



Plant Community Composition and Structure Monitoring at Fort Union Trading Post National Historic Site

2018 Data Summary Report

Natural Resource Data Series NPS/NGPN/NRDS—2019/1195





ON THIS PAGE

View of an Northern Great Plains Inventory & Monitoring plant community plot in the Bodmer Unit.
Photograph courtesy of the National Park Service.

ON THE COVER

View of the fort at Fort Union Trading Post National Historic Site in the background of a Plant Community transect photo.
Photograph courtesy of the National Park Service.

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Theresa L. Schaffner

National Park Service
Northern Great Plains Inventory and Monitoring Network
231 East St. Joseph Street
Rapid City, SD 57701

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Abstract

This report presents the results of the Northern Great Plains Inventory and Monitoring Network's vegetation monitoring at Fort Union Trading Post National Historic Site (FOUS) in 2018. This was the eighth year that the Northern Great Plains Inventory and Monitoring Network (NGPN) conducted field work at FOUS.

Crew members from NGPN visited nine long-term monitoring plots to collect data on the plant communities at FOUS. Six plots were part of the regularly scheduled monitoring interval. Three additional plots were read in the Bodmer Overlook Unit to evaluate the effects of cattle grazing in the unit. This work is part of a long-term monitoring effort designed to provide a better understanding of the condition of the vegetation community and how it changes over time. NGPN staff measured species richness, herb-layer height, native and non-native species abundance, ground cover, and site disturbance at each of the nine plots. In three plots where woody species were present or nearby, tree regeneration, tall shrub density, tree density, and woody fuel loads were also measured.

In 2018, the NGPN monitoring crew identified 97 unique plant species in nine monitoring plots, compared to 71 unique species observed in six plots in 2017. Of the 97 species observed in 2018, 76 were native and 21 were exotic. The five plots located in the Bodmer Overlook Unit were more diverse than the four plots located in the Upland Terrace Unit near the fort. No trees or woody fuels were present in the nine plots, but the crew did identify two green ash (*Fraxinus pennsylvanica*) seedlings. The most commonly observed ground disturbances resulted from grazing in the Bodmer Unit.

Acknowledgments

Thank you to the staff at Fort Union Trading Post National Historic Site for providing logistical support. The 2018 NGPN vegetation field crew—I. Ashton, S. Rockwood, M. Davis, and T. Schaffner—collected all the data included in this report.

Introduction

Fort Union Trading Post National Historic Site (FOUS) was established in 1966 “to commemorate the significant role played by Fort Union as a fur trading post on the Upper Missouri River” (NPS 2013). The trading post sits on 444 acres of upland mixed-grass prairie and riparian forests. Vegetation monitoring at FOUS was initiated by the Northern Great Plains Fire Ecology Program in 1997 (Wienk et al. 2010). In 2011, the Northern Great Plains Inventory & Monitoring Network (NGPN) and the Fire Ecology Program combined their efforts to establish a single, coordinated vegetation monitoring protocol. Plot locations were also shifted to better represent the entire park (Symstad et al. 2011) and meet the goals of the FOUS vegetation management plan (Symstad 2012). Combined sampling efforts began in 2011 (Ashton et al. 2012).

Two distinct areas of grassland at FOUS are monitored: the Upland Terrace and the Bodmer Overlook Unit (hereafter, the Bodmer Unit). The Upland Terrace, which surrounds the reconstructed fort, has an extensive history of agricultural use that predates the creation of the park. More recently, it was planted with native species (Symstad 2012). The Bodmer Unit, a 30-acre parcel of rolling hills north of the fort and terrace, is comprised of relatively intact native prairie (Symstad 2012). In this report, we provide summaries of the vegetation data collected in 2018 from four Upland Terrace plots and five plots in the Bodmer Unit (Figure 1).



Figure 1. Map of plots visited at Fort Union Trading Post National Historic Site by the Northern Great Plains Inventory & Monitoring Network in 2018: three plots in panel 2 (marked by blue triangles), three plots in panel 3 (green triangles), and three additional plots in the Bodmer Unit (orange triangles).

