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February 9, 2022

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RE: Final Butte Priority Soils Operable Unit (BPSOU) Butte Reclamation Evaluations System (BRES) Field Manual - 2022

Agency Representatives:

I'm writing to you on behalf of Atlantic Richfield Company and Butte-Silver Bow to submit the Final Butte Priority Soils Operable Unit (BPSOU) Butte Reclamation Evaluations System (BRES) Field Manual – 2022. The report and appendices may be downloaded at the following link:

https://pioneertechnicalservices.sharepoint.com/:f/s/submitted/Ej9GlvLbgVZHqI7gpBxBAbL0BO-416Sa70798RmH_r07a-w.

If you have any questions or comments, please call me at (907) 355-3914.

Sincerely,



Mike Mc Anulty
Liability Manager
Remediation Management Services Company
An affiliate of **Atlantic Richfield Company**



Eric Hassler, Director
Department of Reclamation
and Environmental Services
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**SILVER BOW CREEK/BUTTE AREA NPL SITE
BUTTE PRIORITY SOILS OPERABLE UNIT**

*Butte Reclamation Evaluation System
Field Manual*

Atlantic Richfield Company

January 2022



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January 14, 2022

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Re: Approval Letter for the Revised Draft Final Butte Priority Soils Operable Unit (BPSOU) Revised Butte Reclamation Evaluation System (BRES) Field Manual (dated July 2021)

Dear Mike and Eric:

The U. S. Environmental Protection Agency (EPA), in consultation with the Montana Department of Environmental Quality (DEQ), is approving the Revised Butte Priority Soils Operable Unit (BPSOU) *Butte Reclamation Evaluation System (BRES) Field Manual* (dated July 2021) with the comment below. Please re-date the cover page of the manual and distribute as final. The version of this document may be used for the 2022 field season with the next annual review of the manual to be conducted in October 2022.

- As mentioned in EPA's January 2, 2022 comment letter on for the Revised Draft Final Reclaimed Areas Maintenance and Monitoring Plan (dated October 8, 2021), greater detail is needed to include all aspects of polygon delineation with respect to Section 4 of Appendix E of the BPSOU ROD 2006. While the BRES manual does discuss in greater detail, at a minimum a reference to the BRES manual, reference to an SOP for polygon delineation, and details of the importance of polygon delineation into more internally homogeneous units is requested within this plan. EPA continues to be concerned that the polygon approach is not being used as intended, thus reducing the consistency and reproducibility of the field evaluations. However, it is EPA's understanding that the forthcoming Reclaimed Areas Boundary Adjustment Report may in fact provide sites (polygons) with a more homogeneous delineation. If that is the case, then we do not have concerns about the use of delineating sites (polygons).

If you have any questions or concerns, please call me at (406) 457-5019.

Sincerely,

**NIKIA
GREENE**

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**SILVER BOW CREEK/BUTTE AREA NPL SITE
BUTTE PRIORITY SOILS OPERABLE UNIT**

***Butte Reclamation Evaluation System
Field Manual***

Prepared for:

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January 2022

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1.0 INTRODUCTION

The Butte Reclamation Evaluation System (BRES) is a component of the Butte Priority Soils Operable Unit (BPSOU) Solid Media Management Program (SMMP). The SMMP provides contextual information on the remedial work performed in BPSOU and how it will be monitored and maintained in accordance with the Record of Decision Amendment for BPSOU (EPA, 2020a). The BRES was specifically designed for sites where the response action left mine waste in place; the BRES is an appendix to U.S. Environmental Protection Agency (EPA) Record of Decision (ROD) (EPA, 2006). At these sites, vegetated and engineered cap integrity is critical to ensuring waste does not become exposed. The BRES is a site-specific tool to evaluate the stability, integrity, and degree of human and environmental protectiveness afforded by EPA-sanctioned response actions or other past reclamation actions initiated on lands impacted by historical mining within the BPSOU. The information obtained from the evaluations is used to develop corrective action work plans, if necessary, to verify that completed response actions both past and future are effective, well maintained, meeting established performance standards, and protective of human health and the environment.

Land reclamation has been and will continue to be a vital component of the BPSOU cleanup and include caps over waste areas or contaminated areas to mitigate waste migration and impacts to human health and the environment. This field manual summarizes the BRES methodology and is provided to the field evaluators as a training guide and to assist them with the field evaluation process. This field manual describes the performance standards, evaluation methodology, and evaluation criteria used to determine if remediated areas (sites) are protective.

Supplemental information vital to performance of field evaluations is provided in appendices listed below.

- Appendix A User Guides
 - Appendix A.1 - Butte-Silver Bow (BSB) Product Documentation and User Guide for BRES
 - Appendix A.2 - Quick Reference Guide to Assist Field Personnel Performing Assessments
- Appendix B - Required Reports
 - Appendix B.1 Summary and Technical Recommendations Report
 - Appendix B.2 Corrective Action Plan (CAP)
 - Appendix B.3 Annual Maintenance Report
- Appendix C - Desired and Undesired Plant Species List
- Appendix D - Erosion Condition Class Determination Guideline

1.1 Reclamation Description

Remedial action performed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) response actions includes stormwater controls, waste removals, and capping mine waste or contamination left in place. Source areas requiring reclamation were typically graded to match surrounding topography, accommodate soil placement, route stormwater, and establish vegetation. Vegetative caps were established in many areas, while

some sites required the placement or development of an engineered cap. The various types of remedial caps are further described below.

1.2 Upland Vegetation Caps

The vegetation growing in cover soil overlying waste left in place serves several purposes critical to the stability and permanence of the protective cap. If the cover soil comprising the cap erodes to a point where waste material is exposed, contaminants may be transported off the site by water or wind and may come into contact with human or environmental receptors. A vegetative cap prevents this through placement of cover soil and establishing vegetation described in the Butte Hill Revegetation Specifications (BHRS), which is included in the BPSOU Reclaimed Areas Maintenance and Monitoring (M&M) Plan in Accordance with BRES (Atlantic Richfield, 2018a), referred to herein as the Reclaimed Areas M&M Plan. Cover soil ensures contaminated soil is not exposed to human or environmental receptors and provides an environment suitable for vegetation to be established. Plants and vegetation stabilize the soil and minimize waste transportation from the site by wind or infiltration of surface water to the waste material beneath the cap surface through the following:

- Minimizing water and/or wind erosion.
- Foliage provides a greater surface area than bare ground for rainwater evaporation.
- Plants transpire soil water during carbon assimilation.

Standing or fallen dead plant material can reduce wind and water erosion and provide an evaporative surface for stormwater. Plants and dead plant material act in several ways to minimize surface water percolation and the transport of contaminants off the site. However, excessive plant litter accumulation can retard/slow evaporation and thereby enhance infiltration. Therefore, erosional stability, as determined in part by vegetation cover, is critical to a determination of the functionality and permanence of a response action at the BPSOU.

Specific characteristics of a site help identify both localized and polygon-specific cap integrity or stability problems. Evaluation parameters are discussed further in Section 4.0 and Section 5.0.

1.3 Engineered Cap

Engineered caps are constructed using standard engineering materials including riprap, rock covers, concrete, shotcrete, asphalt, and gravel. Engineered caps are used in defined areas such as parking lots or trails. Because engineered caps function as a barrier in areas where the public has access, it is critical that they remain protective and functional. An electronic checklist for engineered cap integrity has been developed for use by the field evaluators and will be used during site evaluations when engineered caps are present (an example form is in Appendix D). The field evaluator enters information into the electronic checklist where it is then uploaded into the BRES database.

1.4 Residential Yards and Playgrounds

As stated in Section 3.5.3 of the ROD (EPA, 2006), the BRES evaluation does not include evaluation of residential yards or playgrounds/play areas. Response actions on these areas are covered in the BSB Residential Metals Abatement Program (RMAP) or protocols described in the 2020 RODA (EPA, 2020a) and the Institutional Controls Implementation and Assurance Plan (ICIAP) (BSB/Atlantic Richfield, 2019).

1.5 Riparian Area Evaluation

The BRES (EPA, 2006) does not include the evaluation of riparian areas; these exist along Silver Bow Creek and Blacktail Creek within the BPSOU. Only response actions completed in the upland areas of the BPSOU are included in the BRES. A riparian area evaluation form is being developed that follows the remediation of riparian zones. Operation, maintenance, and monitoring documents will be developed and submitted for riparian areas in accordance with Appendix D to EPA BPSOU Consent Decree (EPA, 2020b) and EPA-provided remedial design and remedial action guidance document (EPA, 1995).

1.6 Site Boundaries

All reclaimed upland areas in the BPSOU require BRES evaluations. Additional sites may be added as sites are identified and reclamation is performed. Each site's boundary is based on the footprint of reclamation completed. Boundaries are present for both engineered and vegetation caps. Within that boundary, various land conditions exist including slopes, angles, and aspects and land types or engineered caps such as lawns, parking lots, driveways, concrete shaft caps or enclosures, open space, or native planting areas tree pods.

2.0 GOALS AND OBJECTIVES

The BRES is a formal evaluation process to assess the integrity of reclaimed land, soil cover caps, or other forms of engineered caps covering mine waste material left in place. The system uses defined evaluation procedures for measuring performance to direct long-term monitoring and corrective action. The process ensures the response actions and future remedial action remains protective of human health and the environment.

Implementing the process can quickly, consistently, and cost-effectively identify areas of current or potential reclamation failures and determine how to maintain the area to achieve the performance standards. Design of the BRES evaluation process allows the collection of precise (repeatable) information by individuals with experience in ecological and soil erosion assessment techniques. Field evaluators can collect information quickly and with a minimal amount of field equipment.

Field evaluations are performed annually after field evaluation personnel participate in a training and field calibration process to guide decision making in the field.

2.1 Goals

The goal of the BRES is to evaluate reclaimed sites and identify deficiencies to direct maintenance and ensure reclamation remains protective of human health and the environment. Maintenance objectives and associated procedures are defined in the Reclaimed Areas M&M Plan associated with the SMMP.

2.2 Reclamation Performance

The performance standards for vegetation caps within BPSOU are described as the following:

- Greater than 40% adjusted live cover.
- A score of 55 or less based on the Erosion Condition Class Determination guidelines (refer to Section 2.10).
- Site edges bearing no distinct dissimilarity to the interior of the site.
- No exposed waste material including mine tailings, waste rock, or soil contaminated by metals, arsenic, or acidic material.
- Minimal evidence of soil movement or instability.
- No more than 75 square feet of barren ground on any one site.
- Minimal evidence of rills, gullies, or active water-related erosion.

The performance standards for engineered caps within BPSOU are described as the following:

- Integrity of surface cover (void of cracks, deterioration).
- Limited displacement of cover material such as rock, asphalt, or concrete or exposure of liner material.
- Limited evidence of surface staining.
- Limited evidence of cover movement such as rilling, slope instability, or vehicle-induced damage.

2.3 Evaluation Objectives

The evaluations observe vegetation, erosion, and general land conditions. Attainment of the performance standards is determined by observance of specific parameters defined below.

2.4 Ground Cover

Ground cover estimates are used in the BRES as an indicator of the condition of upland vegetation caps. Ground cover includes observance of live cover including undesirable weedy species, noxious weeds, native lichen and moss, plant litter, and rocks. These parameters are further defined below.

The field evaluator should estimate and record all vegetation parameters, paying specific attention to percent live cover of desirable vegetation. Refer to the BRES plant guide in Appendix C. The percent live cover along with other ground cover values recorded on the field form should be considered when determining corrective action is required at the site.

