# THREE-YEAR BASELINE MONITORING STUDY

# FOR *SILENE SPALDINGII* ON THE

# FLATHEAD INDIAN RESERVATION:

# YEAR 2018

Prepared for:

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**THREE-YEAR BASELINE MONITORING STUDY FOR *SILENE SPALDINGII* ON THE FLATHEAD INDIAN RESERVATION: YEAR 2018**

## 1.0 INTRODUCTION

Spalding's Catchfly (*Silene spaldingii*) is a regional endemic found in Montana, Washington, Oregon, Idaho, and barely extending into British Columbia, Canada. The Recovery Plan for *Silene spaldingii* (Spalding's Catchfly) (USFWS 2007; hereafter referred to as the Recovery Plan) requires that 27 populations, referred to as Key Conservation Areas (KCAs), each with at least 500 reproducing Spalding's Catchfly individuals, occur rangewide in five physiographic provinces. Specifically, for the *Intermontane Valleys* physiographic province, which occurs only in Montana, the Recovery Plan states that four KCAs be identified (USFWS 2007). Further, Delisting Criterion #3 states that populations of Spalding's Catchfly at KCAs must demonstrate stable or increasing population trends for at least 20 years using consistent range-wide long-term monitoring (USFWS 2007). The objective of this project is to make demonstrable progress towards the recovery plan goals for Spalding's Catchfly by initiating the required monitoring at two potential KCAs on land owned by the Confederated Salish and Kootenai Tribes (CSKT). Funding from the U.S. Fish and Wildlife Service (USFWS) and cooperation from the CSKT is allowing the Montana Natural Heritage Program (MTNHP) Botanist to conduct the 3-year baseline for monitoring trend of Spalding's Catchfly at the Sullivan Gulch and Crosson Valley/Sullivan Hill potential KCAs (**Figure 1**).

Within a given Spalding's Catchfly population, individual plants exhibit dormancy for one or more growing seasons (Lesica and Crone 2004, USFWS 2012). This makes assessing population trends (stable, declining, or increasing) difficult. However, studies in Montana have shown that plants are rarely dormant for more than two growing seasons (USFWS 2012, Lesica and Crone 2007, and Lesica and Steele 1994). Therefore, the draft monitoring guidelines (USFWS 2012) requires that individuals within a defined transect are mapped for three consecutive years to account for about 95% of that population (USFWS 2012). Further, the 3-consecutive years of monitoring would then be repeated at 5- to 7-year intervals over the 20-year period to establish if the population is stable, declining, or increasing (USFWS 2012). This report documents the methods and results of Year 2 (2018) in the 3-year baseline monitoring studies at the Sullivan Gulch and Crosson Valley/Sullivan Hill areas.

## 2.0 METHODS

The Little Bitterroot River Population for Spalding's Catchfly occurs almost exclusively within the Flathead Indian Reservation on land owned by the CSKT. It is composed of approximately 30 discrete areas referred to as Species Occurrences (SOs) that are mapped by the MTNHP (MTNHP 2018). Within the population two geographic areas are being proposed as KCAs which serve to focus conservation efforts: Sullivan Gulch area and Crosson Valley/Sullivan Hill area (**Figure 1**).

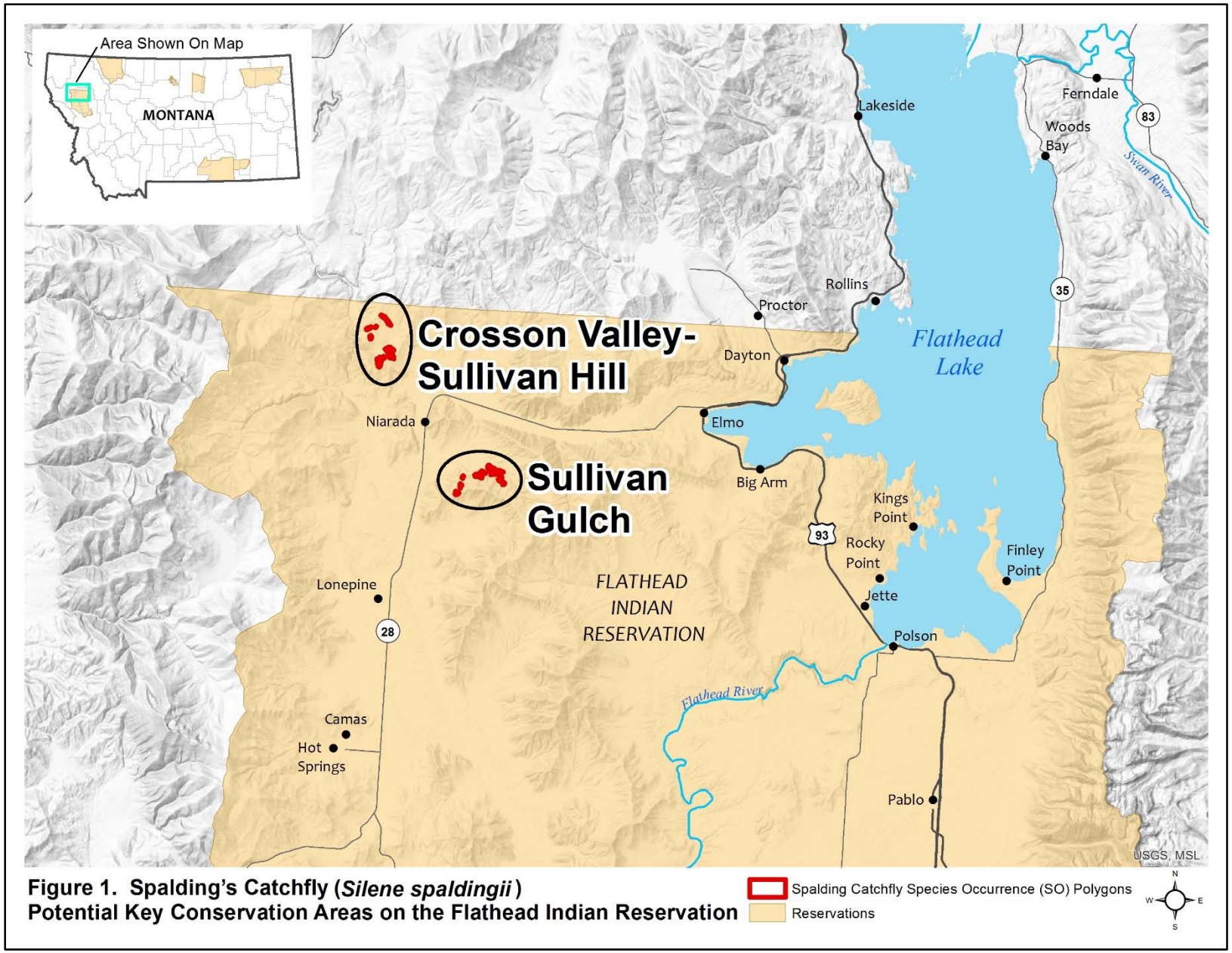


**Figure 1. Spalding's Catchfly (*Silene spaldingii*)**
**Potential Key Conservation Areas on the Flathead Indian Reservation**

Spalding Catchfly Species Occurrence (SO) Polygons
Reservations

## 2.1 Transect Establishment

In each potential KCA 11 transects were established in accordance with the USFWS (2012) monitoring guidelines for determining trends over the next 20-year period (**Figures 2** and **3** in **Appendix B**). Monitoring design is described in the 2017 report, which details the first of a 3-year baseline monitoring protocol (Pipp 2017). In 2018 monitoring occurred at the same transects by Andrea Pipp (MTNHP Botanist) and with assistance from Rusty Sydnor (CSKT Restoration Botanist) and Fidencio Balderas (Salish Kootenai College student) from July 16-26.