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. The general approach is briefly described below. For more detail, please see Symstad et al. 2012a, available at <https://www.nps.gov/im/ngpn/plant-communities.htm>.

Sample Design

The NGPN team implemented a survey to monitor plant community structure and composition at FOUS using a spatially balanced probability design (Generalized Random Tessellation Stratified [GRTS]; Stevens and Olsen 2003, 2004). Using a GRTS design, 15 randomly located sites were selected within FOUS to become Plant Community Monitoring plots (PCM plots). These sites were split into five panels containing three sites each. An NGPN crew visits two panels (six PCM plots) during late July every year, using a rotating sampling schedule that consists of three sites visited the previous year and three sites that have not been visited for five years. Data from these randomly selected sites can be used to estimate the condition of vegetation communities for the whole park and to discern trends in condition over time. In 2018, the NGPN crew visited sites in panel 2, panel 3, plus three additional sites in the Bodmer Unit (Figure 1). Sampling was completed by a four-person crew in approximately 84 crew hours over two and half days (Table 1). This total does not include the drive time between Rapid City and FOUS. The crew lodged for two nights in Williston, ND.

The three additional plots in the Bodmer Unit were visited to better detect the effect of earlier cattle grazing. In June of 2018, FOUS park management and the Northern Great Plains Exotic Plant Management Team (EPMT), released 100 cattle onto the Bodmer Unit, in an effort to allow cattle grazing to limit exotic species and increase the growth of native species. One-hundred heifers were released on to the unit on the morning of June 3, 2018 and taken out the morning of June 8, 2018 (B. Hawk, personal communication November 13,2018).

Table 1. Field journal for plant community plots monitored at Fort Union Trading Post National Historic Site in 2018.

Date Visited	Plot Name	Park Unit	Field Notes
7/27/2018	PCM_004	Upland Terrace	–
7/28/2018	PCM_003	Upland Terrace	–
7/28/2018	PCM_005	Upland Terrace	–
7/28/2018	PCM_006	Upland Terrace	–
7/28/2018	PCM_130	Bodmer Overlook	Grazed
7/28/2018	PCM_131	Bodmer Overlook	Grazed
7/29/2018	PCM_129	Bodmer Overlook	Grazed; unscheduled visit
7/29/2018	PCM_132	Bodmer Overlook	Grazed; unscheduled visit
7/29/2018	PCM_133	Bodmer Overlook	Grazed; unscheduled visit

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 by identifying every species within five 1 m² quadrats distributed along each transect (Figure 2). 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.