2.5 Live Cover

Percent live vegetation cover of desirable species (Appendix C) is the most critical evaluation parameter and is used more extensively in the decision-making process. Percent live cover refers to the percentage of ground surface covered by the current season's plant growth. The number of undesirable weedy species and noxious weeds, which are defined in the sections below, is an important evaluation parameter to guide maintenance as it may contribute to maintenance issues in the future. Standing plant material from the current year (i.e., live, dead, or senescent) should be included in the estimate of percent live vegetation cover.

2.6 Litter

Litter is defined as the uppermost layer of organic debris composed of dead plant material from the previous years' growth or other slightly decomposed organic materials including straw mulch. Litter does not count toward the percent live cover estimate and is not a trigger item. It is recorded on the field form to assist in the decision-making process regarding potential corrective action at a site.

2.7 Undesirable Species

Undesirable species are plant species that are acceptable for BPSOU sites in small numbers but are considered undesirable in large numbers. Identified in the Native and Undesirable Plant Species report for the BPSOU list (Appendix C), undesirable species are plants with certain characteristics that could undermine the cap integrity or stability of the site. For example, undesirable species might be shallow rooted or have a short seasonal, annual, or biennial life cycle; characteristics that reduce the stability of a vegetation cap.

2.8 Noxious Weeds

Noxious weeds are defined as all plants on the state and county noxious weed lists (<http://mt-buttessilverbow2.civicplus.com/184/Weed-Control>). Noxious weeds are those regulated by law or those that are difficult to control. In general, noxious weeds are non-native plants that compete with desirable plants for nutrients, water, and/or space. Noxious weeds do not count towards the estimate of percent live vegetation cover, and do not serve as a trigger item. The percent cover by noxious weeds should be estimated in the field and recorded so that appropriate operation and maintenance (O&M) measures can be taken to reduce the weed infestation.

2.9 Rocks

During the calibration and validation period of the initial BRES (EPA, 2006), it was concluded that rocks less than two inches in size do not contribute to erosion protection, whereas rocks greater than two inches may provide some degree of erosion protection. For the reclaimed sites therefore, rocks are defined as any solid material greater than two inches on at least one side. Material smaller than two inches should be considered bare ground when estimating total ground

cover. On the field form, the field evaluator records the percent of the site covered by rocks so the information can be used when planning corrective action at the site.

2.10 Erosion

Erosion is a natural geological process in which earthen material can be transported by wind or precipitation from its initial placement. During site evaluations, the field evaluator must refer to the BRES Erosion Condition Class Determination Guideline (Appendix D.1) and then record scores for each erosion parameter on the field evaluation form. Erosion is evaluated individually on a case-by-case basis, not across an entire site.

2.11 Site Edges

Differences between site edges and the site interior are evaluated with several factors in mind that may be contributing to the differences:

- Cover soil may be thin around the site edges, which may cause stressed and sparse vegetation or lack of successful establishment of desirable vegetation due to a lack of adequate rooting depth for desirable plant species.
- Increased erosion at site edges due to run-on from a street, alley, stormwater ditch, sidewalk, and/or adjacent property. Site edges may also be steeper than most of the site, which may increase erosion due to runoff.
- Unfenced site edges that experience more traffic, especially when there is no adjacent sidewalk. This foot or bike traffic reduces the ability of the vegetation to persist.
- Rock layers around the edges of a site.

Whether a difference between a site edge and the site interior is significant enough to note on the field form will rely, to some degree, on the evaluator's professional judgment. To guide the evaluator's interpretation of the potential differences in the site edge, check box categories are listed on the field form such as presence of lime rock barriers, increased weeds, increased erosion, gullies, depositional areas, steep slopes, and less vegetation.

The items listed serve as a guide to identify differences between the edges and interior of a site. If differences are identified at a site and the check boxes on the form have not accounted for these differences, the evaluator should note the differences on the field form. In addition to check boxes, the field form has a space for the evaluator to estimate the size width of the affected area. The evaluator should also capture the site edge using the tracking capabilities of the field device to outline the affected area (refer to Section 4.2). The site edge will then be recorded for future analysis during subsequent BRES evaluation cycles to determine if the site edge condition is improving or declining.

2.12 Exposed Waste Material

Exposed waste material includes mine tailings and waste rock, as well as any soil that has been impacted from historic mining operations in the BPSOU. The existence of exposed waste

material at a site is considered a trigger item and should be recorded in the field by tracking the area of waste with the field device (refer to Section 4.2).

2.13 Bulk Soil Failure or Mass Instability

Bulk soil movement or mass instability indicates a current or potential for underlying waste material to become exposed. If these situations are identified at a site, the evaluator should record the area location using the field device. The field form also has a check box for the existence of subsidence at a site, even though subsidence is the responsibility of the landowner and is not a CERCLA issue. Field evaluators will record evidence of subsidence in the field and the Department of Reclamation and Environmental Services Environment and O&M Division Manager (O&M Manager) must notify the Atlantic Richfield Company (Atlantic Richfield) Project Manager and Agency personnel.

2.14 Barren Areas

Barren areas are areas devoid of vegetative cover or are made up of rocks less than 2 inches in diameter. These areas can lead to increased erosion. Barren areas may be considered trigger items if they are:

- greater than 75 square feet in total area; and
- have no more than 10% total plant cover (live cover plus litter) on the area.

Barren areas do not include native rock outcrops or areas of cryptogammic crust, mosses, or lichens. If the barren area meets the above conditions, the field evaluator should record the number of barren areas, whether the barren areas cover greater than 25% of the site, and the precise location of the barren area(s). Barren areas are to be included in the erosion evaluation and when estimating live plant cover.

2.15 Gullies

The presence of gullies indicates that soil loss by water erosion is occurring or has occurred in the past, which increases the chance of continued erosion. An active gully has unstable sidewalls with little or no vegetation or recent soil loss by erosion. Active cutting, sometimes referred to as head-cutting, may be occurring at the upgradient end of the channel. If a gully is actively eroding it may jeopardize the stability of the vegetation cap and is therefore considered a trigger item.

Conversely, a healing gully is identified by the reestablishment of vegetation on the sidewall and reduction in soil loss in the channel bottom. A healing gully is not considered a trigger item, but the presence of a healing gully and its physical characteristics (depth and length) should be noted and monitored. Field evaluators must track the location of the gullies using the field tablet (refer to Section 4.2).

2.16 Maintenance Triggers

Various maintenance items described below are used as triggers for site improvements.

2.16.1 Vegetation

The vegetation cover category makes distinctions among the three live vegetation cover categories:

1. Vegetation scores that fall in the lowest live vegetation cover category (less than 21% live cover): site must undergo either a vegetative improvement (VI) or reclamation improvement (RI). A VI occurs first and should be within a calendar year from when the deficiency was observed. Then the site will undergo another evaluation 3 years following corrective action work (i.e., back on the 4-year evaluation cycle). If a site undergoes a VI and then falls into the less than 21% live cover category in the following evaluation, an RI must be completed and implemented according to the BHRS (refer to the Reclaimed Areas M&M Plan).
2. Vegetation scores that fall into the middle live vegetation cover category (21-40% of the cover is undesirable and contains undesired weedy species [UWS]): if greater than 10% of score is from UWS, the site must undergo a VI. If less than 10% of the score is due to UWS, the site should be evaluated again under the regular 4-year cycle.
3. Sites with scores that fall into the upper vegetation cover category (41-100% of the site contains live vegetative cover): no action is required and the site should be re-evaluated again under the regular 4-year cycle. Although, the site may benefit from other corrective actions that prevent a low score in the following evaluation.

2.16.2 Erosion

Per the Reclaimed Areas M&M Plan, an erosion evaluation score of 55 or less requires no immediate action. The site will continue to be on the regular 4-year evaluation cycle. An erosion score greater than 55 triggers a recommendation for corrective action including an engineering assessment on the erosion and flow patterns to determine the appropriate corrective action to reduce erosion, and additional monitoring activities at least yearly and preferably also after large storm events. If the erosion control actions are failing, the site should be repaired immediately. The site will undergo a full evaluation 3 years following the corrective action work (refer to the Reclaimed Areas M&M Plan).

2.16.3 Site Edges

The site edge parameter is primarily a monitoring category, except when gullies or exposed waste materials are present. Gullies or exposed waste material along the site edge trigger corrective action to repair the gully and remove or cover the exposed waste material. Corrective action work should be completed within a calendar year of the evaluation and then the site returns to the regular 4-year evaluation cycle (i.e., will be evaluated 3 years following corrective action work).

If neither gullies nor exposed waste exist, yet a significant difference has been identified between the site edge and the site interior, the evaluator must track the area using the field tablet (Section 4.2) so the data can be used for future trend analysis to determine whether site edge condition is improving or declining. These sites will remain on the regular 4-year evaluation cycle.

2.16.4 Exposed Waste

Any exposed waste on a site triggers corrective action as described in the Reclaimed Areas M&M Plan. Exposed waste noted outside of an existing reclaimed area boundary should be tracked using the field tablet (Section 4.2) so the data can be used to evaluate the site further (as described in the Reclaimed Areas Quality Assurance Project Plan (QAPP) (Atlantic Richfield, 2018b) and the Unreclaimed Sites QAPP (Atlantic Richfield, 2018c) as applicable.

Corrective action must be completed according to the schedule in Section 3.5. The site will continue on the regular 4-year evaluation cycle following the corrective action work.

2.16.5 Bulk Soil Failure or Mass Instability

Signs of bulk soil failure or land slumps trigger corrective action. If an evaluation determines the existence of bulk soil failure or mass instability it will trigger an engineering assessment of the area to determine the appropriate type of action needed to repair the cap, development of a corresponding CAP to be implemented within the calendar year, and continued monitored especially after large storm events. After the corrective action, the site will return to the regular 4-year evaluation cycle. If future evaluations note that the corrective action is failing, the area must be repaired immediately.

If evaluators note subsidence present on the site, they will track it using the field device (Section 4.2) so the information can be used by BSB to take appropriate actions.

2.16.6 Barren Areas

If a barren area, or areas, is located within a site but covers less than 25% of the site area, the site must undergo a VI plan and/or a RI plan to repair only the barren area(s). The O&M Manager must review all pertinent historic data or recent management records to develop the applicable plan. If no usable data or records exist, the O&M Manager will coordinate efforts to fill the data gaps prior to developing the CAP. If a VI plan is implemented and the next evaluation indicates that the VI actions failed, the barren area or areas must be reclaimed in accordance with the BHRS (refer to the Reclaimed Areas M&M Plan).

If a barren area, or areas, covers 25% or more of the site, the site must undergo a VI plan and/or RI plan to include the entire site, not just the barren areas. If a VI plan is implemented and the next evaluation indicates that the VI actions fail, a RI plan must be developed and approved, and the entire site must then be reclaimed in accordance with the BHRS (refer to the Reclaimed Areas M&M Plan).

Under each of the above circumstances, the corrective action must be completed within a calendar year of the evaluation that identified the deficiency. The reclaimed barren area must then undergo a full evaluation 3 years following completion of the corrective action work (evaluated according to the regular 4-year cycle).

2.16.7 Gullies

If a gully exists within a site boundary, evaluators must note on the field evaluation form whether the gully is actively eroding or healing (refer to Section 2.15). If the gully is healing, no immediate action is required, and the site will continue on the regular 4-year evaluation cycle. If gullies within the site are actively eroding, this will trigger an engineering assessment on the gullies, a corresponding CAP to repair the gullies within the calendar year, and continued monitoring of the repaired area at least yearly and preferably also after large storm events, until the next regular evaluation (on the 4-year cycle). If the corrective actions are failing, the area should be repaired immediately.

3.0 MANAGEMENT AND SCHEDULE

Program Management involves stakeholders from the regulatory agencies and settling defendant groups. For an illustration, please see Figure 1.