## 2.2 Monitoring

Each transect is divided into thirty, one-meter square plots to record Spalding's Catchfly plant and habitat data. On the transect, the (x, y) coordinate of each Spalding's Catchfly plant was mapped to the nearest centimeter. Field data recorded for each plant included the: a) life stage (dormant, rosette, stemmed-not flowering, or stemmed-flowering), b) number of stems, c) number of grazed stems, d) number of flowers, e) presence/absence of insect herbivory on flowers, and f) comments. Each plant is assigned a unique identifier to track the individual over a 20-year period. In general plants that occur less than 10 centimeters (in both the x- and y-directions) of last year's location are considered the same plant.

Habitat data was recorded in each square-meter to provide context for where the Spalding's Catchfly plants grow and will aid in explaining changes over the 20-year period. Habitat data includes determining cover of vascular plants, exotic plants, non-vascular species, plant litter, bare ground, rock, and wood. The percent cover of total vascular plants and total noxious weeds is based out of 100%. The combined percent cover of non-vascular species, plant litter, bare ground, rock, and wood is based out of 100% because these occupy the ground surface. Changes to the habitat from 2017 will be quantified in Years 2 (2018) and 3 (2019). Across the 3-year baseline a comprehensive vascular plant species list is developed for each transect, as conditions permit. Each year a qualitative assessment of the grazing condition is made for the transect. Each year the transects are photographed from each end (toward the other end) in the portrait and landscape positions. Additional photographs are taken of the plots, plants, and habitat, as deemed necessary.

A cursory survey to count the number of Spalding's Catchfly plants will be conducted in as many SOs as project time permits. For each SO visited, plants will be counted and habitat conditions assessed as the observers meander through the polygon. Observation data is entered into the MTNHP's botany database, and information is available on Map Viewer and through data requests. Updated observation data and mapping is also shared with the CSKT Restoration Botanist.

# 3.0 RESULTS

Following a very good 2017-2018 winter snowpack, Spalding's Catchfly plants were abundant in most areas surveyed. The snowpack, moist spring, and warm summer conditions favored plants remaining viable long into the growing season. Plants ranged in their development from budding to flowering to dispersing seeds, but overall were at peak flowering. Many forbs also retained their greenery, which made adding to each transect's species list possible (**Tables 1** and **2** in

**Appendix A**).

### 3.1 Sullivan Gulch

The Sullivan Gulch area currently consists of 12 SOs (**Figure 2** in **Appendix B**). Although it was not a requirement of this project a cursory survey for Spalding's Catchfly plants was conducted at all 12 SOs. A total of 2,289 plants were observed in the Sullivan Gulch area in late July (**Table 1**).

**Table 1.** ***Number of Spalding's Catchfly plants observed in the Sullivan Gulch Species Occurrences (SOs) in 2018.***

| SO NUMBER | ON MONITORING TRANSECT | CURSORY SURVEY OF SO | TOTAL |
|---|---|---|---|
| 41 | 7 | 90 | 97 |
| 42 | 22 | 98 | 120 |
| 43 | 12 | 433 | 445 |
| 51 | not applicable | 106 | 106 |
| 52 | 6 | 110 | 116 |
| 53 | not applicable | 494 | 494 |
| 54 | not applicable | 117 | 117 |
| 55 | 9 | 433 | 442 |
| 56 | not applicable | 163 | 163 |
| 64 | 3 | 116 | 119 |
| 65 | 14 | 29 | 43 |
| 66 | 8 | 19 | 27 |
| | | **TOTAL** | **2,289** |

In the Sullivan Gulch area 11 transects were established within 8 SOs (**Figure 2** in **Appendix B; Photos 1** to **22** in **Appendix C**). Habitat was consistent among the transects and consisted of mesic grassland dominated by Rough Fescue (*Festuca campestris*). Vascular plant cover ranged from 60% to 98% per square meter, with an average cover ranging from 68% to 84% per transect (**Table 2**). Noxious plant cover ranged from 0% to 5.5% per square meter, with an average cover ranging from 0% to less than 1% per transect (**Table 2**). Ground cover by non-vascular species consists mostly of lichens and mosses, also called biological soil crust. Non-vascular cover ranged widely from 0.5% to 85% per square meter, with an average cover ranging from 14% to 77% per transect (**Table 2**). Plant litter varied widely from 10% to 99% per square meter, with an average cover ranging from 20% to 82% per transect (**Table 2**). Bare ground ranged from 0% to 30% per square meter, with an average cover ranging from less than 1% to 4% per transect (**Table 2**). Rock ranged from 0% to 40% per square meter, with an average cover ranging from 0% to 5% per transect (**Table 2**). Wood was not found on any transect (**Table 2**).

**Table 2.** ***Summary statistics on Spalding's Catchfly plants, habitat, and noxious weeds collected on monitoring plots from July 16-19, 2018 in the Sullivan Gulch area.***

| SO / TRANSECT | TOTAL NUMBER ON TRANSECT FOR SPALDING'S CATCHFLY | | | | | | | | AVERAGE PERCENT COVER ON TRANSECT | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2017 Plants Absent[1] in 2018 | Plants Present in 2018 | Non-Flowering Plants [2] | Flowering Plants | Flowers | Plants w/ Flower Insect Herbivory | Stems | Grazed Stems[3] | Vascular Plants | Non-Vascular Species | Plant Litter | Bare Ground | Rock | Wood | Noxious Plant |
| **SO #41** | | | | | | | | | | | | | | | |
| **SG-01** | 2 | 3 | 0 | 2 | 22 | 0 | 2 | 0 | 81 | 54 | 43 | 3 | < 1 | 0 | < 1 |
| **SG-02** | 2 | 5 | 2 | 3 | 67 | 0 | 5 | 0 | 72 | 53 | 41 | 5 | 1 | 0 | < 1 |
| **SO #42** | | | | | | | | | | | | | | | |
| **SG-03** | 3 | 13 | 3 | 10 | 127 | 0 | 14 | 0 | 83 | 44 | 52 | 4 | < 1 | 0 | 0 |
| **SG-04** | 2 | 9 | 1 | 8 | 230 | 0 | 17 | 0 | 82 | 60 | 38 | 2 | < 1 | 0 | 0 |
| **SO #43** | | | | | | | | | | | | | | | |
| **SG-05** | 2 | 10 | 6 | 4 | 42 | 0 | 10 | 0 | 81 | 77 | 20 | 1 | 2 | 0 | 0 |
| **SG-06** | 2 | 2 | 1 | 2 | 16 | 0 | 2 | 0 | 76 | 72 | 26 | < 1 | 2 | 0 | 0 |
| **SO #64** | | | | | | | | | | | | | | | |
| **SG-07** | 0 | 3 | 0 | 3 | 60 | 0 | 3 | 0 | 68 | 60 | 32 | 4 | 4 | 0 | 0 |
| **SO #65** | | | | | | | | | | | | | | | |
| **SG-08** | 6 | 14 | 6 | 8 | 86 | 4 | 20 | 1 | 80 | 38 | 61 | 1 | < 1 | 0 | 0 |
| **SO #66** | | | | | | | | | | | | | | | |
| **SG-09** | 5 | 8 | 3 | 5 | 45 | 1 | 14 | 0 | 84 | 26 | 71 | 3 | 0 | 0 | < 1 |
| **SO #52** | | | | | | | | | | | | | | | |
| **SG-10** | 3 | 6 | 2 | 4 | 183 | 0 | 9 | 1 | 81 | 14 | 82 | < 1 | 5 | 0 | < 1 |
| **SO #55** | | | | | | | | | | | | | | | |
| **SG-11** | 0 | 9 | 1 | 8 | 134 | 2 | 13 | 0 | 75 | 66 | 27 | 4 | 3 | 0 | < 1 |
| **2018 Total** | **27** | **82** | **25** | **57** | **1,012** | **7** | **109** | **2** | **79** | **52** | **45** | **3** | **2** | **0** | **< 1** |

[1] Absent due to dormancy, death, or an unknown reason.

[2] Plants that did not grow an inflorescence and plants browsed such that the inflorescence was completely removed.