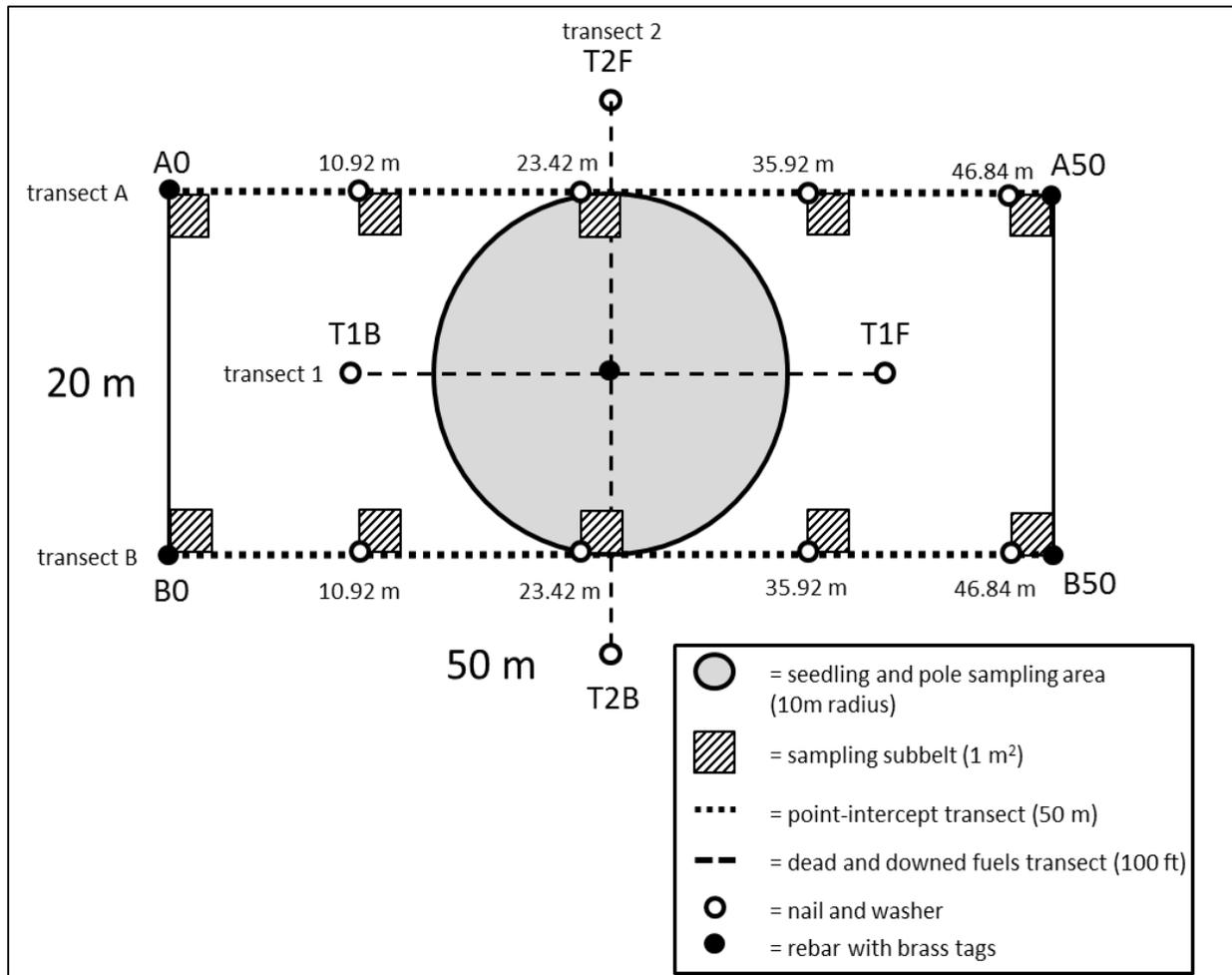


Figure 2. Long-term monitoring plot layout used by the Northern Great Plains Inventory & Monitoring Network for sampling vegetation.

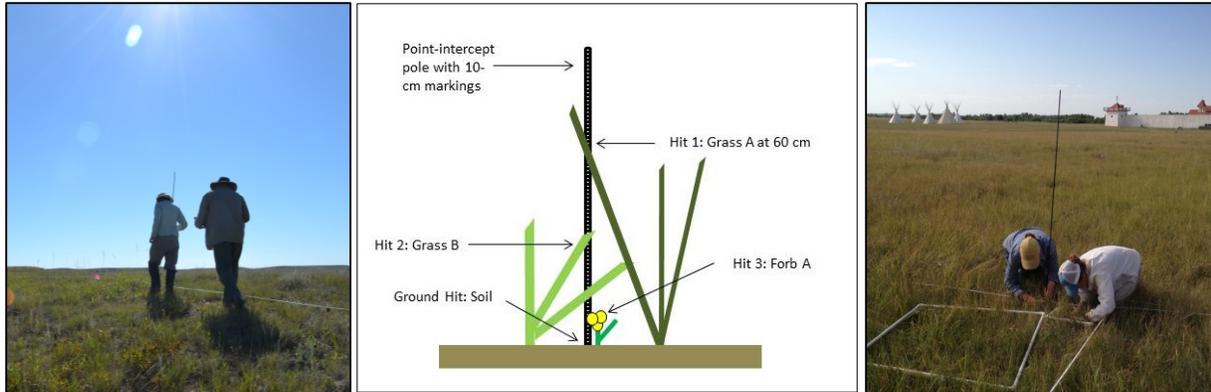


Figure 3. The Northern Great Plains Inventory & Monitoring Network vegetation crew uses point-intercept (left and center panel above) and quadrat (right panel above) sampling methods to record plant diversity and abundance.