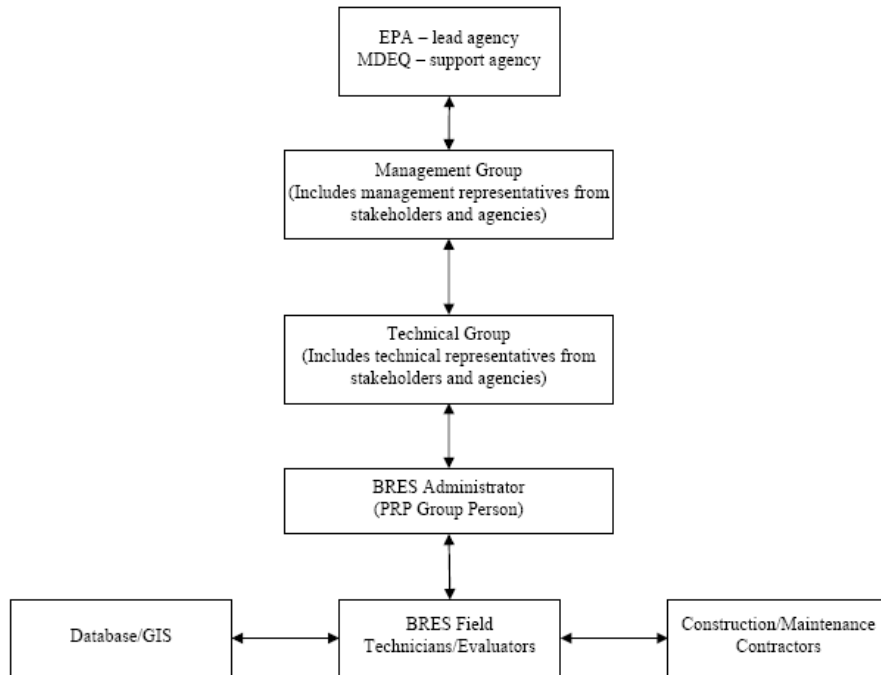


Figure 1. BRES Management and Administration Chart.

Figure 2 shows the specific program organization and communication structure of the BPSOU reclaimed areas.

BPSOU Reclaimed Areas Program Organization and Communication Structure

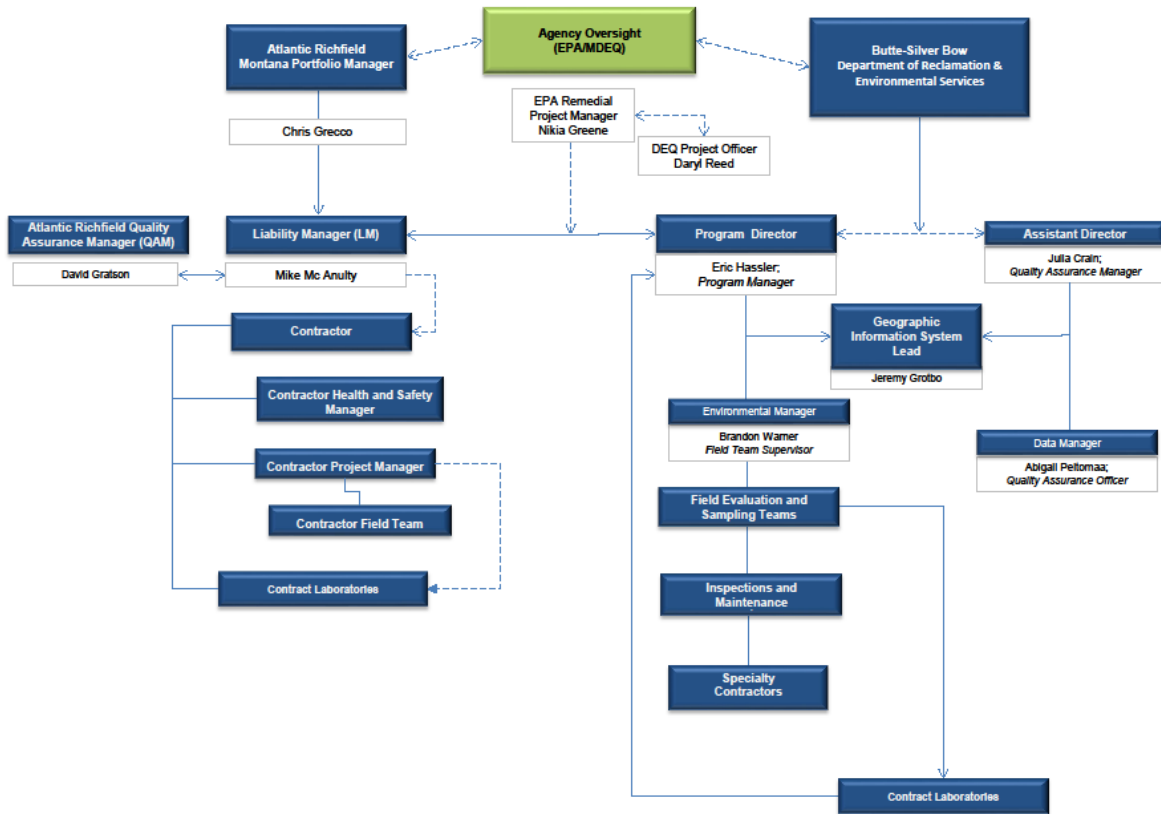


Figure 2. BPSOU Reclaimed Areas Program Organization and Communication Structure

3.1 Stakeholders

EPA, as the lead agency, and Montana Department of Environmental Quality (DEQ), as the support agency, oversee the BRES program. EPA Remedial Project Manager, Nikia Greene, and DEQ Project Officer, Daryl Reed, are responsible for reviewing summary and technical recommendations reports, participating in the development of CAPs through technical and management working groups, approving CAPs, ensuring reports are submitted as prescribed, and participating in performance monitoring inspections to ensure M&M activities are performed as prescribed.

Atlantic Richfield Liability Manager, Mike McAnulty, is responsible for ensuring the program is implemented as prescribed including participating in the management and technical working groups and monitoring reclaimed area performance, including maintenance and reporting activities. Atlantic Richfield will collaborate with BSB to review all field recommendations with BSB prior to the recommendations being submitted for Agency approval.

The BSB Department of Reclamation and Environmental Services is responsible for all evaluations, monitoring, and reporting and for coordinating the associated annual field evaluation training prior to completing field evaluations. BSB also performs all associated maintenance and monitoring required to ensure reclaimed areas in BPSOU remain protective of human health and the environment. Key individuals comprising the BSB Department of Reclamation and Environmental Services are shown on Figure 1 and responsibilities are described below.

Program Director

The Program Director, Eric Hassler, oversees all activities and implementation of remedial actions throughout the department related to Superfund.

Assistant Program Director

The Assistant Program Director, Julia Crain, assumes the role of BRES Administrator. This individual is responsible for coordinating annual field evaluator training, overseeing system database and Geographic Information System (GIS) components, assuring the quality of all field data, compiling all associated reporting requirements, managing program data, and reporting final remediated property requirements to the Agencies.

Environment and O&M Division Manager

The Environment and O&M Division Manager (O&M Manager), Brandon Warner, assumes the role of Project Manager for reclaimed areas monitoring, maintenance, and end-use compliance. The O&M Manager/Project Manager is responsible for scheduling all work and ensuring that the work is performed in accordance with the requirements of the program and will direct the field evaluators as appropriate.

Data Management Division Manager

The Data Management Division Manager, Abby Peltomaa, ensures data quality is completed per the project QAPP, maintains the project database, leads preparation and review of project reports, evaluates field data, and evaluates inspection reports and surveillance reports.

GIS Data Specialist

The GIS Data Specialist, Jeremy Grotbo, ensures up-to-date GIS data are verified and maintained in the project database, maintains GIS data such as site boundaries, updates proposed changes to site boundaries, and notifies team members of updates.

3.2 Management Group

The Management Group (Figure 1 and Figure 2) includes Atlantic Richfield (Mike McAnulty), BSB (Eric Hassler and Julia Crain), EPA (Nikia Greene), and DEQ (Daryl Reed).

3.3 Technical Group

The Technical Group (Figure 1 and Figure 2) includes BSB (Eric Hassler, Julia Crain, and Brandon Warner), EPA (Nikia Greene), and DEQ (Daryl Reed). Additional members of the technical group may include reclamation vegetation specialists and technical and engineering support specialists.

3.4 BRES Field Evaluators

The BRES field evaluators are a team of external, objective, and independent contract personnel. The evaluators complete mandatory annual field training prior to performing field evaluations.

3.5 Timing and Schedule

3.5.1 Field Evaluations

Field evaluations occur each summer, normally in June. The evaluation administrator will lead the field evaluation process. EPA, with assistance from DEQ, will provide oversight as deemed necessary. Other stakeholders can participate in the evaluation process, which is performed by the BRES field evaluators.

3.5.2 Reporting

Main reporting requirements are detailed in the Reclaimed Areas M&M Plan. This section summarizes the preparation of associated reports.

Long Term Schedule

The BRES evaluations take place in 4-year cycles. A site is evaluated the first year and maintenance is performed the following year. The site is then reevaluated 3 years following the maintenance. This allows for evaluation every 4 years. A 4-year cycle was chosen for the following reasons:

- The decision logic for the BRES states that after corrective action work is completed on a reclaimed site, 3 full growing seasons are to be allowed prior to the next evaluation being performed.
- The division of reclaimed sites into 4 groups allows adequate time to complete field evaluations of a single quadrant during the peak standing biomass period of the growing season.

All sites in the same quadrant are evaluated during the same year. The long-term schedule for the BRES is in Table 1.

Table 1. Long-Term BRES Evaluation Schedule

		Evaluation Cycle 2				Evaluation Cycle 3				Evaluation Cycle 4				Evaluation Cycle 5			
	Summer Following ROD	2012	2013	2014	2015	2016*	2017**	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Site Evaluations	Polygon delineation	Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4	Quadrant 1 A	Quadrant 2	Quadrant 3	Quadrant 4	Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4	Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4
Corrective Actions			Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4	Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4	Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4	Quadrant 1	Quadrant 2	Quadrant 3
*Boundary Adjustments Proposed																	
**Boundary Adjustments Field Verified																	

4.0 METHODS AND PROCEDURES

4.1 Evaluation Preparation

The Quality Assurance Manager (QAM) (Figure 2) prepares for the field evaluation by determining the quadrant to be evaluated. The QAM issues a request for proposal to select a qualified contractor with experience in performing visual inspections related to reclamation requirements. The QAM selects the contractor and enters into a Professional Services Agreement with the contractor. The QAM coordinates any technology upgrades to the field tablets for field use. This work includes performing routine software updates on all program tablets, setting up the field maps, and ensuring all appropriate attributes are added and available for field collection.

4.2 Evaluation Field Forms

The field evaluation forms are integrated into an ESRI ArcGIS Survey 1,2,3 application available on the program tablets. This application provides drop-down menus and radio buttons for evaluators to input data. This data is seamlessly uploaded to the user interface within Microsoft Access. The data undergo quality assurance checks and are stored in the database.

4.3 Evaluation Maps

The field evaluation maps are accessible through ESRI ArcGIS Collector application on the program tablets. The evaluation maps include aerial imagery and a variety of features to guide evaluations in the field. Primarily, the maps include all previously identified shafts and hazards, which help with identifying and discerning potential land slumps or soil failures in the field; the cadastral file, which includes parcel level details such as ownership, geocode, acreage, and property type; the stormwater features including hydrodynamic devices, catch basins, and engineered Superfund stormwater features; and the BPSOU quadrants, site boundaries, and the historic points, lines, and polygons collected over the duration of the program. These features are in addition to the feature classes associated with BRES evaluation data collection, which are further described in the Section 5.0.

4.4 Field Training and Evaluation

BSB will lead a mandatory field training session each season with the assistance of Agency representatives and provide this BRES Field Manual as a training guide to assist with the field evaluation process. As part of this training, field evaluators will receive software training, described in the User Guide (Appendix A.1).