[3] Number of stems grazed/browsed such that the inflorescence was partially or fully removed.

A total of 82 Spalding's Catchfly plants were found on 11 transects with a range from 2 to 14 plants per transect (**Table 2**). Plants occurred as single- or multi-stemmed individuals and no rosettes were found. Flowering plants, which can be single- or multi-stemmed, accounted for 70% of the individuals observed (**Table 2**). The 57 flowering plants produced 1,012 flowers, but ranged from 1 to 141 flowers per plant (**Table 2**). Only 7 (12%) flowering plants exhibited insect herbivory on their flowers or fruits (**Table 2**). Of the 109 stems counted 2 stems on 2 transects were browsed or grazed by native ungulates and/or livestock (**Table 2**). Livestock grazing was observed and was most prevalent at elevations lower than the transects. Livestock grazing in or adjacent to the transects was qualitatively of low disturbance as evidenced by few grazed plants and old cow dung. Transect SG-2 showed the most sign of livestock disturbance and occurs at an elevation that is easily accessible by livestock. Disturbance by voles and pocket gophers were evident on all transects, particularly SG-1, 2, 5, 7, and 8. Disturbance included vole tunnels and pocket gopher diggings, but surprisingly uprooted Spalding's Catchfly plants were not found though some uprooted Lupine [*Lupinus* spp.] were seen.

On the 11 transects 27 plants found in 2017 did not appear in 2018. It is assumed these individuals were dormant, but a few were likely not distinguishable because their base was clipped by a small mammal or they could have naturally died. Sometimes the location where a plant emerges makes it difficult to discern if it is a new plant or not. A few of these borderline situations occurred and hopefully will be clarified by the 2019 plant occurrences.

### 3.2 Crosson Valley / Sullivan Hill

The Crosson Valley/Sullivan Hill area currently consists of 7 SOs (**Figure 3** in **Appendix B**). Although it was not a requirement of this project a cursory survey for Spalding's Catchfly plants was conducted at all SOs. A total of 463 plants were observed in the Crosson Valley/Sullivan Hill area in late July (**Table 3**).

**Table 3.** ***Number of Spalding's Catchfly plants observed in the Crosson Valley/Sullivan Hill Species Occurrences (SOs) in 2018.***

| SO NUMBER | ON MONITORING TRANSECT | CURSORY SURVEY OF SO | TOTAL |
|---|---|---|---|
| 9 | 20 | 158 | 178 |
| 10 | 14 | 13 | 27 |
| 11 | 2 | 40 | 42 |
| 12 | 3 | 10 | 13 |
| 13 | 29 | 107 | 136 |
| 14 | 6 | 60 | 66 |
| 74 | not applicable | 1 | 1 |
| | | **TOTAL** | **463** |

**Table 4.** ***Summary statistics on Spalding's Catchfly plants, habitat, and noxious weeds collected on monitoring plots from July 23-27, 2018 in the Crosson Valley/Sullivan Hill area.***

| SO / TRANSECT | TOTAL NUMBER ON TRANSECT FOR SPALDING'S CATCHFLY | | | | | | | | AVERAGE PERCENT COVER ON TRANSECT | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2017 Plants Absent[1] in 2018 | Plants Present in 2018 | Flowering Plants | Non-Flowering Plants[2] | Flowers | Plants w/ Flower Insect Herbivory | Stems | Grazed Stems[3] | Vascular Plants | Non-Vascular Species | Plant Litter | Bare Ground | Rock | Wood | Noxious Plant |
| **SO #9** | | | | | | | | | | | | | | | |
| **CV-01** | 1 | 18 | 8 | 4 | 32 | 2 | 16 | 9 | 82 | 14 | 84 | 1 | < 1 | 0 | < 1 |
| **CV-02** | 4 | 2 | 2 | 0 | 31 | 0 | 3 | 0 | 74 | 27 | 72 | 2 | < 1 | 0 | 0 |
| **SO #14** | | | | | | | | | | | | | | | |
| **CV-03** | 6 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 77 | 9 | 82 | 9 | < 1 | 0 | 0 |
| **CV-11** | 1 | 5 | 4 | 0 | 114 | 0 | 11 | 5 | 59 | 20 | 54 | 26 | < 1 | 0 | < 1 |
| **SO #10** | | | | | | | | | | | | | | | |
| **CV-04** | 2 | 7 | 5 | 2 | 42 | 0 | 8 | 2 | 74 | 5 | 65 | 28 | 1 | < 1 | < 1 |
| **CV-05** | 7 | 7 | 4 | 3 | 27 | 0 | 7 | 5 | 76 | 3 | 72 | 26 | < 1 | 0 | < 1 |
| **SO #11** | | | | | | | | | | | | | | | |
| **CV-06** | 1 | 2 | 2 | 0 | 3 | 0 | 3 | 1 | 78 | 21 | 70 | 9 | < 1 | 0 | 4 |
| **SO #13** | | | | | | | | | | | | | | | |
| **CV-07** | 0 | 12 | 9 | 3 | 313 | 6 | 21 | 3 | 77 | 50 | 37 | 13 | 1 | 0 | < 1 |
| **CV-08** | 1 | 8 | 4 | 4 | 87 | 1 | 18 | 5 | 73 | 53 | 41 | 5 | 1 | 0 | 0 |
| **CV-09** | 1 | 9 | 7 | 2 | 2 | 2 | 15 | 12 | 87 | 53 | 46 | 1 | < 1 | 0 | 0 |
| **SO #12** | | | | | | | | | | | | | | | |
| **CV-10** | 3 | 3 | 2 | 1 | 19 | 0 | 4 | 0 | 80 | 32 | 62 | 5 | < 1 | < 1 | 3 |
| **2018 Total** | **27** | **74** | **47** | **19** | **670** | **11** | **107** | **43** | **76** | **26** | **62** | **11** | **< 1** | < 1 | **1** |

[1] Absent due to dormancy, death, or unknown reason.
[2] Plants that did not grow an inflorescence and plants browsed/grazed such that the inflorescence was completely removed.
[3] Number of stems grazed/browsed such that the inflorescence was partially or fully removed.

In the Crosson Valley/Sullivan Hill area 11 transects were established within 6 SOs (**Figure 3** in **Appendix B**; **Photos 23** to **44** in **Appendix C**). Habitat was consistent among the transects and consisted of mesic grassland dominated by Rough Fescue. Vascular plant cover ranged from 25% to 90% per square meter, with an average cover ranging from 59% to 87% per transect (**Table 4**). Exotic plant cover ranged from 0% to 25% per square meter, with an average cover ranging from 0% to 4% per transect (**Table 4**). Non-vascular species cover ranged widely from 0% to 80% per square meter, with an average cover ranging from 3% to 53% per transect (**Table 4**). Plant litter varied widely from 2% to 100% per square meter, with an average cover ranging from 37% to 84% per transect (**Table 4**). Bare ground widely ranged from 0% to 91% per square meter, with an average cover ranging from 1% to 28% per transect (**Table 4**). Rock ranged from 0% to 20% per square meter, with an average cover of 1% or less per transect (**Table 4**). Wood ranged from 0% to 2% per square meter, with an average cover of less than 1% per transect (**Table 4**).

A total of 74 plants were found on the 11 transects and ranged from 1 to 18 plants per transect (**Table 4**). Plants occurred as single- or multi-stemmed individuals or as rosettes. Surprisingly two plants in the rosette stage were found in July. Plants emerge as rosettes in early spring and either later shrivel or develop into stemmed plants. It is assumed that the high snowpack made it possible for these rosette plants to retain themselves longer. Flowering plants accounted for 64% of the individuals observed (**Table 4**). The 47 flowering plants produced 670 flowers, ranging from 1 to 103 flowers per plant (**Table 4**). Insect herbivory of the flowers or fruits was found on 23% (11 plants) of the flowering plants (**Table 4**). Of the 107 stems counted 43 stems on 9 transects were grazed by livestock; it is possible that some were browsed by native ungulates (**Table 4**). Disturbance from livestock included grazing and hoofs uprooting plants, both of which were directly observed in SO-10. In contrast vegetation trampling and moderate ground disturbance observed in SO-13 and SO-14 in 2017 appeared partially restored by 2018. A leasee we met said cattle could graze the area containing SO-14 until October. Ground disturbance from vole tunnels and pocket gopher diggings were observed on most transects, but mostly appeared benign. In contrast many uprooted plants caused by voles were found on about 3 transects.