When woody species were present within 38 m of plot center, tree regeneration and tall shrub density data were collected within a 10 m radius subplot centered in the larger 50 m x 20 m (0.1 ha) plot. For each tree (DBH > 15 cm), the species, diameter at breast height (DBH), live or dead status, and condition (e.g., leaf-discoloration, insect-damaged) 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. Seedlings (DBH < 2.54 cm) were tallied by species within the 10 m radius subplot. In 2018, changes were made to the protocol to avoid inconsistent seedling density calculations: seedlings were always counted or estimated in all four quarters of the 10 m radius subplot. Previously, once the count for a species had reached 100, seedlings were not counted in the following quarters. 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. In 2018, woody species were present within 38 m of plot center of three plots: PCM_129, PCM_130, and PCM_131. Data was collected in PCM_130, but no woody species were observed within the plot area of PCM_129 or PCM_131. No woody fuels intersected the fuel lines in either of these plots, therefore no fuels data were collected.

NGPN surveyed for vegetation and ground disturbances at each plot. Disturbances are categorized into groups including grazing, mammal disturbances, mowing, animal trails, fire, wind, and human activity. Disturbances are estimated by NGPN crew members and recorded in terms of area in m². In 2018, a new category called soil disturbance was added to account for any and all loose, exposed soil from all sources.

Plots were also assessed for the presence and abundance of target exotic species (Table 2). Early detection of these species is critical for rapid response and control of 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 = 1–5% cover, 4 = 5–25% cover, and 5 = cover > 25% of the plot.

Table 2. Exotic riparian and upland species included in the Northern Great Plains Inventory & Monitoring Network’s early detection and rapid response program. The state noxious weed column indicates species included on the Montana or North Dakota state list of noxious weeds. ND-M indicates species considered noxious only in McKenzie County, ND.

Habitat	Scientific Name	Common Name	State Noxious Species
Riparian	<i>Alliaria petiolata</i>	garlic mustard	–
	<i>Polygonum cuspidatum</i> ; <i>P. sachalinense</i> ; <i>P. x bohemicum</i>	knotweeds	MT
	<i>Pueraria montana</i> var. <i>lobata</i>	kudzu	–
	<i>Iris pseudacorus</i>	yellow iris	MT
	<i>Ailanthus altissima</i>	tree of heaven	–
	<i>Lepidium latifolium</i>	perennial pepperweed	MT
	<i>Arundo donax</i>	giant reed	–
	<i>Rhamnus cathartica</i>	common buckthorn	–
	<i>Heracleum mantegazzianum</i>	giant hogweed	–
Upland	<i>Taeniatherum caput-medusae</i>	medusahead	–
	<i>Centaurea solstitialis</i>	yellow star thistle	MT
	<i>Hieracium aurantiacum</i> ; <i>H. caespitosum</i>	orange and meadow hawkweed	MT
	<i>Isatis tinctoria</i>	Dyer's woad	MT
	<i>Chondrilla juncea</i>	rush skeletonweed	MT
	<i>Gypsophila paniculata</i>	baby's breath	ND-M
	<i>Centaurea virgata</i> ; <i>C. diffusa</i>	knapweeds	MT, ND
	<i>Linaria dalmatica</i> ; <i>L. vulgaris</i>	toadflax	MT, ND
	<i>Euphorbia myrsinites</i> & <i>E. cyparissias</i>	myrtle spurge	–
	<i>Dipsacus fullonum</i> & <i>D. laciniatus</i>	common teasel	–
	<i>Salvia aethiopsis</i>	Mediterranean sage	–
	<i>Ventenata dubia</i>	African wiregrass	–

Data Management and Analysis

FFI (FEAT/FIREMON Integrated; <http://frames.gov/ffi/>) is 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 recognized a new name that was not in the USDA PLANTS database, the new name was used, and a unique plant code was assigned.