During the training session, field evaluator will be taught to make quantitative measurements and visual estimates of vegetation and erosional parameters to make reproducible estimates of vegetation cover and erosional assessments in the field, and correctly record the appropriate information on the field form.

4.5 Vegetation

The field evaluators will be trained to visually estimate vegetation cover on reclaimed sites by using a modified point intercept method (Standard Operating Procedure: SOP-1, included in Appendix D). The crew will visit several site boundary areas that include a range in percent vegetation cover values. The recommended scale to quantitatively measure the cover is a modified point intercept frame of 0.25 square meters. The recommended method consists of laser pointers used in conjunction with a grid of 10 points on a frame.

4.6 Erosion

The field evaluators will be trained in erosion evaluation using the BLM Erosion Condition Class Determination Guidelines in Appendix D.1. After the initial training session, field evaluators will evaluate several sites that vary in erosional condition. The evaluators will observe surface litter, surface rock movement, pedestalling, flow patterns, rill depth and frequency, gully depth and frequency, and soil movement using the BRES Erosion Condition Class Determination Guidelines, and then compare their scores with one another. Once individual members can reliably rank erosional conditions within plus or minus 10% of the group mean, the erosion evaluation portion of the training will be complete.

4.7 Trigger Items

The field evaluators will be trained to identify trigger items (see Section 4.1 and Section 4.2) and record appropriate information on the field form. During the testing, field evaluators will evaluate an area and then compare evaluations within the group. If there are discrepancies in trigger item identification, the field evaluator(s) and the trainer will discuss the discrepancies. Training will be complete when all members of the training session consistently identify trigger items.

4.8 Using Tablets

For the field evaluations, BSB uses tablet applications to provides password-protected secure access to BRES data to support evaluations. This information includes quantitative and qualitative field data as well as spatial data to describe and illustrate site conditions. Field

evaluators input data into the tablet-based applications and that information is then uploaded into a Microsoft Access Database and an ESRI ArcGIS geodatabase. For more information on using the tablet system, please refer to Appendix A.

5.0 FIELD EVALUATIONS

5.1 Evaluation Objectives

The evaluation form requires input of quantitative scores pertaining to the following:

- Percent live cover data for desirable species, UWS, noxious weeds, litter, and rocks greater than two inches on a site.
- Identification of desirable species and weedy species that are dominant, frequent, and infrequent.
- Identification of a precise erosion classification following the Erosion Condition Class Determination evaluation methodology, which is a modified U.S. Bureau of Land Management (BLM) procedure (BLM, 1981) with seven variables to score. The BRES Erosion Condition Class Determination Guideline is in Appendix D.1.
- Identification of a precise cover estimate.
- Identification of exposed mine waste (or the potential for waste to become exposed), site edge problems, bulk soil failure, land slumps, subsidence, barren areas, and/or gullies.

5.2 Evaluation Map Attributes

Map attributes such as point, lines, polygons, etc. are described below.

Spatial Data Collection Guidelines

Points are features that are too small to represent as lines or polygons as well as point locations. There are two points relevant to BRES evaluation described below:

- Generic Points are used to identify point locations of dumping, objects such as tires or a trespassing vehicle, or other incidental occurrence on a BRES site.
- Manholes are present throughout the BPSOU. While most are identified, some may be encountered during site visits. These locations can help to identify current or historic infrastructure for further inspection.

Lines represent the shape and location of geographic objects, such as street centerlines and streams, too narrow to depict as areas. Lines are also used to represent features that have length but no area, such as contour lines and boundaries.

- Generic Line feature can be useful to describe circumstances occurring inside a site or along the perimeter of a site distinct from site edges. A good example of a generic line would be pathways created through sites by the public or by motorized vehicles such as all-terrain vehicles (ATVs).
- Curbing is an important best management practice (BMP) for routing stormwater from reclaimed source areas. In some locations, curbing is established and in others it may be

necessary. The curb feature allows the evaluators to identify areas where curb repair is necessary or would possibly benefit the site conditions.

- Gully or Rill feature is used to identify the beginning and end of a gully or rill occurring on a site including characteristics such as depth, status, and recommendations for maintenance.
- Pipe Culvert feature is used to identify the inlet and outlet of culvert systems that convey stormwater on the Butte Hill.
- Site Edge feature allows the evaluator to identify locations where site edges differ from the interior of the site.
- Swale features are identified to explain where water is routing through the site to observe potential erosion issues that may emerge over time.

Polygons are multiple-sided area features that represent the shape and location of homogenous feature types such as states, counties, parcels, soil types, and land use zones. Polygons may be generated to identify specific land area features such as the following.

- Generic Polygons are useful for identifying the location, shape, and area of conditions on the site that are not captured by other features.
- Barren Areas are identified by walking the perimeter of the barren area and recording the location and condition.
- Exposed Waste may be evident on the site. This feature allows the evaluator to identify the location and area where exposed waste is present. The comment section allows the evaluator to record the pH.
- Land Slumps and other land issue locations and areas are identified with this polygon.
- Sediment Removal is useful for identifying areas where stormwater flows and sediment have accumulated and blocked inlets, swales, or other management infrastructure and maintenance requirements.
- Vegetation Improvements should be identified only if the area meets the defined criteria for a VI based on the adjusted live score.
- Weeds are prevalent throughout sites. The polygon identifies patches of species to target maintenance in the field.
- Proposed Boundary polygons allow the evaluator to identify locations where a site boundary should extend. This is often used to identify locations where additional remedy may be necessary.

6.0 REFERENCES

- Atlantic Richfield, 2018a. Draft Final BPSOU Reclaimed Areas Maintenance and Monitoring (M&M) Plan in Accordance with Butte Reclamation Evaluation System (BRES). Prepared for Atlantic Richfield Company by Pioneer Technical Services, Inc. November 5, 2018.
- Atlantic Richfield, 2018b. Final Reclaimed Areas Maintenance and Monitoring Quality Assurance Project Plan QAPP. Prepared by Pioneer Technical Services, Inc., October 5, 2018.
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- EPA, 1995. Remedial Design/Remedial Action Handbook, EPA 540/R-95/059. U.S. Environmental Protection Agency June 1995.

Appendix A

User Guides

Appendix A.1
Butte-Silver Bow Product Documentation and User Guide
for BRES



The City and County of

Butte-Silver Bow Montana

Product Documentation and User Guide

Butte Reclamation
Evaluation System
(BRES)

Produced By

Butte-Silver Bow
County

<http://co.silverbow.mt.us/>

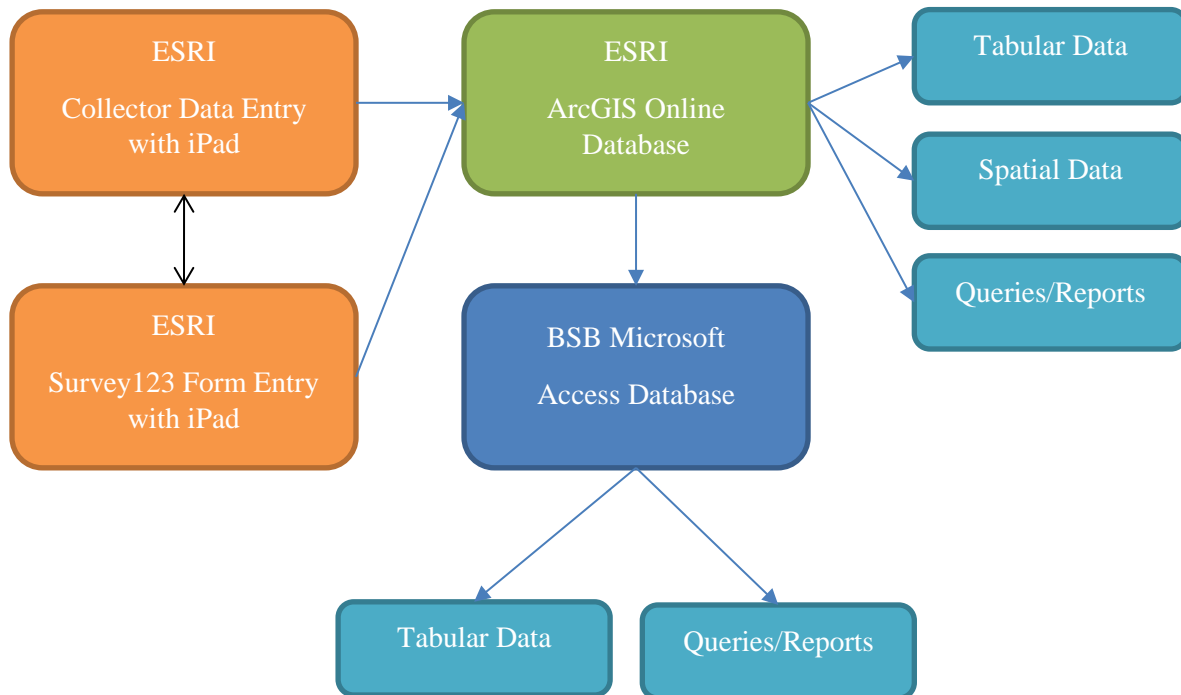
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Product Overview

The Butte Reclamation and Evaluation System (BRES) system is an integrated data collection, management and storage system for BRES data. The system utilizes tablets running ESRI's Survey123 and Collector applications for data collection which is seamlessly stored in BSB's ArcGIS Online database, and a Microsoft Access database front end application for querying and reporting purposes. By leveraging ESRI's ArcGIS online storage, data can be accessed using the ArcGIS Online maps (<https://www.arcgis.com/index.html>), Survey123's web portal (<https://survey123.arcgis.com/>) or from a variety of applications by utilizing ESRI's REST API. BSB's Microsoft Access Database utilizes the REST API to sync data from ArcGIS online to a local database. The flowchart below gives an overview of how the system works.



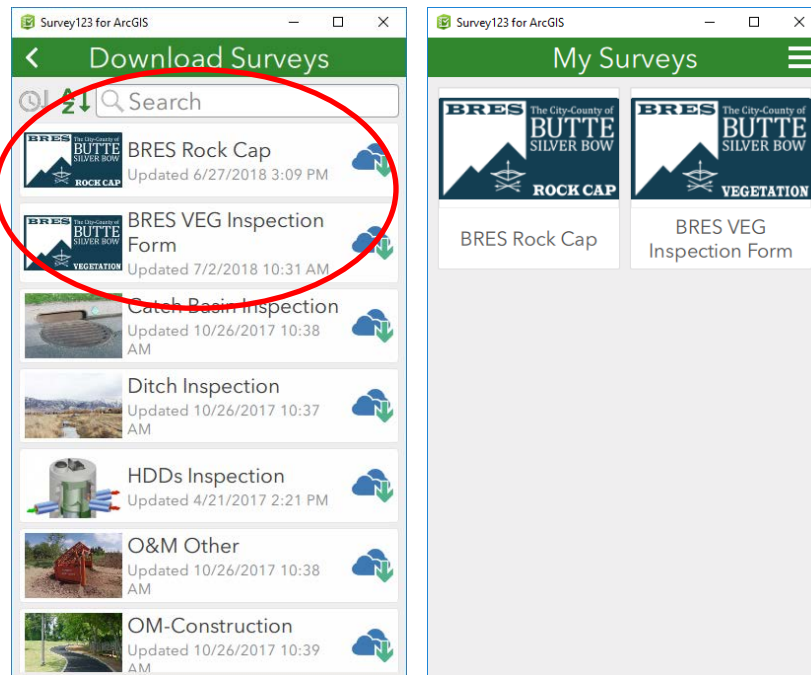
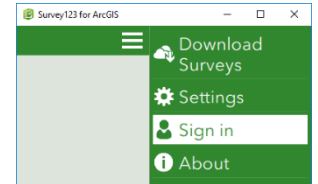
System Requirements

The BRES system requires use of ArcGIS Online, ESRI's Survey123 and ESRI Collector software, this software is included with the counties annual ESRI maintenance. Survey123 and Collector applications can run on IOS or Android devices, the county currently utilizes iPad's for field data collection. Microsoft Access is used as a front-end application for querying and reporting, this software is included with the counties current Microsoft software package. It is also important to note that it's preferable to have a tablet with cellular service for real time updating and collection, BSB utilizes Verizon in their iPad's for this currently.