On the 11 transects 27 plants found in 2017 did not appear in 2018. It is assumed these individuals were dormant, but a few were likely not distinguishable because their base was clipped by a small mammal or they could have naturally died. Sometimes the location where a plant emerges makes it difficult to discern if it is a new plant or not. A few of these borderline situations occurred and hopefully will be clarified by the 2019 plant occurrences.

## 4.0 DISCUSSION

The CSKT land hosts one of the largest populations of Spalding's Catchfly in Montana (MTNHP 2010). The 3-year baseline monitoring will determine each transect's population size and be used to compare against future 3-year datasets over the minimum 20-year monitoring period. The comparison of 3-year datasets along intervals in the 20-year period will determine population trend (stable, declining, or increasing) at each transect and collectively (all 11

transects) at the Sullivan Gulch and at the Crosson Valley/Sullivan Hill proposed KCAs. In addition, the 3-year baseline will provide information on dormancy rates, flower productivity, qualitative damage from insect, small mammal, and ungulate (native and domestic) activities, and significant changes in habitat conditions at the transect level that can be extrapolated to the Sullivan Gulch and Crosson Valley/Sullivan Hill areas.

## 4.1 Population

The Recovery Plan requires that KCAs have at least 500 reproducing Spalding's Catchfly individuals growing in intact habitat. A cursory count of plants was made while conducting other monitoring tasks (accessing, setting-up, and monitoring). Since one's eye usually keys into the plant's inflorescence, almost all plants in the cursory counts were flowering. Upon close inspection, varying stages of development were found among plants, as well as within an inflorescence. Collectively, all stages from developing flower buds to flowering, capsule development to seed dispersal were observed. In 2018 plants were abundant, particularly in the Sullivan Gulch area. This was attributed to the high winter snowpack, but other influences are likely involved as well. Boundaries of four Sullivan Gulch SOs were expanded. This year all Sullivan Gulch SOs were visited, resulting in 2,289 counted plants (**Table 1**)! At the Crosson Valley/Sullivan Hill area plants were observed as plentiful, but the total 2018 count of 463 plants was less than found in 2017 (**Table 3**). The difference could reflect survey effort, disturbance, and unexplained reasons. Based on 2018 and past survey work both areas are still supporting intact, viable populations.

## 4.2 Disturbances

### 4.2.1 Native Wildlife

Disturbance was assessed at each monitoring transect. Plant and ground cover changes were found on all transects in both areas, but mostly accounted to a 10% or less change for any particular cover variable. In most places cover variables changed because climate affects plant growth and litter production and because small mammal populations are dynamic. Vole tunnels, pocket gopher diggings, and/or other small mammal activities were observed at each transect in both areas. At Crosson Valley/Sullivan Hill area one transect includes what might be an active fox den. Specifically, voles seemed to forage on Lupine and Spalding's Catchfly plants within and outside transects. A few clipped plants (by voles) were observed in the Sullivan Gulch area while many were found in the Crosson Valley/Sullivan Hill area.

Spalding's Catchfly is not noted as being highly palatable because of its viscid, glandular hairs. Occasionally at the Sullivan Gulch and Crosson Valley/Sullivan Hill SOs small areas of plants with browsed inflorescences would be found. Some patches of browsed plants are likely from native ungulates since fresh livestock sign was not also seen.

### 4.2.2 Livestock Grazing

Evidence of livestock use included visual sightings and the presence of hoof prints, grazed vegetation, cow patties, and trails. Livestock use the Sullivan Gulch and Crosson Valley/Sullivan Hill SOs, but it does not appear to be year-round. At the Sullivan Gulch area livestock use was not directly observed in July 2018, but their sign was prevalent at elevations

mostly below the transects and along the main access roads. The low grazing disturbance observed on all transects is likely because most transects are on a slope and not near to any water source. Some timing restrictions for livestock use occur in at least a portion of the Crosson Valley/Sullivan Hill SOs (personal communication from a lessee). At the Crosson Valley/Sullivan Hill area livestock (bulls) were observed in SO 10, and many Spalding's Catchfly plants had grazed inflorescences or were uprooted by hoof action. On the contrary, the livestock trail observed in 2017 in SO 13 had begun to re-vegetate and the number of grazed Spalding's Catchfly plants appeared less in 2018. The localized, but significant ground disturbance (compaction and biological soil crust busting) caused by livestock in 2017 on portions of Transects CV-11 and CV-4 were in 2018 re-vegetating in part because of the timing restriction. This is also reflected in the 2017 and 2018 habitat cover values recorded for those transects. In 2018 no evidence was observed that suggested harm at the population level for Spalding's Catchfly. It is likely that some level of disturbance from grazing or low-intensity fire will help to maintain or improve conditions for Spalding's Catchfly (Lesica 1999, MTNHP 2018). Surveys in 2011 and 2015 at the Niarada Hill area (SO 50) has found a very productive, large population in the context of an overgrazed grassland. It is thought that removing or reducing the canopy cover of bunchgrass litter may enhance germination and recruitment of Spalding's Catchfly plants (Lesica 1999). It is likely that the timing and type of ground disturbance influence the effects on these plants. Thus, grazing areas with Spalding's Catchfly plants after seed dispersal (October) is recommended.

#### 4.2.3 Insect Herbivory

Insects can alter plant reproduction and is being casually monitored on the 22 transects. Spalding's Catchfly plants are sticky and do collect a variety of insects on their stems and leaves. Other insects successfully burrow into developing seed capsules to feed on developing seeds. Insects can damage or prevent development of an entire inflorescence or just some of the flowers. For each plant where at least one seed capsule was damaged, insect herbivory was noted as present. In 2018 12% at Sullivan Gulch and 23% at Crosson Valley/Sullivan Hill areas of monitored flowering plants were found to have at least some insect herbivory. This was a slight increase from 2017 where 11% and 13% of flowering plants at Sullivan Gulch and Crosson Valley/Sullivan Hill, respectively, exhibited some insect herbivory. As far as the number of plants or the number of flowers damaged by insects, herbivory does not appear to be a problem for population viability.

### 4.3 Exotic Plants

Invasive exotic plants have the ability to displace native plants. De-listing criteria in the Recovery Plan requires that invasive exotics that have the potential to displace Spalding's Catchfly plants be controlled or eradicated within 100 meters (328 feet) of all populations within KCAs (USFWS 2007). According to the Recovery Plan or the Intermontane Valleys physiographic province, Meadow Hawkweed (*Hieracium pratense*), Spotted Knapweed (*Centaurea maculosa*), and Sulfur Cinquefoil (*Potentilla recta*) are listed as invasive exotics (USFWS 2007). The Recovery Plan states that integrated pest management should be used within 25 meters (82 feet) of Spalding's Catchfly for the following invasive exotics: Kentucky Bluegrass (*Poa pratensis*), Cheatgrass (*Bromus tectorum*), Canada Thistle (*Cirsium arvense*), and St. Johnswort (*Hypericum perforatum*) (USFWS 2007). Other invasive exotics that are

discovered should also be controlled or eliminated within 100 meters of Spalding's Catchfly plants (USFWS 2007).