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. 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 FOUS in 2018 was determined by cross-referencing with the NatureServe conservation status list, as well as the Montana and North Dakota rare plant species lists. For the purpose of this report, a species is considered rare or of conservation concern if its global (G) or state (S) conservation status rank is classified as critically imperiled (G1/S1), imperiled (G2/S2), or vulnerable (G3/S3). More information on conservation ranks can be found at the [NatureServe](#) website. The 2018 species list was also cross-referenced with the list of noxious weeds maintained by the [North Dakota Department of Agriculture](#) and the [Montana Department of Agriculture](#).

Results

There are 386 vascular plant species on the FOUS species list, and the NGPN monitoring crew identified a total of 97 species from nine monitoring plots visited in 2018 (Table 3). Of these, 76 are species native to the park, and 21 are considered exotic. The list of species was cross-referenced with the state lists of rare species; three species identified in 2018 are considered rare in either North Dakota or Montana. *Phlox alyssifolia* is a North Dakota state level 1 (S1) rare species. *Physaria ludoviciana* is considered to be a S2-S3 rare species in Montana. *Penstemon grandiflorus* is considered a level S1 rare species in Montana because its presence has been verified only in Custer County, in the southeast portion of the state. However, both of the species identified as rare on the Montana state list were identified in plots located in North Dakota.

The 2018 species list was also cross-referenced with the state exotic species lists. Leafy spurge (*Euphorbia esula*) is listed on the North Dakota state list. Leafy spurge and field bindweed (*Convolvulus arvensis*) are listed on the Montana state list as management priority 2B: abundant in Montana and widespread in many counties. According to the [Montana Department of Agriculture](#), management criteria of 2B designated species in Montana requires eradication or containment where less abundant and shall be prioritized by local weed districts.

Table 3. A list of all plant species identified in Fort Union Trading Post National Historic Site’s long-term plant community monitoring plots in 2018. All species are native unless listed in the Notes column as “Exotic.” Species considered to be rare are marked with the appropriate global or state conservation ranks. State-wide noxious weed species are designated as ND for North Dakota or MT for Montana.

Family	Symbol	Scientific Name	Common Name	Notes
Anacardiaceae	TORY	<i>Toxicodendron rydbergii</i>	western poison ivy	–
Asclepiadaceae	ASPU	<i>Asclepias pumila</i>	plains milkweed	–
Asteraceae	ANTEN	<i>Antennaria</i> spp	pusseytoes	–
	ARDR4	<i>Artemisia dracunculus</i>	tarragon	–
	ARFR4	<i>Artemisia frigida</i>	prairie sagewort	–
	ARLU	<i>Artemisia ludoviciana</i>	white sagebrush	–
	BREU	<i>Brickellia eupatorioides</i>	false boneset	–
	CIUN	<i>Cirsium undulatum</i>	wavyleaf thistle	–
	COCA5	<i>Conyza canadensis</i>	Canadian horseweed	–
	ECAN2	<i>Echinacea angustifolia</i>	blacksamson echinacea	–
	GUSA2	<i>Gutierrezia sarothrae</i>	broom snakeweed	–
	HEVI4	<i>Heterotheca villosa</i>	hairy false goldenaster	–
	LASE	<i>Lactuca serriola</i>	prickly lettuce	Exotic
	LIPU	<i>Liatris punctata</i>	dotted blazing star	–
	LOAR5	<i>Logfia arvensis</i>	field cottonrose	Exotic
	LYJU	<i>Lygodesmia juncea</i>	rush skeletonplant	–
MUOB99	<i>Mulgedium oblongifolium</i>	blue lettuce	–	

Table 3 (continued). A list of all plant species identified in Fort Union Trading Post National Historic Site's long-term plant community monitoring plots in 2018. All species are native unless listed in the Notes column as "Exotic." Species considered to be rare are marked with the appropriate global or state conservation ranks. State-wide noxious weed species are designated as ND for North Dakota or MT for Montana.