Installation Instructions

Suvey123 Installation

1. Visit the appropriate app store on your device
 - Google play for Android
 - App store for IOS
2. Search for Survey123 for ArcGIS, click install and launch the app.
 - a. In the upper right corner click the three horizontal lines and choose Sign in
 - Sign in credentials are provided by BSB's GIS department through ArcGIS Online
 - b. Once signed in, click the three horizontal lines again and choose Download Surveys
 - c. Click the Download button to install the BRES Rock Cap and BRES VEG Inspection forms.

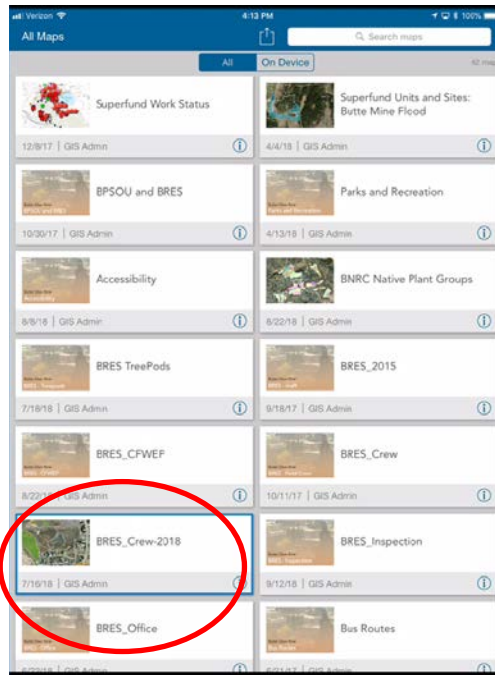


- d. The surveys are now ready to use on the device.

ArcGIS Collector Installation

1. Visit the appropriate app store on your device
 - Google play for Android
 - App store for IOS
2. Search for Collector for ArcGIS, click install and launch the App

3. Choose to sign into ArcGIS Online and enter the sign in credentials provided by BSB GIS
4. Open the appropriate map to collect Data



Microsoft Access Database Installation

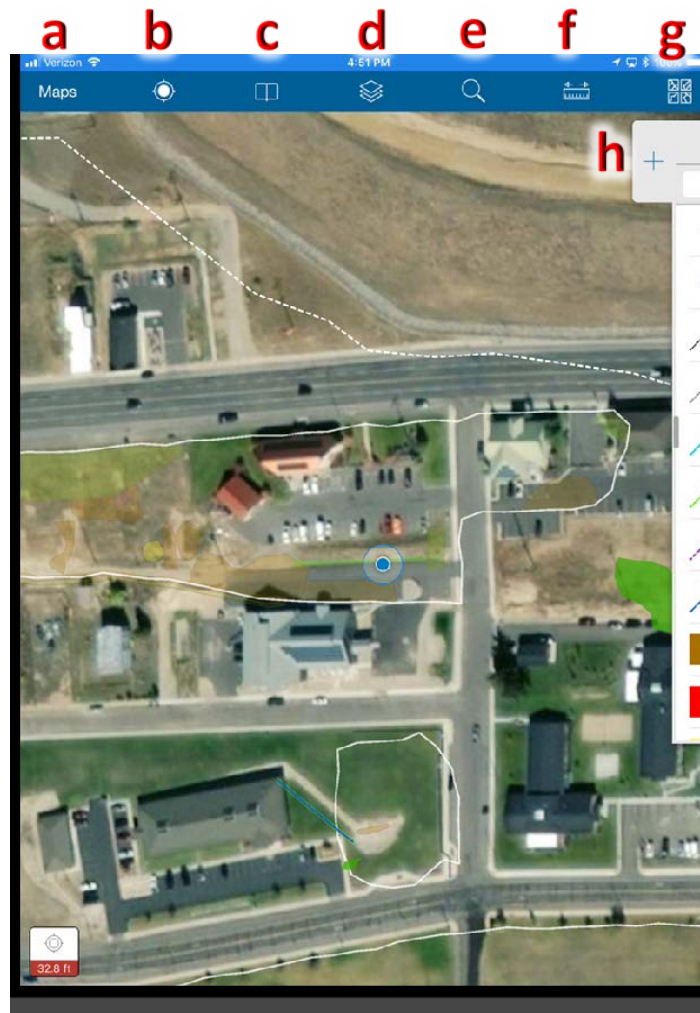
1. The Microsoft Access database requires that Microsoft Access 2013 or greater is installed. The custom database is installed by copying the file to a network or local file directory. Data is automatically synced when the database is open.

Operational Instructions

ESRI Collector Application

Application Overview

1. On the iPad launch the collector application, sign in and open the BRES mapping application. See installation instructions for installing ESRI Collector for information on installing the application.
2. Once opened the application zooms to your current GPS location as indicated by blue dot on the screen as shown below.

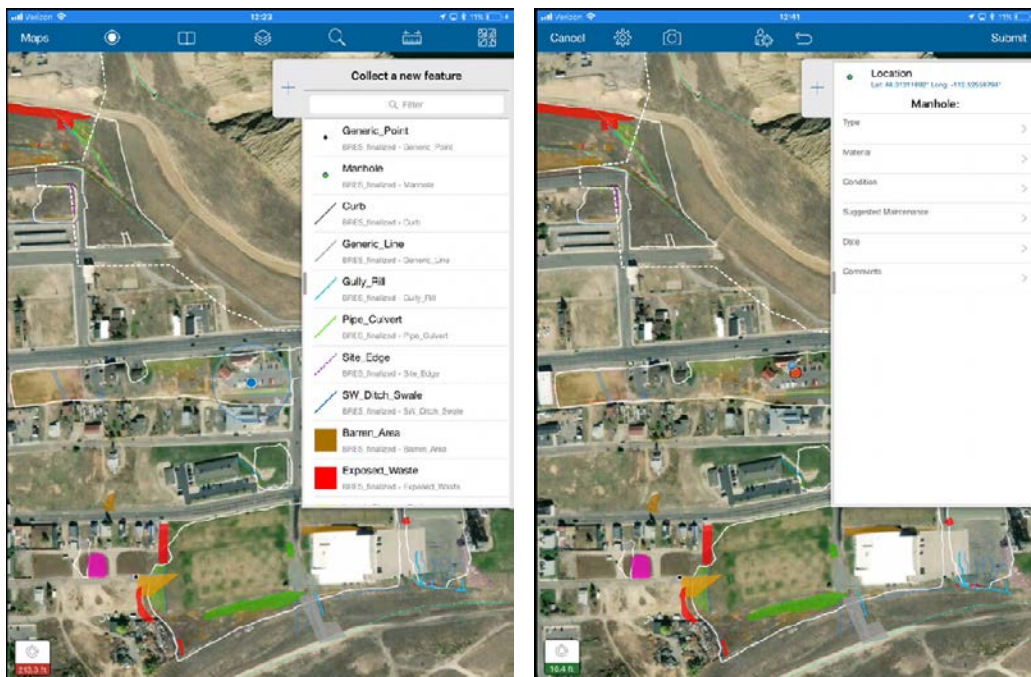


3. Below is a explanation of the collector app's icons. Please see coorisponding letter from image above for information on it's use
 - a. Tap the Maps icon in collector to select a different map to use for BRES data collection
 - b. The location icon turns on or off location services (GPS), when the icon is filled it is using the current GPS location from your device. If it's hollow no location services are being utilized.

- c. This is the bookmarks icon which allows the user to bookmark frequent places or map extents.
- d. Tap the layers icon to view a list of layers and optionally turn them on and off.
- e. The search icon allows you to search for a location and optionally bookmark for later use.
- f. The measure icon allows the user to measure distance or areas by tapping on the map or using your current GPS location.
- g. The basemap icon allows users to choose between several different basemaps, for example aerial or topographic.
- h. Tap the plus (+) symbol to open up the data collection menu.

Collecting Features

Tap the plus (+) arrow on the upper right-hand side of the screen to open the data collection menu.



Collecting Point Features

1. To collect a point feature, tap the feature type (Manhole in this example)
2. Collector begins collecting a point at your current GPS location. Fill out attribute information in the right-hand menu and hit Submit to create a feature at the current GPS location
3. To digitize a point feature, click on the screen at the desired location, fill out attribute information and tap Submit

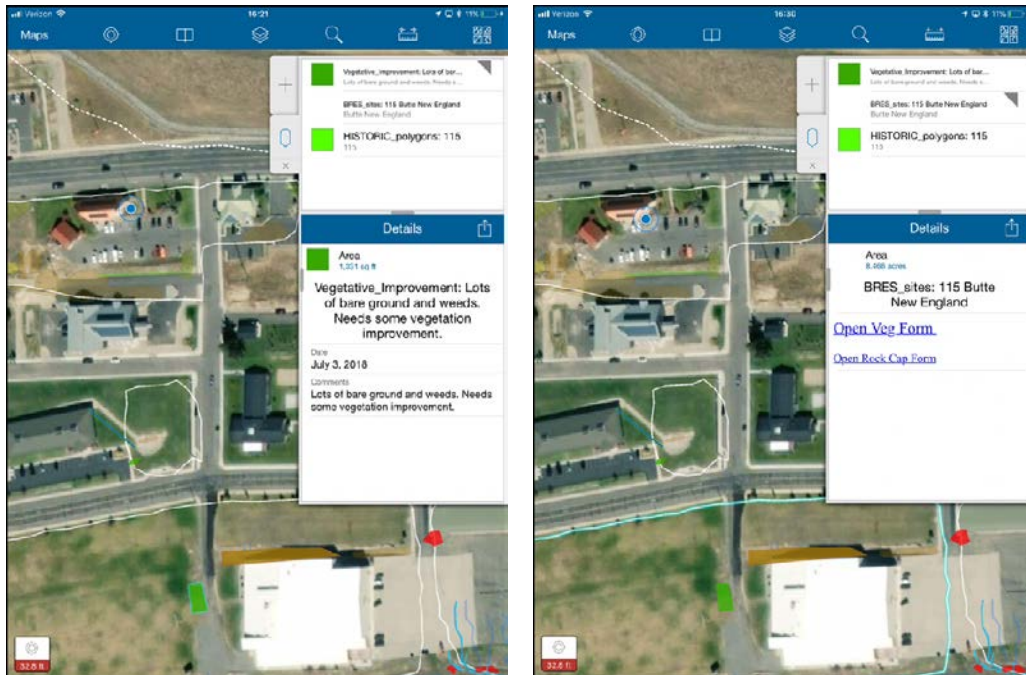
Collecting Line Features

1. To collect a line feature, tap the feature type (Pipe_Cuvert) in this example.

2. To collect using current GPS location tap the Start Streaming button at the top of the screen and start walking the route.
3. Attribute information can be entered before starting streaming or streaming can be paused at any time for data entry.
4. To finish data collection, click the Submit button in the top right corner of the screen. Alternatively tap the Cancel button to discard changes

Identifying Features Launching Survey123 application

1. To identify a feature, make sure the layer is turned on in the Layers menu, zoom to a location and click a feature to display the pop-up menu.