Exotic plants occur in some Sullivan Gulch SOs and monitoring transects (**Table A-1** in **Appendix A**). State noxious weeds present in the Sullivan Gulch SOs include: Spotted Knapweed (*Centaurea stoebe*), Sulphur Cinquefoil (*Potentilla recta*), and Field Bindweed (*Convolvulus arvensis*). The State regulated exotic plant, Cheatgrass (*Bromus tectorum*) also occurs. In general, noxious and regulated exotics are found in the lower elevations of the SOs or on the hotter, drier southern aspects. These exotics are also patchy in their distribution; thus, much of the SO sites consist of native, intact grassland habitat. All roads leading up to the SOs do have a diversity and high density of noxious plants. On the Sullivan Gulch monitoring transects, Sulphur Cinquefoil, Field Bindweed, and Cheatgrass were found on 26 of the 330 plots (8%) which occurred on Transects 1, 2, 9, 10, and 11. Where present, total noxious cover ranged from less than 0.5% to 5.5% per square meter. On the monitoring transects average noxious cover did not change from 2017 to 2018 though species and abundance did shift some at the plot-level (**Table 2**). Within the SO sites most of the exotic plants are at stages of invasiveness that would be relatively easy to control given proper management techniques and timing.

Other exotic plants that occur in the Sullivan Gulch monitoring transects occur at low densities (**Table A-1** in **Appendix A**). These exotics include: Soft Brome (*Bromus hordeaceus*), Kentucky Bluegrass (*Poa pratensis*), Yellow Sweet-clover (*Melilotus officinalis*), Tall Tumble-mustard (*Sisymbrium altissimum*), and Meadow Goat's-beard (*Tragopogon dubius*). A relatively new species to the Sullivan Gulch area is Ventenata (*Ventenata dubia*). Ventenata was found at lower elevations in vicinity of the Sullivan Gulch area.

Exotic plants occur in some Crosson Valley/Sullivan Hill SOs and monitoring transects (**Table A-2** in **Appendix A**). State noxious weeds present in the Crosson Valley/Sullivan Hill SOs include: Spotted Knapweed (*Centaurea stoebe*) and Sulphur Cinquefoil (*Potentilla recta*). The State regulated exotic plant, Cheatgrass (*Bromus tectorum*) also occurs. Overall, noxious weeds are more noticeable in the SOs of the Crosson Valley/Sullivan Hill area. On the Crosson Valley/Sullivan Hill monitoring transects, Spotted Knapweed, Sulphur Cinquefoil, and Cheatgrass were found on 57 of the 330 plots (17%) which occurred on Transects 1, 4, 5, 6,7, 10, and 11. When present total noxious and regulated weed cover ranged from less than 0.5% to 25% per square meter. Sulphur Cinquefoil and Cheatgrass were more prevalent than Spotted Knapweed in most places. Portions of SO 10, 11, and 12 have the most frequency of noxious and regulated exotic plants. In comparison to the Sullivan Gulch area this represents twice the level of noxious weed presence. Despite the increased presence of noxious and regulated weeds in the Crosson Valley/Sullivan Hill SOs the average noxious cover on the monitoring transects did not change from 2017 to 2018 though species and abundance did shift some at the plot-level (Table 4). Within the SO sites most of the exotic plants are at stages of invasiveness that would be relatively easy to control given proper management techniques and timing.

Other exotic plants that occur in the Crosson Valley/Sullivan Hill monitoring transects occur at low densities (**Table A-2** in **Appendix A**). These exotics include: Crested Wheatgrass (*Agropyron cristatum*), Soft Brome (*Bromus hordeaceus*), Deptford Pink (*Dianthus armeria*),

Bulbous Bluegrass (*Poa bulbosa*), Kentucky Bluegrass (*Poa pratensis*), Yellow Sweet-clover (*Melilotus officinalis*), and Meadow Goat's-bear (*Tragopogon dubius*). Ventenata was not found in the Crosson Valley/Sullivan Hill area.

De-listing criteria in the Recovery Plan recommends conducting prescribed burning to mimic the historical fire regimes specific to the physiographic region (USFWS 2007). However, the plan cautions that burns should not include more than 30% of the individuals in a population or be done in areas that could exacerbate invasive exotic plants, and that additional plant monitoring should be enacted prior to and following the prescribed burn (USFWS 2007).

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# Appendix A

*Vascular Plant Checklists for* Silene spaldingii *Monitoring Transects*

**Table A-1.** ***Vascular plants identified in 2015, 2017, and/or 2018 on transects in the Sullivan Gulch area. Nomenclature within parenthesis indicates an uncertainty in identification.***

| SPECIES | TRANSECTS | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **SG-01** | **SG-02** | **SG-03** | **SG-04** | **SG-05** | **SG-06** | **SG-07** | **SG-08** | **SG-09** | **SG-10** | **SG-11** |
| *Achillea millefolium* | X | | X | X | X | X | X | X | X | X | X |
| *Agoseris glauca* | | | | X | | | X | | X | | |
| *Agropyron spicatum* | | | X | X | | X | X | X | X | | X |
| *Antennaria* spp. | X | | X | X | X | X | X | X | X | X | X |
| *Apocynum androsaemifolium* | | | | | | | | X | | | |
| *Balsamorhiza sagittata* | | | | | | | | | | X | X |
| *Besseya rubra* | X | | X | X | X | X | | X | X | | |
| Brassicaceae Family | | | | | | X | | | X | | |
| *Bromus tectorum* | X | | X | X | | | | | | | X |
| *Bromus hordeaceus* | | | | X | | | | | | X | X |
| *Calochortus* spp. | X | | | X | | X | X | | | X | X |
| *Campanula rotundifolia* | | | | | | X | | | X | | |
| *Carex praticola* | | | X | X | | X | | | | | |
| *Castilleja* spp. | X | | X | X | | | X | X | | | X |
| *Cerastrium* spp. | X | | X | X | | X | | | X | X | |
| *Chrysothamnus viscidiflorus* | | | | X | X | | | | | | |
| *Cirsium undulatum* | X | | | | | | | | | | |
| *Collinsia parviflora* | | | | X | | | | | | | |
| *Convolvulus arvensis* | X | X | | | | | | | | | |
| *Crepis* (*acuminata*) | X | | | | | | | | | X | |
| *Danthonia* spp. | | | | | X | | | | | | |
| *Dianthus armeria* | X | | X | X | | | X | X | X | X | |
| *Drymocallis arguta* | X | | X | X | X | X | | X? | X | | |
| *Epilobium* spp. | | | | X | | | | | | X | |
| *Ericameria nauseosa* | X | | X | | | | | | | | |
| *Eriogonum* spp. | | | | | | | | | | | |
| *Eriogonum heracleoides* | X | | X | X | X | X | | | X | X | |
| Fabaceae Family | | | | | | | | | | | X? |
| *Festuca campestris* | X | X | X | X | X | X | X | X | X | X | X |
| *Festuca idahoensis* | X | | X | X | X | X | X | X | X | X | X |
| *Gaillardia aristata* | | | X | X | | X | | | | | X |
| *Gaura coccinea* | | | | X | | | | | | | |
| *Geranium viscosissinum* | | | X | X | | | | | | | |
| *Geum triflorum* | X | | X | X | X | X | | X | X | X | X |
| *Heterotheca villosa* | | | | | | | | | | | |
| *Heuchera* (*cylindrica*) | X | | | | X | X | | | | X | |
| *Hieracium scouleri* | X | | X | X | | X | X | X | X | X | X |
| *Koeleria macrantha* | X | | X | | | X | | | | | |
| *Lithospermum ruderale* | X | | X | X | X | X | X | X | X | X | X |
| *Lomatium* spp. | | | X | X | X | X | X | X | X | | |
| *Lomatium macrocarpum* | | | | | | | | | | | |
| *Lomatium triternatum* | | | | | | X | | | | X | |
| *Lupinus sericeus* | X | | X | X | | X | X | X | X | X | X |
| *Melilotus officinalis* | | | | | | | | | | | |
| *Monarda fistulosa* | X | | X | | | | | | | | |
| *Orthocarpus tenuifolius* | X | | X | X | X | X | X | X | X | X | X |