Family	Symbol	Scientific Name	Common Name	Notes
Asteraceae (continued)	RACO3	<i>Ratibida columnifera</i>	prairie coneflower	–
	SOMI2	<i>Solidago missouriensis</i>	Missouri goldenrod	–
	SYER	<i>Symphyotrichum ericoides</i>	white heath aster	–
	SYMPH4	<i>Symphyotrichum</i>	aster	–
	SYOB	<i>Symphyotrichum oblongifolium</i>	aromatic aster	–
	TAOF	<i>Taraxacum officinale</i>	common dandelion	Exotic
	TEAC	<i>Tetraneuris acaulis</i>	stemless four-nerve daisy	–
	TRDU	<i>Tragopogon dubius</i>	yellow salsify	Exotic
Brassicaceae	ALDE	<i>Alyssum desertorum</i>	desert madwort	Exotic
	BODI4	<i>Boechea divaricarpa</i>	spreading rockcress	–
	DESO2	<i>Descurainia sophia</i>	herb sophia	Exotic
	DRNE	<i>Draba nemorosa</i>	woodland draba	–
	ERCA14	<i>Erysimum capitatum</i>	sanddune wallflower	–
	LEDE	<i>Lepidium densiflorum</i>	common pepperweed	–
	PHLU99	<i>Physaria ludoviciana</i>	foothill bladderpod	S2-S3 Rare (MT)
	SIAL2	<i>Sisymbrium altissimum</i>	tall tumbled mustard	Exotic
	THAR5	<i>Thlaspi arvense</i>	field pennycress	Exotic
Cactaceae	OPFR	<i>Opuntia fragilis</i>	brittle pricklypear	–
	OPPO	<i>Opuntia polyacantha</i>	plains pricklypear	–
Caprifoliaceae	SYOC	<i>Symphoricarpos occidentalis</i>	western snowberry	–
Chenopodiaceae	CHENO	<i>Chenopodium</i>	goosefoot	Exotic
	KOSC	<i>Kochia scoparia</i>	burningbush, kochia	Exotic
	KRLA2	<i>Krascheninnikovia lanata</i>	winterfat	–
	SAKA	<i>Salsola kali</i>	Russian thistle	Exotic
Convolvulaceae	COAR4	<i>Convolvulus arvensis</i>	field bindweed	Exotic; noxious (MT)
Cyperaceae	CADU6	<i>Carex duriuscula</i>	needleleaf sedge	–
	CAFI	<i>Carex filifolia</i>	threadleaf sedge	–
Euphorbiaceae	EUES	<i>Euphorbia esula</i>	leafy spurge	Exotic; noxious (ND, MT)
	EUGL3	<i>Euphorbia glyptosperma</i>	ribseed sandmat	–
	EUSE5	<i>Euphorbia serpyllifolia</i>	thymeleaf sandmat	–
Fabaceae	ASFL2	<i>Astragalus flexuosus</i>	flexile milkvetch	–
	ASGI5	<i>Astragalus gilviflorus</i>	plains milkvetch	–

Table 3 (continued). A list of all plant species identified in Fort Union Trading Post National Historic Site's long-term plant community monitoring plots in 2018. All species are native unless listed in the Notes column as "Exotic." Species considered to be rare are marked with the appropriate global or state conservation ranks. State-wide noxious weed species are designated as ND for North Dakota or MT for Montana.