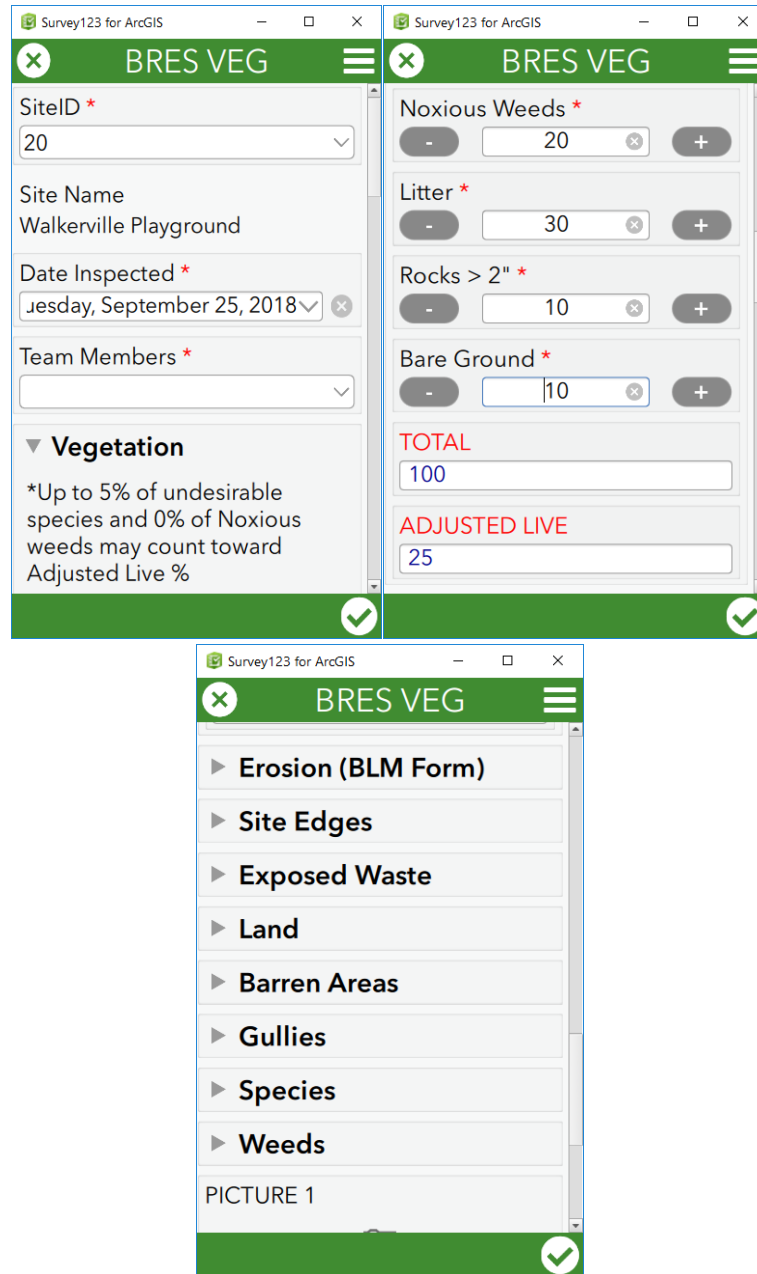
2. The identify menu appears on the upper left portion of the screen, as you can see the top menu shows how many layers have been identified (3 in this example). To switch between layers, tap the layer name.
3. When identifying a BRES polygon feature you will see options to launch the Veg inspection and Rock Cap inspection forms, clicking the appropriate hyperlink launches the appropriate form and links the identified BRES polygon information. For more information on using these forms see ESRI Survey123 Application in this manual.

ESRI Survey123 Application

Vegetation Inspection Form

1. Vegetation Inspection Form can be launched in the following ways:
 - a. The preferred way is to launch the program directly from ESRI collector application using the hyperlink by identifying a BRES polygon. This method automatically fills in the location information (SiteID and Site Name) on the Vegetation inspection form.
 - b. To launch the application directly tap the Survey123 application on your device.

- c. Sign in with credentials provided by BSB GIS department
- d. Tap BRES VEG Inspection Form, then tap Collect to start collecting data.



2. If app was launched from ESRI Collector, the SiteID and Site Name are automatically filled in. Selecting a SiteID from the drop-down list automatically selects a site name.
3. Fields with an asterisk (*) beside them are required fields which require an entry. The TOTAL for Vegetation and the Erosion (BLM Form) are automatically calculated. Once the required TOTAL for the Vegetation section equals 100 and the calculated ADJUSTED LIVE score is shown
4. Tapping the arrow next to each section expands it for required data entry.
5. Up to three pictures can be taken with each inspection. To capture a picture, tap the icon in the picture section, take a picture and the app embeds a thumbnail into the form, once

picture 1 has been taken the picture 2 sections becomes visible, picture 3 is visible when pictures 1 and 2 have been taken.


6. When all data has been entered tap the check mark in the bottom right hand corner to submit the data.

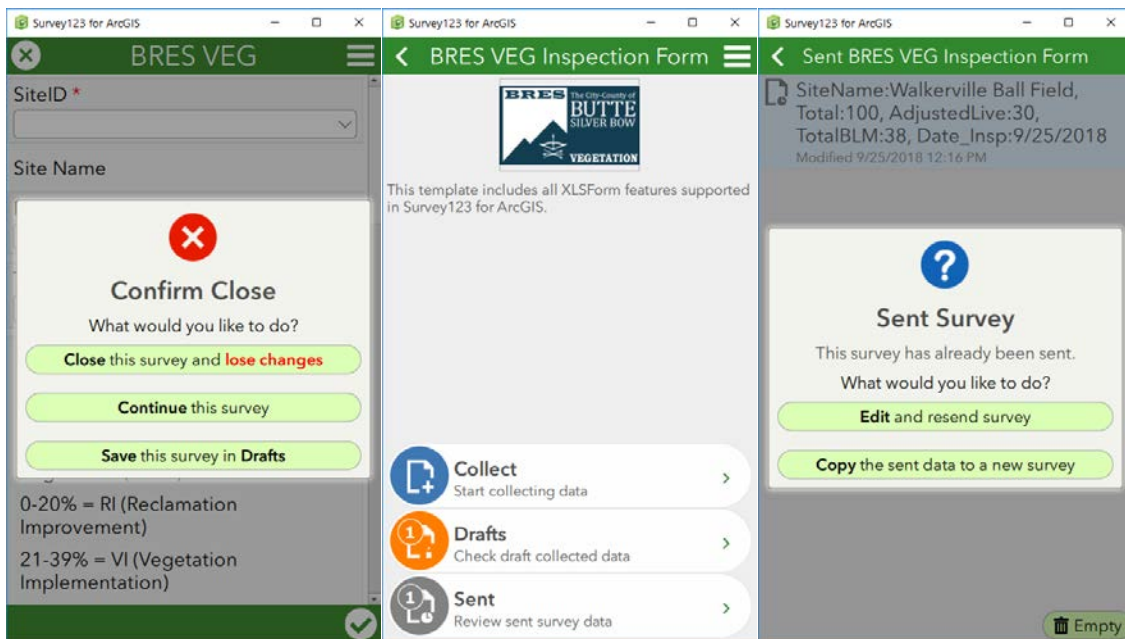
Rock Cap Inspection Form

1. The Rock Cap Inspection Form can be launched in the following ways:
 - a. The preferred way is to launch the program directly from ESRI collector application using the hyperlink by identifying a BRES polygon. This method automatically fills in the location information (SiteID and Site Name) on the Rock Cap Inspection form.
 - b. To launch the application directly tap the Survey123 application on your device.
 - c. Sign in with credentials provided by BSB GIS department
 - d. Tap Rock Cap Inspection form, then tap Collect to start collecting data.

2. If app was launched from ESRI Collector, the SiteID and Site Name are automatically filled in. Selecting a SiteID from the drop-down list automatically selects a site name.
3. Fields with an asterisk (*) beside them are required fields which require an entry.
4. Up to three pictures can be taken with each inspection. To capture a picture, tap the icon in the picture section, take a picture and the app embeds a thumbnail into the form, once picture 1 has been taken the picture 2 sections becomes visible, picture 3 is visible when pictures 1 and 2 have been taken.
5. When all data has been entered tap the check mark in the bottom right hand corner to submit the data.

Survey123 tips and tricks

- To update a survey from the My Surveys screen, tap the three horizontal lines in the upper right-hand corner of the app, choose the  refresh icon to update the survey.
- Setting favorite answers is an excellent way for speed up data entry. With a survey open fill out all of the information in the survey to save as favorites, tap the three horizontal lines in the top right corner of the screen and choose set as favorite answers. To use favorite answers on a new survey, tap the three horizontal lines and choose paste answers from favorite to fill in the appropriate fields.
- To edit a sent survey tap Sent on the main survey screen to Review sent survey data, this button shows a list of submitted surveys. Tapping as sent survey gives the user the option to edit and resend the survey or copy the sent data to a new survey.
- To cancel a survey, tap the X in the upper left portion of the screen, this gives you the option to save the survey as a draft that can be opened later from the main screen.



Microsoft Access Application

The Microsoft Access application provides a dashboard style view which automatically syncs with ArcGIS online (AGOL). This application leverages ESRI's REST API to retrieve data from BSB's ArcGIS online server. It's important to note this is a one-way sync from ArcGIS online. If a record is deleted in the Access app but not in AGOL the record will be retrieved again on the load event of the navigation form.

The code uses Visual Basic for Applications and can be viewed and edited from within the application by using the Alt+F11 buttons. A screen snap of the code is shown below.

```

Microsoft Visual Basic for Applications - BRES_web_RC - [JsonParse (Code)]
Project - BRES_RR
BRES_RR (BRES_web_RC)
  Microsoft Access Class Objects
  Form_BRES_Inspection
  Form_BRES_Inspection_QAQC
  Form_BRES_Inspection_Query_R
  Form_BRES_Inspection_RC
  Form_BRES_Inspection_RC_QAQC
  Form_BRES_Need_CAP_Form
  Form_BRES_Need_CAP_RC_DS
  Form_Corrective_Actions_Detail
  Form_Corrective_Actions_Nav
  Form_Dashboard_CAP_RC_NAV
  Form_Dashboard_CAP_VEG_NAV
  Form_Dashboard_INSP_RC_NAV
  Form_Dashboard_INSP_VEG_NAV
  Form_Form1
  Form_Navigation_Form
  Form_New_inspections_NAV
  Form_OM_Detail
  Form_OM_Nav
  Form_Reports
  Report_Corrective_Action_Report
  Report_Corrective_Action_Report
  Report_OM_Report
  Modules
  JsonParse
  Module1

(General)
ParseData

If Not (rs.EOF And rs.BOF) Then
rs.MoveFirst 'Unnecessary in this case, but still a good habit
Do Until rs.EOF = True

Dim x As Variant
x = rs!SourceName
MsgBox varItem("attributes")(x)

t_string = t_string & rs!TargetName & ","

Select Case rs!Type
Case "Date"
s_string = s_string & "#" & Epoch(varItem("attributes")(x)) & "#,"
Case "String"
s_string = s_string & "" & varItem("attributes")(x) & ","
Case "Number"
s_string = s_string & varItem("attributes")(x) & ","
Case "Lookup"
If x = "SiteID" Then
Debug.Print DLookup("[SITEID]", "BRES_Sites", "[MAPID] = '" & varItem("attributes")(x) & "'")
s_string = s_string & DLookup("[SITEID]", "BRES_Sites", "[MAPID] = '" & varItem("attributes")

Else
s_string = s_string & Nz(varItem("attributes")(x), "Null") & ","
End If
Case Else
s_string = s_string & Nz(varItem("attributes")(x), "Null") & ","
End Select
'Perform an edit
fName = rs!FeatureName
fURL = rs!FeatureURL
strquery = "OBJECTID>0"

```

The dashboard style form automatically opens and syncs with AGOL on when the database is opened. As shown in the screen snap below this navigation form allows users to quickly query data by year by selecting a year from the drop-down list and clicking through the Vegetation, Rock Cap inspections or the Corrective Action Plans (CAP Items). Clicking the hyperlink for individual INSPECTIONID displays details about each item. The first tab of the navigation form displays inspections by year and inspections that need to be QA/QC'd in the bottom screen. Once inspections have been QA/QC'd any items requiring a corrective action plan will appear in the CAP Items tab.