**Table A-1 (continued).** ***Vascular plants identified in 2015, 2017, and/or 2018 on transects in the Sullivan Gulch area. Nomenclature within parenthesis indicates an uncertainty in identification.***

| SPECIES | TRANSECTS | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | SG-01 | SG-02 | SG-03 | SG-04 | SG-05 | SG-06 | SG-07 | SG-08 | SG-09 | SG-10 | SG-11 |
| *Penstemon* spp. | X | | X | X | X | X | | X | X | X | X |
| *Pinus ponderosa* | X | | X | | | | | | | | |
| *Poa pratensis* | | | X | | | | | | | | |
| *Potentilla gracilis* | X | | X | X | | | | | X | | |
| *Potentilla recta* | X | | | X | | | | | X | | X |
| *Purshia tridentata* | | | | | | | | | | | |
| *Rosa acicularis* | | | X | | | | | | | X | X |
| *Silene spaldingii* | X | X | X | X | X | X | X | X | X | X | X |
| *Sisymbrium altissimum* | | | | | | | | | X | | |
| *Solidago* spp. | | | X | X | | | | | X | | |
| *Spiranthes romanzoffiana* | X | | | | | | | | | | |
| *Stipa viridula* | | | X | X | | | | | X | | |
| *Stipa comata* | | X | | | | | | | | | |
| *Tragopogon dubius* | | | | | | | | | | | |

**Table A-2.** ***Vascular plants identified in 2015, 2017, and/or 2018 that occur on transects in the Crosson Valley / Sullivan Hill area. Nomenclature within parenthesis indicates an uncertainty in identification.***

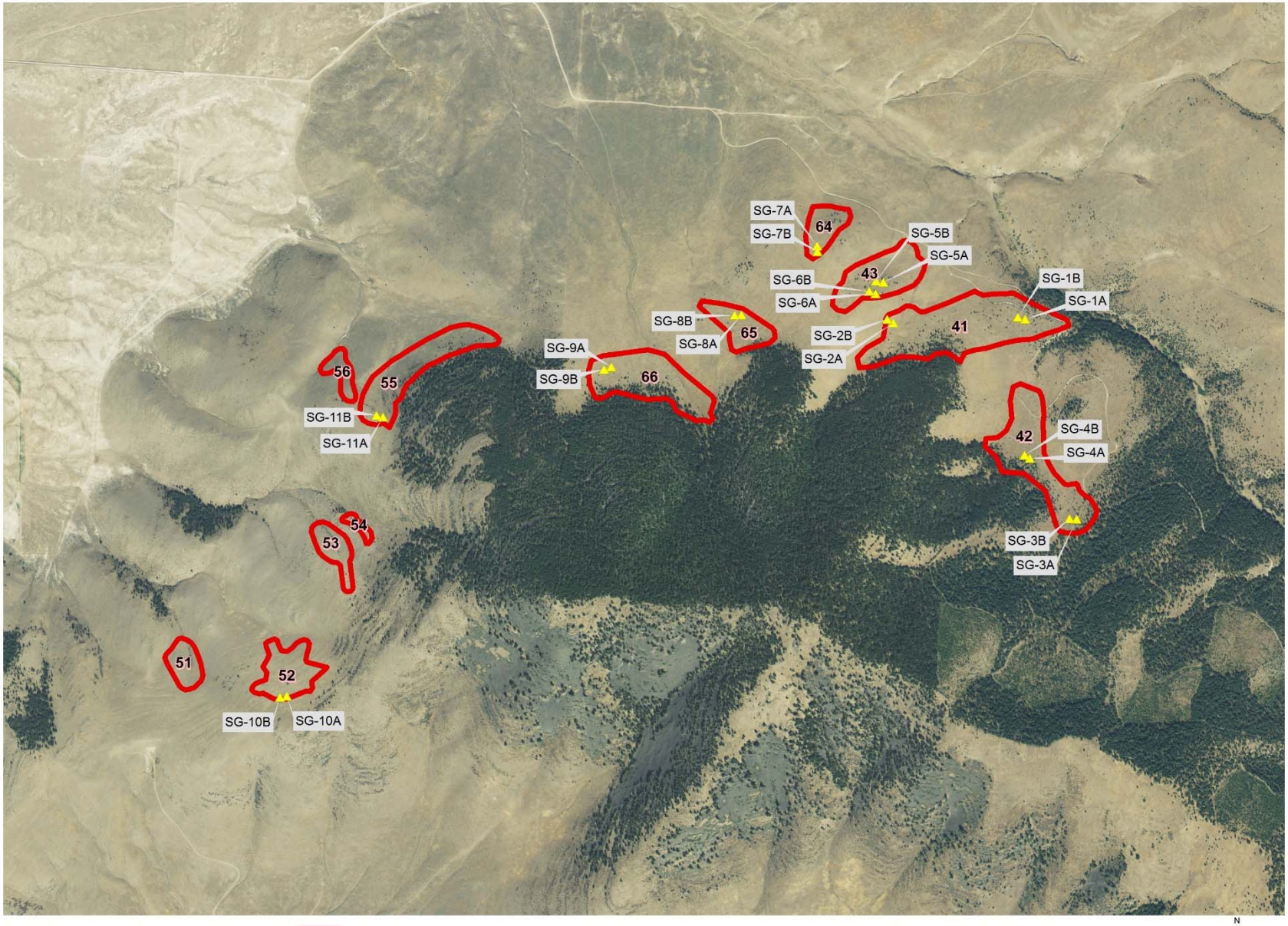
| SPECIES | TRANSECTS | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | CV-01 | CV-02 | CV-03 | CV-04 | CV-05 | CV-06 | CV-07 | CV-08 | CV-09 | CV-10 | CV-11 |
| *Achillea millefolium* | X | X | X | X | X | X | X | X | X | X | X |
| *Agropyron cristatum* | | | | | | X | | | | | |
| *Agropyron spicatum* | | | | X | | | X | X | X | | |
| *Antennaria* spp. | X | | X | X | X | | X | X | X | | X |
| Apiaceae Family | X | | | | | | | X | | X | |
| *Besseya rubra* | | | | | | | | | | | |
| Brassicaceae Family | | X | | | | X | | | | X | X |
| *Bromus hordeaceus* | | | | X | X | X | | | | | |
| *Bromus tectorum* | | | | | | X | | | | | X |
| *Calochortus* spp. | | | X | | X | | X | X | X | X | X |
| *Carex praticola* | | X | X | | | X | | | | | |
| *Castilleja* spp. | | | | | | | X | | X | | |
| *Centaurea stoebe* | | | | X | | X | | | | X | |
| *Cerastrium* spp. | | | | | | | | | | | |
| *Cirsium undulatum* | | | | | | | | | | | |
| *Danthonia* spp. | | | | | | | | | | | |
| *Dianthus armeria* | | | | | | | | | X | | |
| *Drymocallis arguta* | X | | X | X | X | X | X | X | | X | |
| *Ericameria nauseosa* | | | | | | | | | | | |
| *Eriogonum* spp. | | X | | | | | | | | | |
| *Eriogonum heracleoides* | X | X | X | X | | X | X | X | X | X | X |
| Fabaceae Family | | | | | | | | | | | |
| *Festuca campestris* | X | X | X | X | X | X | X | X | X | X | X |
| *Festuca idahoensis* | X | X | X | X | X | X | X | X | X | X | X |