Family	Symbol	Scientific Name	Common Name	Notes
Fabaceae (continued)	DACA7	<i>Dalea candida</i>	white prairie clover	–
	DAPU5	<i>Dalea purpurea</i>	purple prairie clover	–
	MEOF	<i>Melilotus officinalis</i>	yellow sweetclover	Exotic
	OXYTR	<i>Oxytropis</i> spp	locoweed	–
	VIAM	<i>Vicia americana</i>	American vetch	–
Liliaceae	ALTE	<i>Allium textile</i>	textile onion	–
Linaceae	LILE3	<i>Linum lewisii</i>	Lewis flax	–
	LIRI	<i>Linum rigidum</i>	stiffstem flax	–
Malvaceae	SPCO	<i>Sphaeralcea coccinea</i>	scarlet globemallow	–
Oleaceae	FRPE	<i>Fraxinus pennsylvanica</i>	green ash	–
Onagraceae	OESE3	<i>Oenothera serrulata</i>	yellow sundrops	–
	OESU99	<i>Oenothera suffrutescens</i>	scarlet beeblossom	–
Plantaginaceae	PLPA2	<i>Plantago patagonica</i>	woolly plantain	–
Poaceae	AGCR	<i>Agropyron cristatum</i>	crested wheatgrass	Exotic
	ANGE	<i>Andropogon gerardii</i>	big bluestem	–
	ARPU9	<i>Aristida purpurea</i>	purple threeawn	–
	BOCU	<i>Bouteloua curtipendula</i>	sideoats grama	–
	BOGR2	<i>Bouteloua gracilis</i>	blue grama	–
	BRIN2	<i>Bromus inermis</i>	smooth brome	Exotic
	BRJA	<i>Bromus japonicus</i>	Japanese brome	Exotic
	CALO	<i>Calamovilfa longifolia</i>	prairie sandreed	–
	ELLA3	<i>Elymus lanceolatus</i>	thickspike wheatgrass	–
	ELTR7	<i>Elymus trachycaulus</i>	slender wheatgrass	–
	HECO26	<i>Hesperostipa comata</i>	needle and thread	–
	HESP11	<i>Hesperostipa spartea</i>	porcupinegrass	–
	KOMA	<i>Koeleria macrantha</i>	prairie Junegrass	–
	MUCU3	<i>Muhlenbergia cuspidata</i>	plains muhly	–
	NAVI4	<i>Nassella viridula</i>	green needlegrass	–
	PASM	<i>Pascopyrum smithii</i>	western wheatgrass	–
	PAVI2	<i>Panicum virgatum</i>	switchgrass	–
	PEGL2	<i>Pennisetum glaucum</i>	pearl millet	Exotic
	POPR	<i>Poa pratensis</i>	Kentucky bluegrass	Exotic
	PSSP6	<i>Pseudoroegneria spicata</i>	bluebunch wheatgrass	–
SCSC	<i>Schizachyrium scoparium</i>	little bluestem	–	

Table 3 (continued). A list of all plant species identified in Fort Union Trading Post National Historic Site's long-term plant community monitoring plots in 2018. All species are native unless listed in the Notes column as "Exotic." Species considered to be rare are marked with the appropriate global or state conservation ranks. State-wide noxious weed species are designated as ND for North Dakota or MT for Montana.

Family	Symbol	Scientific Name	Common Name	Notes
Poaceae (continued)	SEVI4	<i>Setaria viridis</i>	green bristlegrass	Exotic
	SPCR	<i>Sporobolus cryptandrus</i>	sand dropseed	–
Polemoniaceae	PHAL3	<i>Phlox alyssifolia</i>	alyssumleaf phlox	S1 Rare (ND)
	PHHO	<i>Phlox hoodii</i>	spiny phlox	–
Polygalaceae	POAL4	<i>Polygala alba</i>	white milkwort	–
	ERPA9	<i>Eriogonum pauciflorum</i>	fewflower buckwheat	–
	FACO	<i>Fallopia convolvulus</i>	black bindweed	Exotic
Primulaceae	ANOC2	<i>Androsace occidentalis</i>	western rockjasmine	–
Ranunculaceae	ANPA19	<i>Anemone patens</i>	eastern pasqueflower	–
Rosaceae	ROAR3	<i>Rosa arkansana</i>	prairie rose	–
Santalaceae	COUM	<i>Comandra umbellata</i>	bastard toadflax	–
Scrophulariaceae	PEAL2	<i>Penstemon albidus</i>	white penstemon	–
	PEGR5	<i>Penstemon gracilis</i>	lilac penstemon	–
	PEGR7	<i>Penstemon grandiflorus</i>	large beardtongue	S1 Rare (MT)

Based on the total count of unique species observed in all plots in 2018, the five plots located in the Bodmer Unit had more total species per plot (Table 4) than the plots located in the Upland Terrace Unit. The Bodmer Unit plots also had more unique native species identified than the Upland Terrace plots. Four of the Bodmer Unit plots and three of the Upland Terrace plots had greater native species absolute cover than exotic absolute cover. (Table 5). PCM_129 had the most native species identified, with 45 out of 47 species identified in the plot, 145% absolute native cover, and 0% exotic cover. PCM_131 had the highest native cover at 169%. The only Bodmer Unit plot to have more exotic cover than native cover, PCM_133, had a large presence of crested wheatgrass (*Agropyron cristatum*). The most commonly intercepted exotic plant species were crested wheatgrass (*Agropyron cristatum*), Kentucky bluegrass (*Poa pratensis*), and smooth brome (*Bromus inermis*).

