCM_009	37	5	42
PCM_010	16	0	16
PCM_011	21	1	22
PCM_012	43	6	49

Table 5. Absolute percent cover of native and exotic plant species in plots monitored at Mount Rushmore National Memorial in 2019. Absolute percent cover is calculated using the point-intercept data. This includes overlapping species canopies, which can result in values greater than 100%.

Plot	Absolute Cover %	
	Exotic	Native
PCM_007	0	26
PCM_008	17	59
PCM_009	10	76
PCM_010	0	19
PCM_011	1	38
PCM_012	6	59



Figure 4. Plot PCM_010, one of two plots with 100% relative cover of native plants in 2019. Photograph courtesy of the National Park Service.

The NGPN crew collected woody species data at 6 plots in 2019 (Table 6). Seven unique species of trees and shrubs were observed, with ponderosa pine (*Pinus ponderosa*) as the dominant cover. Regeneration, or seedlings present, was observed in five of six plots. Surface fuel data was collected at all 6 plots (Table 7). Plot PCM_007 had the highest fuel loads totaling over 44 tons per acre.

Table 6. Woody species data from 6 long-term monitoring plots visited at Mount Rushmore National Memorial in 2019. DBH categories are tree (DBH > 15 cm), pole (2.54 cm ≤ DBH ≤ 15 cm), and seedling (DBH < 2.54 cm).

Plot Name	Common Name	Status	DBH	Density/ha
PCM_007	chokecherry	Live	Seedling	605
PCM_007	ponderosa pine	Live	Seedling	3278
PCM_007	paper birch	Dead	Tree	10
PCM_007	ponderosa pine	Live	Pole	1178
PCM_007	ponderosa pine	Dead	Tree	90
PCM_007	ponderosa pine	Live	Tree	260
PCM_008	ponderosa pine	Dead	Pole	32
PCM_008	ponderosa pine	Live	Pole	64
PCM_008	ponderosa pine	Dead	Tree	80
PCM_008	ponderosa pine	Live	Pole	10
PCM_008	ponderosa pine	Live	Tree	570
PCM_009	chokecherry	Live	Seedling	255
PCM_009	ponderosa pine	Live	Seedling	1146
PCM_009	ponderosa pine	Dead	Tree	30
PCM_009	ponderosa pine	Live	Tree	150
PCM_010	chokecherry	Live	Seedling	1178
PCM_010	ponderosa pine	Live	Seedling	891
PCM_010	ponderosa pine	Dead	Pole	32
PCM_010	ponderosa pine	Live	Pole	350
PCM_010	ponderosa pine	Dead	Tree	30
PCM_010	ponderosa pine	Live	Pole	10
PCM_010	ponderosa pine	Live	Tree	250
PCM_011	chokecherry	Live	Seedling	159
PCM_011	ponderosa pine	Live	Seedling	1591
PCM_011	ponderosa pine	Live	Pole	10
PCM_011	ponderosa pine	Live	Tree	470
PCM_012	chokecherry	Live	Seedling	2005
PCM_012	bur oak	Live	Seedling	64
PCM_012	paper birch	Live	Seedling	987
PCM_012	Saskatoon serviceberry	Live	Seedling	3819
PCM_012	Bebb willow	Live	Seedling	318
PCM_012	quaking aspen	Live	Seedling	2483
PCM_012	ponderosa pine	Live	Seedling	127
PCM_012	paper birch	Dead	Pole	64
PCM_012	paper birch	Live	Pole	127
PCM_012	Bebb willow	Live	Tree	10

Table 6 (continued). Woody species data from 6 long-term monitoring plots visited at Mount Rushmore National Memorial in 2019. DBH categories are tree (DBH > 15 cm), pole (2.54 cm ≤ DBH ≤ 15 cm), and seedling (DBH < 2.54 cm).

Plot Name	Common Name	Status	DBH	Density/ha
PCM_012	quaking aspen	Dead	Pole	32
PCM_012	quaking aspen	Live	Pole	318
PCM_012	ponderosa pine	Dead	Tree	50
PCM_012	ponderosa pine	Live	Tree	240

Table 7. Surface fuels summary for 6 plots visited in 2019 at Mount Rushmore National Memorial by the Northern Great Plains Network.

Macroplot	Average Tons per Acre										Avg. Depth (in.)		
	1-hr	10-hr	100-hr	1-100-hr	1000-hr sound	1000-hr rotten	1-1000-hr	Duff	Litt	Total	Duff	Litt	Total
PCM_007	0.20	1.49	1.45	3.14	1.96	14.92	20.02	22.80	2.10	44.92	1.3	0.5	1.8
PCM_008	0.10	2.71	2.91	5.72	14.24	4.20	24.16	6.34	2.44	32.94	0.4	0.6	1.0
PCM_009	0.20	0.28	0.00	0.48	2.15	2.78	5.41	4.31	2.12	11.84	0.2	0.5	0.8
PCM_010	0.06	1.99	1.52	3.58	1.38	3.80	8.75	6.16	2.26	17.17	0.4	0.6	0.9
PCM_011	0.06	1.41	0.73	2.21	1.53	0.25	3.98	2.29	1.98	8.25	0.1	0.5	0.6
PCM_012	0.02	0.00	2.25	2.27	2.93	16.52	21.72	5.46	2.66	29.83	0.3	0.7	1.0

Disturbances were observed in 3 of the 6 plots visited by NGPN in 2019 (Table 8). The most common disturbance was soil disturbance. The largest disturbances per square meter were tree removal and soil disturbance. Plot PCM_011's soil disturbance was crew related due to the steep terrain along the transects. All six plots were also assessed for the presence of early detection exotic species, but none were found in 2019.

Table 8. Disturbance type and area observed in 3 of 6 plots visited at Mount Rushmore National Memorial by the Northern Great Plains Network in 2019. The disturbance area was approximated out of a total area of 1000 m² or recorded as present.

Plot	Disturbance Type	Area (m ²)
PCM_007	Off-Road	20
PCM_009	Soil Disturbance	20
PCM_009	Storm	Present
PCM_009	Fire	Present
PCM_011	Soil Disturbance	15
PCM_011	Tree Removal (Chipping)	Present
PCM_011	Tree Removal (Thinning)	Present

Further Analysis

This 2019 Data Report is intended to provide a basic review of the data collected during the NGPN team's 2019 visit to Mount Rushmore National Memorial. All data included in this report are available upon request from the Northern Great Plains Inventory and Monitoring Network, and it is archived at <https://irma.nps.gov/DataStore>

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