BRES Navigation Form

Inspections | CAP Items | O & M

Vegetation | Rock Cap

Year: 2018

Year	INS	SiteID	SITE
2015	254		
2016	257		
2017	257	1605	Syndicate PI
2018	257	159	NW Syndica
2019	258		
2020	255		
2021	260		
2022	261		
2023	262		
2024	264		
2025	766		
2026			
2027			
2028	254		
2029	257		
2030	258		

BRES Inspection QAQC

BRES FIELD INSPECTION FORM

Site ID/Site Name: 1605 Date: 7/3/2018 1:59:00 AM

TeamMembers: R_Connole,C_Doyle,A_Peltomaa,Teal_Taylor,Travi_Wise

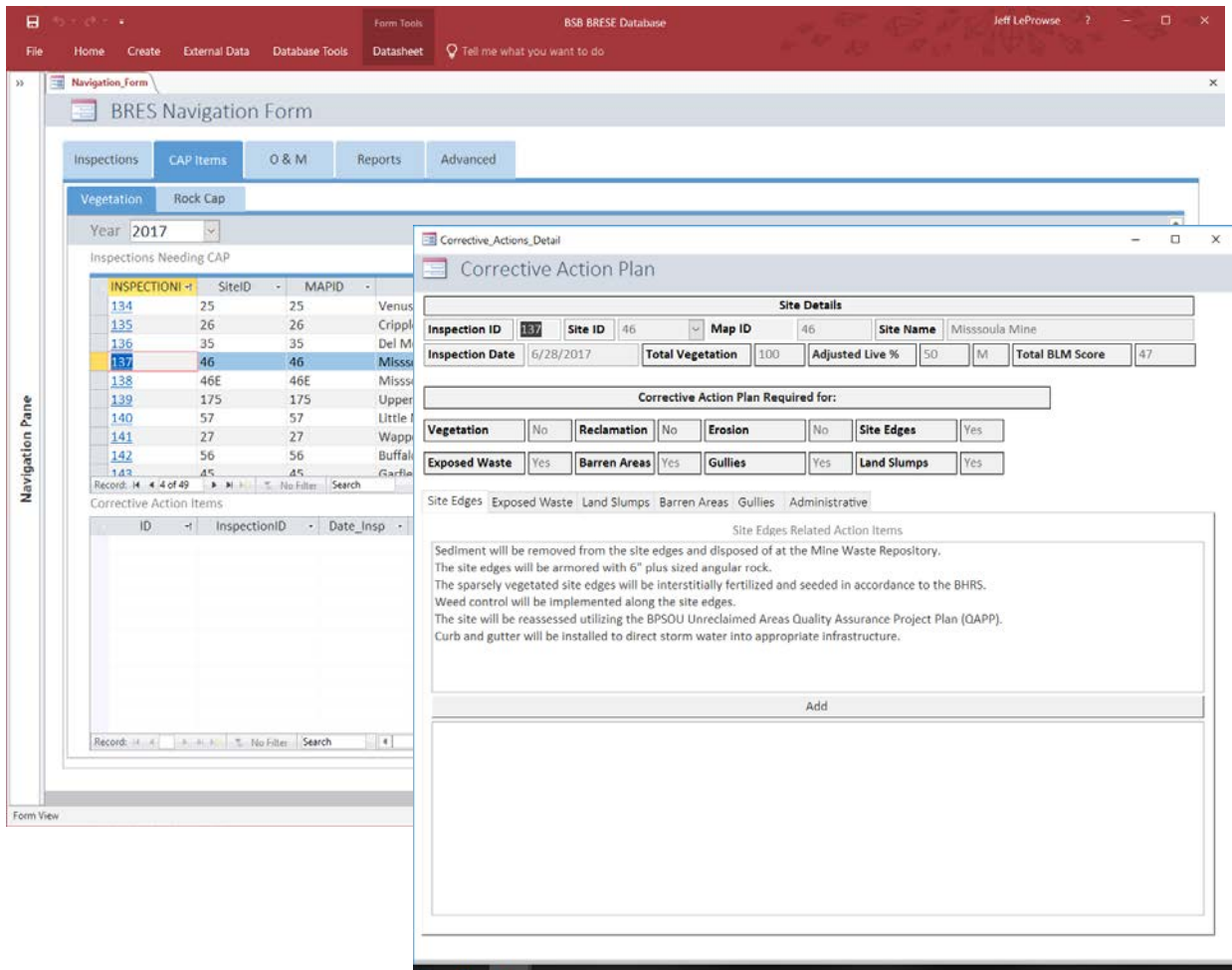
Checked by:

Vegetation | Erosion (BLM Form) | Site Edges | Exposed Waste | Land | Barren Areas | Gullies | Species | Weeds | Comments

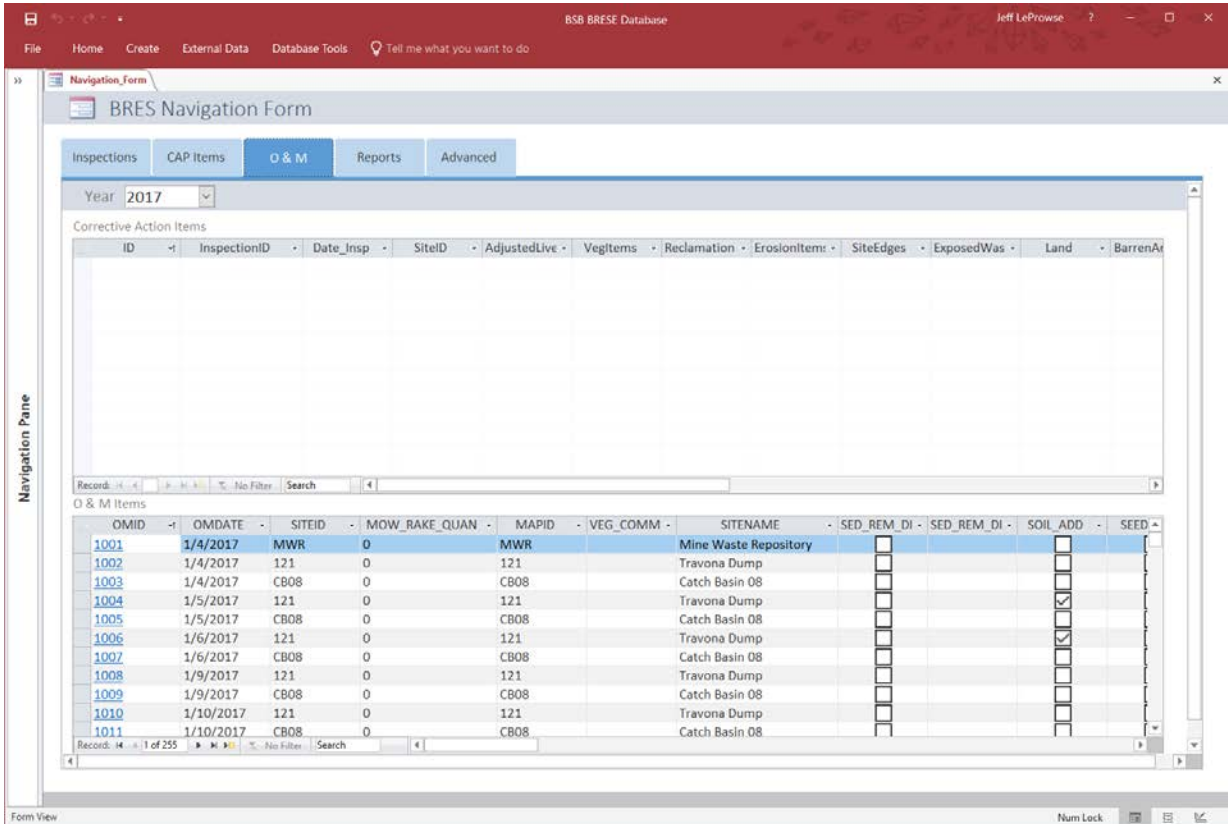
Vegetation: % of ground covered by	
Live (desirable) species	20
*Undesirable (weedy) species	20
Noxious Weeds	5
Litter	40
Rocks > 2"	3
Bare Ground	12
TOTAL	100
ADJUSTED LIVE %	25

Records: 1 of 1 | Filtered | Search

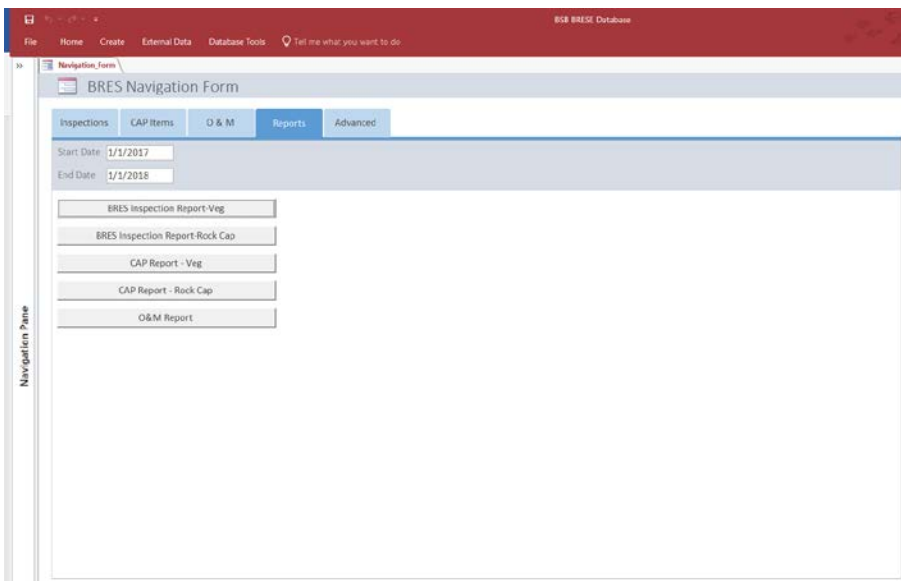
The CAP Items tab shown below displays Inspections needing a corrective action plan (CAP) in the top section of the form, clicking the hyperlink for the INSPECTIONID column displays a pop up form to apply corrective actions for the inspection which moves the item to the corrective Action Items list.



The O&M tab allows for recording Operating and Maintenance activities per year and shows a list of Corrective action items in the top window. The O&M section has been replaced by a different application BSB started utilizing in 2018 to have field crews record this information on iPad's with Survey123.



The reports tab allows easy generation of reports between two dates as shown below. To generate a report, enter start and end date can click the appropriate report to run and print or save as a PDF.



The Advanced tab allows users to add and edit information on the various list that appear in the database.