Table 4. Total number of plant species identified in each of the nine plots monitored at Fort Union Trading Post National Historic in 2018. This is a count of all unique species identified in the plot using all protocols: point-intercept, quadrat, woody species, and target species.

Plot	Park Unit	Native species	Exotic species	Total species
FOUS_PCM_003	Upland Terrace	11	10	21
FOUS_PCM_004	Upland Terrace	6	8	14
FOUS_PCM_005	Upland Terrace	7	7	14
FOUS_PCM_006	Upland Terrace	4	7	11
FOUS_PCM_129	Bodmer Unit	45	2	47
FOUS_PCM_130	Bodmer Unit	22	6	28
FOUS_PCM_131	Bodmer Unit	32	6	38
FOUS_PCM_132	Bodmer Unit	42	5	47
FOUS_PCM_133	Bodmer Unit	20	6	26

Table 5. Absolute percent cover of native and exotic plant species in plots monitored at Fort Union Trading Post National Historic in 2018. Absolute percent cover is calculated using the point-intercept data. This includes overlapping species canopies, which can result in values greater than 100%.

Plot	Park Unit	Absolute Cover (%)	
		Native	Exotic
FOUS_PCM_003	Upland Terrace	76	10
FOUS_PCM_004	Upland Terrace	73	103
FOUS_PCM_005	Upland Terrace	69	44
FOUS_PCM_006	Upland Terrace	123	21
FOUS_PCM_129	Bodmer	145	0
FOUS_PCM_130	Bodmer	128	15
FOUS_PCM_131	Bodmer	169	14
FOUS_PCM_132	Bodmer	163	20
FOUS_PCM_133	Bodmer	43	88

NGPN surveyed for woody species in three plots (PCM_129, PCM_130, and PCM_131) that met the parameters for the woody species protocols. No trees were found in any of the plots. Two green ash (*Fraxinus pennsylvanica*) seedlings were found in the center of PCM_130. No surface fuels or woody debris were found in any of the plots.

All plots were surveyed for early detection exotic species and disturbances. No target exotic species were found; however disturbances were observed in each of the nine plots visited (Table 6). The most common were grazing and small mammal activity.

Table 6. Disturbance type and area observed in the nine plots visited at Fort Union Trading Post National Historic in 2018. Disturbance area is approximated with ocular estimates of the entire 1000 m² plot.

Plot	Disturbance Type	Area (m²)
FOUS_PCM_003	Small Mammal	1
FOUS_PCM_004	Small Mammal	2
FOUS_PCM_005	Small Mammal	1
FOUS_PCM_006	Small Mammal	2
FOUS_PCM_129	Grazing	500
	Small Mammal	30
FOUS_PCM_130	Grazing	750
	Small Mammal	5
	Animal Trail	50
	Off-road vehicle	80
FOUS_PCM_131	Grazing	900
	Small Mammal	2
FOUS_PCM_132	Grazing	750
	Small Mammal	1
	Animal Trail	50
	Off-road vehicle	40
FOUS_PCM_133	Grazing	900
	Small Mammal	3
	Animal Trail	20

Further Analysis

This 2018 Data Summary Report is intended to serve as a quickly released, basic review of the data collected during the 2018 field visit to Fort Union Trading Post National Historic Site. For further analysis, all data included in this report is available upon request. It can be found in the archive at <https://irma.nps.gov/DataStore>. For an in-depth data analysis on long-term trends at FOUS, refer to the 2010–2016 summary report (Ashton and Davis 2017). The next in-depth data analysis is scheduled to be written following the 2019 field season.

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1201 Oakridge Drive, Suite 150
Fort Collins, CO 80525