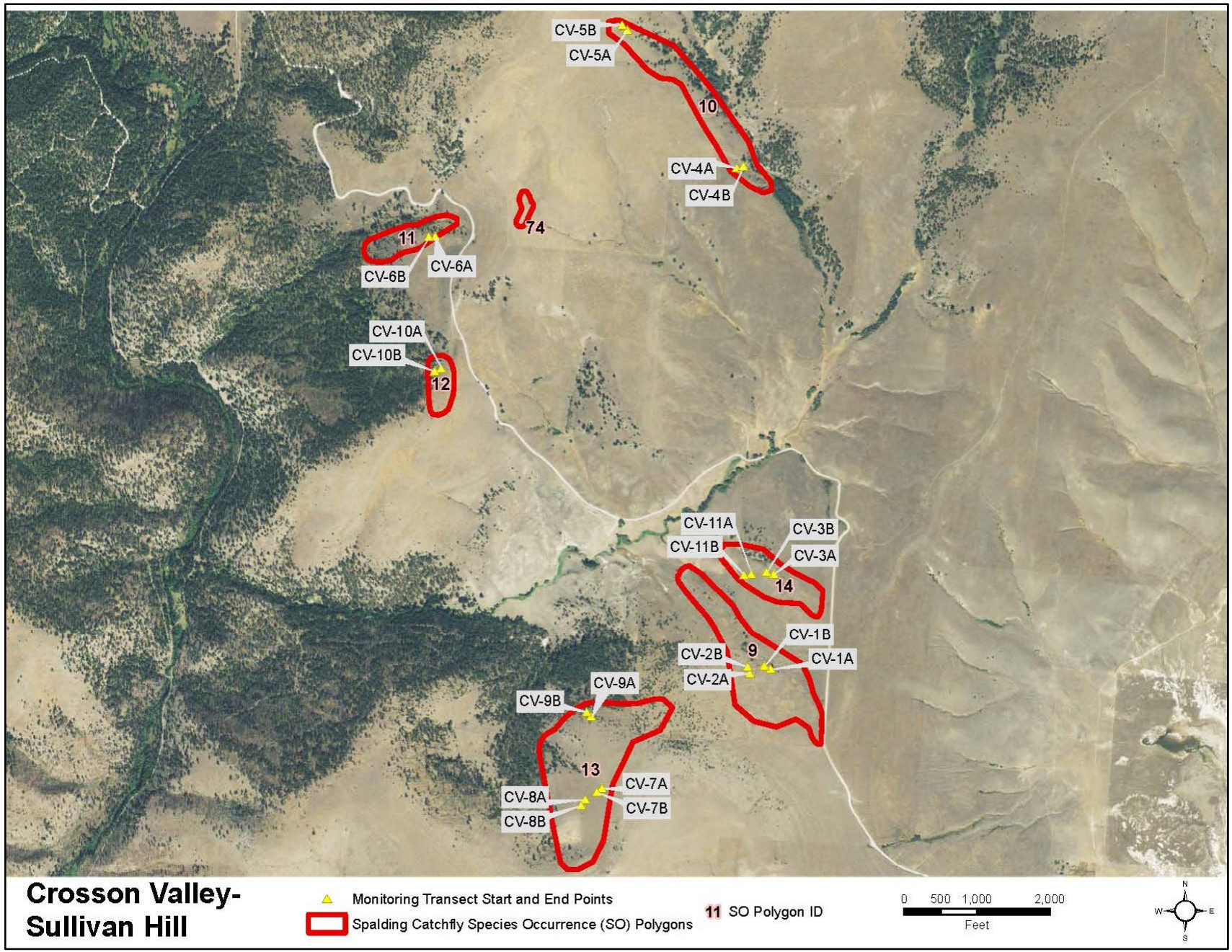
**Table A-2 (continued).** ***Vascular plants identified in 2015, 2017, and/or 2018 that occur on transects in the Crosson Valley / Sullivan Hill area. Nomenclature within parenthesis indicates an uncertainty in identification.***

| SPECIES | TRANSECTS | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **CV-01** | **CV-02** | **CV-03** | **CV-04** | **CV-05** | **CV-06** | **CV-07** | **CV-08** | **CV-09** | **CV-10** | **CV-11** |
| *Gaillardia aristata* | X | X | | X | | X | | | | | |
| *Geranium viscosissinum* | | X | | X | X | | | | | X | |
| *Geum triflorum* | X | X | | | X | X | | | X | X | |
| *Heterotheca villosa* | | | | | | | | | | | |
| *Heuchera* (*cylindrica*) | | | | | | | | | | | |
| *Hieracium scouleri* | X | | | | | | | | X | | |
| *Koeleria macrantha* | | | X | | | X | | | | | |
| *Lithospermum ruderale* | X | X | X | | X | | X | X | X | X | X |
| *Lomatium* spp. | | | | | | | | | | | |
| *Lomatium macrocarpum* | | | X | X | | | | | | X | X |
| *Lomatium triternatum* | | | | | | | X | X | | X | X |
| *Lupinus sericeus* | X | X | X | X | X | X | X | X | X | | X |
| *Melilotus officinalis* | | | | | | | | | | | |
| *Monarda fistulosa* | | | | | | | | | | | |
| *Orthocarpus tenuifolius* | X | | | X | X | | X | X | X | X | X |
| *Penstemon* spp. | X | X | | X | | X | X | | | X | X |
| *Pinus ponderosa* | | | | | | | | | X | X | |
| *Poa bulbosa* | | | | | | X | | | | | |
| *Poa pratensis* | | | | | | | | | | | |
| *Potentilla gracilis* | | X | | X | X | X | | | X | | |
| *Potentilla recta* | X | | | X | X | X | X | | | X | |
| *Pseudotsuga menziesii* | | | | | X | | | | | | |
| *Ribes* spp. | | | | | | | | | | X | |
| *Rosa acicularis* | | X | | X | | | | | | | |
| *Silene spaldingii* | X | X | X | X | X | X | X | X | X | X | X |
| *Solidago* (*canadensis*) | | | | | | | | | | | |
| *Stipa viridula* | | X | | X | | | | | | | |
| *Tragopogon dubius* | | X | | X | | | | | | X | X |

# Appendix B

*Sullivan Gulch and Crosson Valley/Sullivan Hill Area Maps*


SG-7A
SG-7B
64
SG-5B
SG-5A
43
SG-6B
SG-6A
SG-1B
SG-1A
41
SG-8B
SG-8A
65
SG-2B
SG-2A
SG-9A
SG-9B
66
56
55
SG-11B
SG-11A
42
SG-4B
SG-4A
54
53
SG-3B
SG-3A
51
52
SG-10B
SG-10A
Sullivan Gulch
Spalding Catchfly Species Occurrence (SO) Polygons
55 SO Polygon ID
Monitoring Transect Start and End Points
0 650 1,300 2,600
Feet
N
W
E
S


CV-5B
CV-5A
10
CV-4A
CV-4B
74
11
CV-6B
CV-6A
CV-10A
CV-10B
12
CV-11A
CV-11B
CV-3B
CV-3A
14
CV-1B
CV-2B
9
CV-1A
CV-2A
CV-9A
CV-9B
13
CV-7A
CV-8A
CV-7B
CV-8B
Crosson Valley-
Sullivan Hill
Monitoring Transect Start and End Points
Spalding Catchfly Species Occurrence (SO) Polygons
11 SO Polygon ID
0 500 1,000 2,000
Feet
N
W
E
S

# Appendix C

*Sullivan Gulch and Crosson Valley/Sullivan Hill Transect Photographs*

## SPALDING'S CATCHFLY BASELINE MONITORING, SULLIVAN GULCH – 2018 PHOTOGRAPHS

**Photo 1:** View is west from Stake A on Transect SG-1 (SO-41).

**Photo 2:** View is east from Stake B on Transect SG-1 (SO-41).

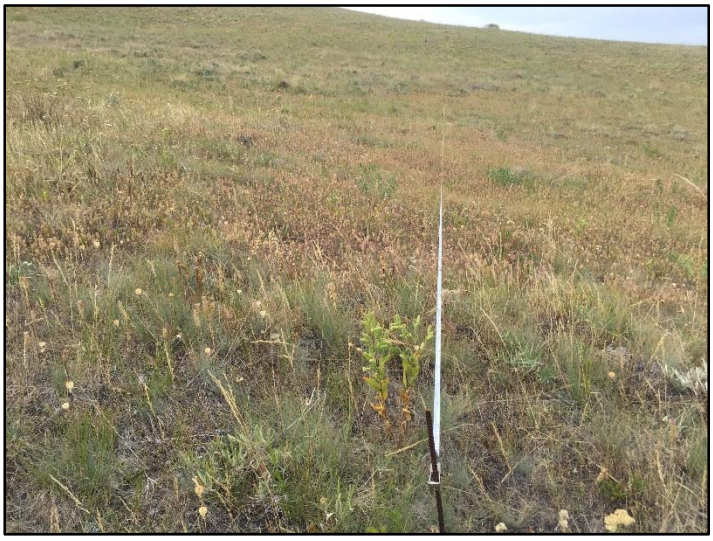


**Photo 3:** View is northwesterly from Stake A on SG-2 (SO-41).

**Photo 4:** View is southeasterly from Stake B on SG-2 (SO-41).

**Photo 5:** View is west northwest from Stake A on SG-3 (SO-42).

**Photo 6:** View is east southeast from Stake B on SG-3 (SO-42).

**Photo 7:** View is northwest from Stake A on Transect SG-4 (SO-42).

**Photo 8:** View is northeast from Stake B on Transect SG-4 (SO-42).

**Photo 9:** View is west from Stake A on Transect SG-5 (SO-43).

**Photo 10:** View is east from Stake B on SG-5 (SO-43).

**Photo 11:** View is west from Stake A on Transect SG-6 (SO-43).

**Photo 12:** View is east from Stake B on Transect SG-6 (SO-43).

**Photo 13:** View is south southeast from Stake A on Transect SG-7 (SO-64).

**Photo 14:** View is north northwest from Stake B on Transect SG-7 (SO-64).

**Photo 15:** View is west from Stake A on Transect SG-8 (SO-65).

**Photo 16:** View is east from Stake B on Transect SG-8 (SO-65).

**Photo 17:** View is southwest from Stake A on Transect SG-9 (SO-66).

**Photo 18:** View is northeast from Stake B on Transect SG-9 (SO 66).

**Photo 19:** View is westerly from Stake A on Transect SG-10 (SO-52).

**Photo 20:** View is easterly from Stake B on Transect SG-10 (SO-52).

**Photo 21:** View is westerly from Stake A on Transect SG-11 (SO-55).

**Photo 22:** View is easterly from Stake B on Transect SG-11 (SO-55).

**Photo 23:** View is west from Stake A on Transect CV-1 (SO-9). **Photo 24:** View is easterly from Stake B on Transect CV-1 (SO-9).

**Photo 25:** View is northwest from Stake A on Transect CV-2 (SO-9).

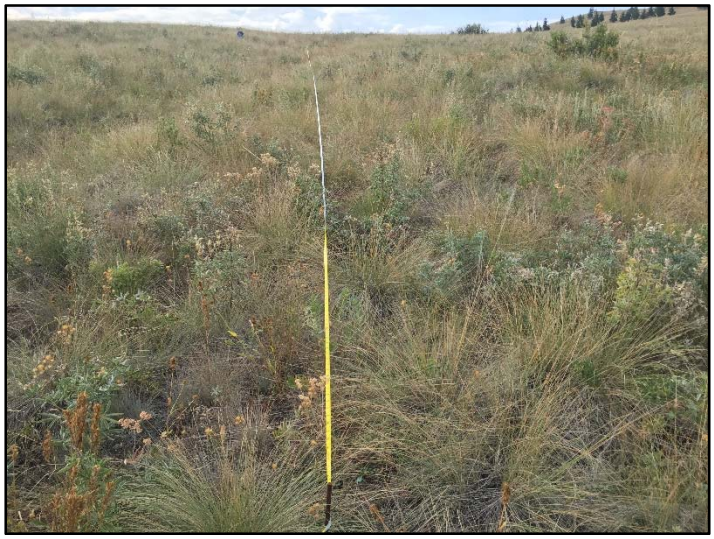


**Photo 26:** View is southeast from Stake B on Transect CV-2 (SO-9).

**Photo 27:** View is west northwest from Stake A on Transect CV-3 (SO-14).

**Photo 28:** View is east southeast from Stake A on Transect CV-3 (SO-14).

**Photo 29:** View is east northeast from Stake A on Transect CV-4 (SO-10).

**Photo 30:** View is west southwest from Stake B on Transect CV-4 (SO-10).

**Photo 31:** View is northwest from Stake A on Transect CV-5 (SO-10).

**Photo 32:** View is southeast from Stake B on Transect CV-5 (SO-10).

**Photo 33:** View is westerly from Stake A on Transect CV-6 (SO-11).

**Photo 34:** View is westerly from Stake B on Transect CV-6 (SO-11).

**Photo 35:** View is southwest from Stake A on Transect CV-7 (SO-13).

**Photo 36:** View is northeast from Stake B on Transect CV-7 (SO-13).

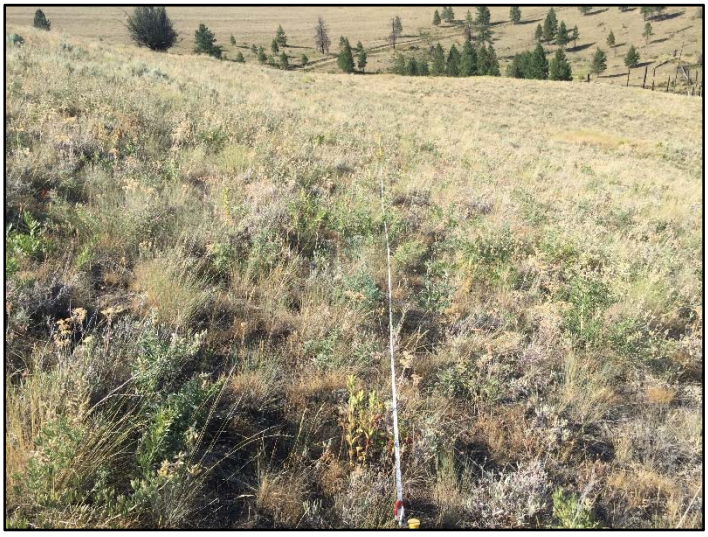


**Photo 37:** View is south southwest from Stake A on Transect CV-8 (SO-13).

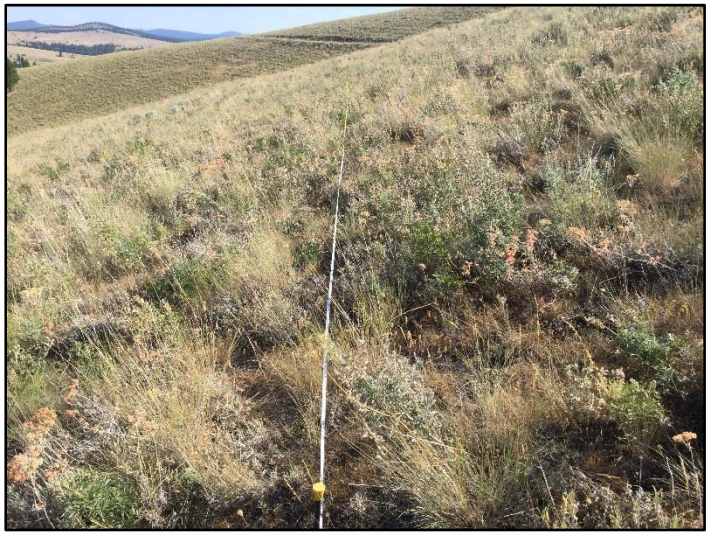


**Photo 38:** View is north northeast from Stake B on Transect CV-8 (SO-13).

**Photo 39:** View is northwest from Stake A on Transect CV-9 (SO-13).

**Photo 40:** View is southeast from Stake B on Transect CV-9 (SO-13).

**Photo 41:** View is west southwest from Stake A on Transect CV-10 (SO-12).

**Photo 42:** View is east northeast from Stake B on Transect CV-10 (SO-12).

**Photo 43:** View is west southwest from Stake A on Transect CV-11 (SO-14).

**Photo 44:** View is east northeast from Stake B on Transect CV-11 (SO-14).