BSB BRESE Database Jeff LeProwse

File Home Create External Data Database Tools Tell me what you want to do

Navigation Form

Inspections CAP Items O & M Reports **Advanced**

Team Members QA/QC Members Weeds Species **CAP Lists Veg** CAP Lists Rock O & M Lists BRES Sites

Vegetation Improvement Reclamation Improvement Erosion Engineering Site Edges Exposed Waste Land Slumps Barren Areas Gullies Administrative

ID	VI_Options
19	Weed control will be implemented for the identified areas throughout the site.
20	The sparsely vegetated areas will be interstitially fertilized and seeded in accordance to the BHRS
21	The prepared seedbed areas will be fertilized and seeded in accordance to the BHRS.
22	The area will be disced or tilled perpendicular to the natural water flow.
23	The tilled area will be seeded by the appropriate method that ensures the seed is uniformly distributed across the area.
24	The seeded area will be fertilized to obtain soil concentrations of Nitrogen - 60lbs/acre, Phosphorus - 80 lbs/acre, Potassium
25	Fertilizer will be applied after the seed application is complete.
26	Fertilizer applied prior to seed application will be blended into the top layer of the soil.
27	Hydraulic seeding will not be implemented during adverse weather conditions.
31	The site will be reassessed utilizing the BPSOU Unreclaimed Areas Quality Assurance Project Plan (QAPP).
★ (New)	

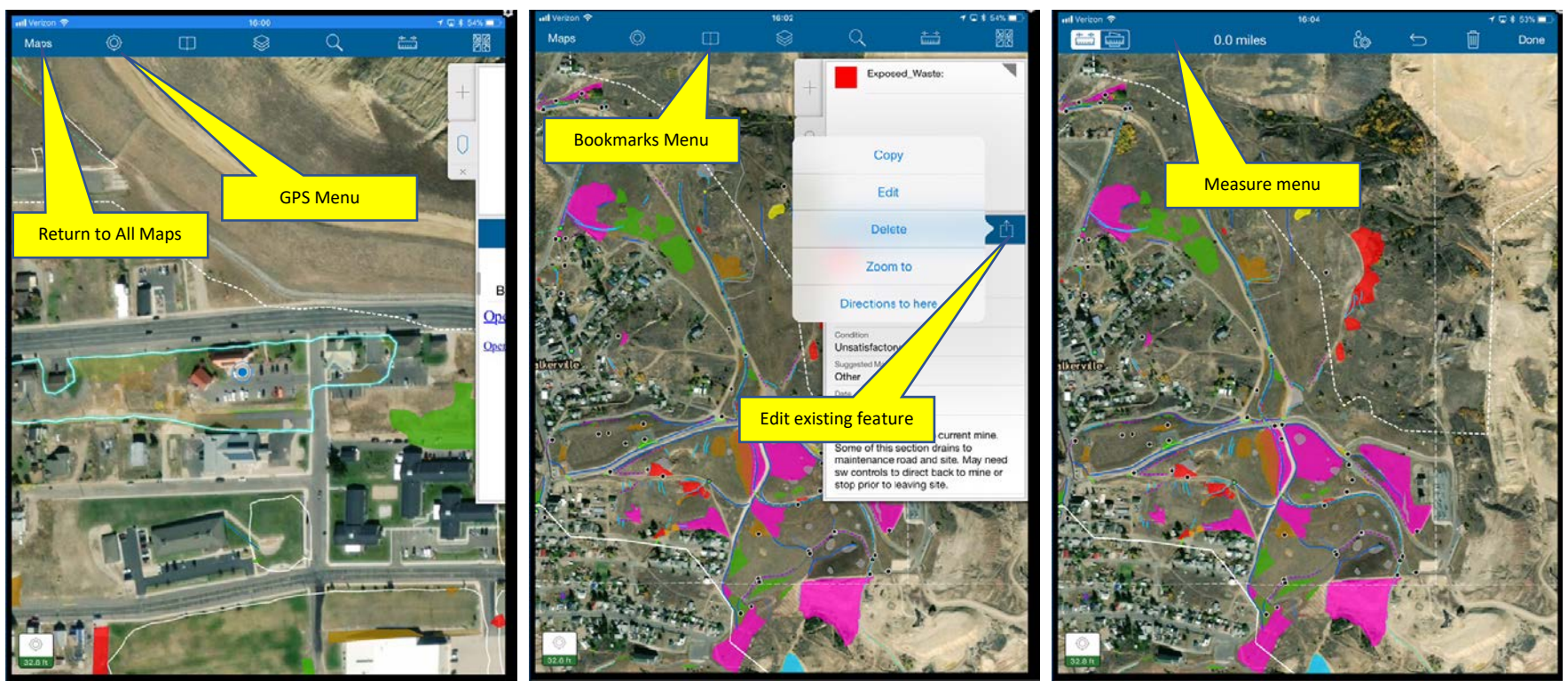
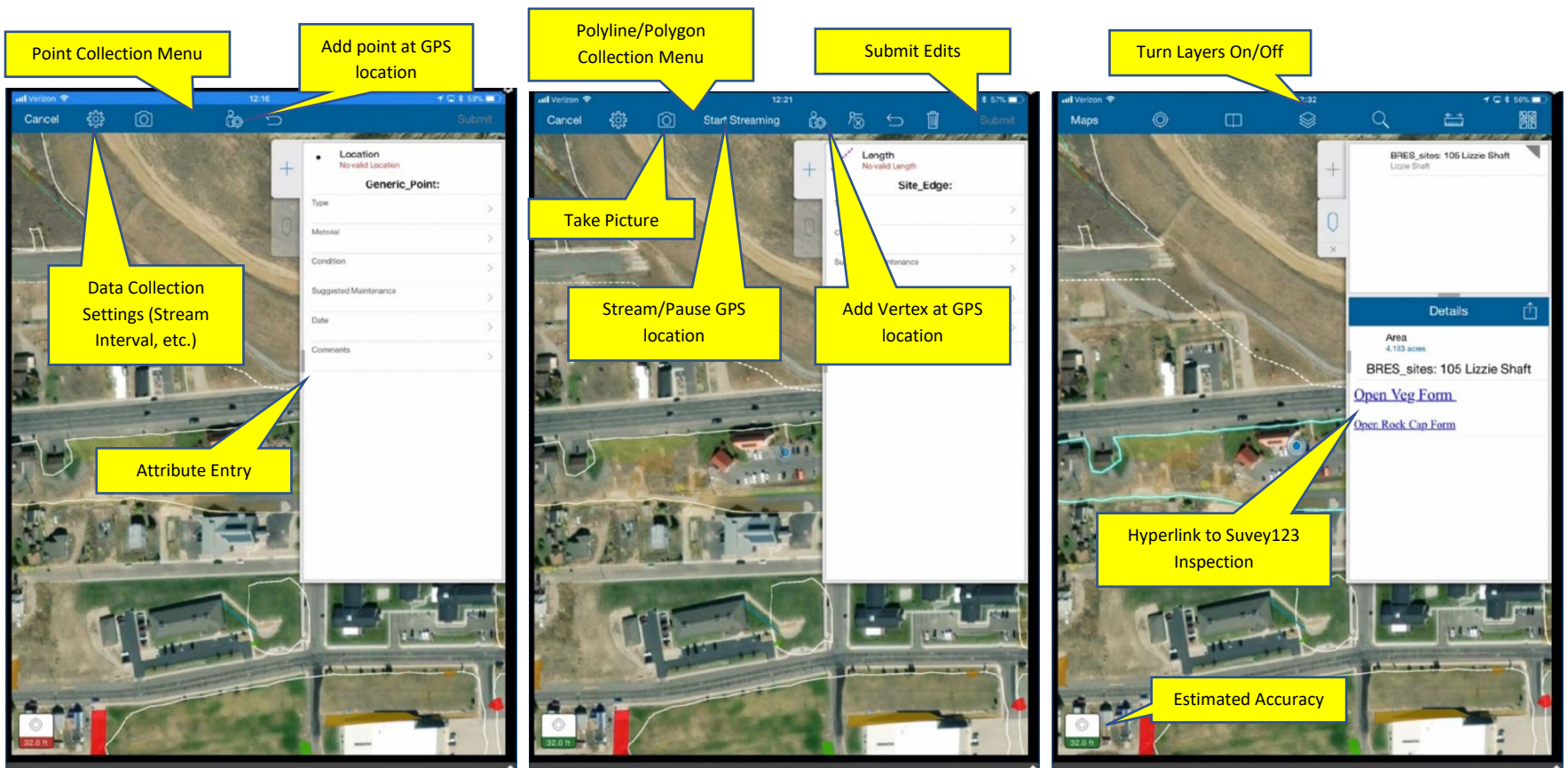
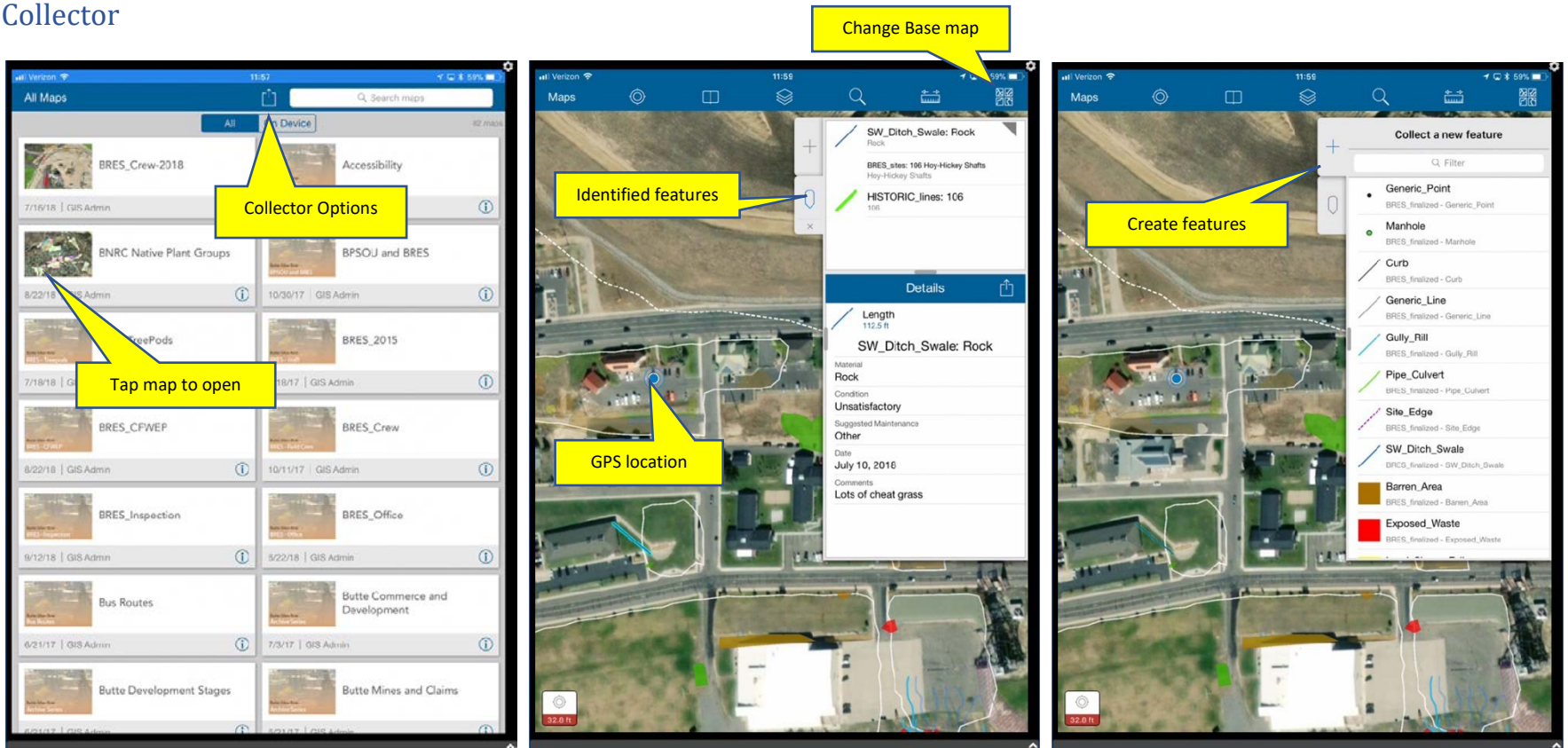
Records: 1 of 10 No Filter Search

Appendix A

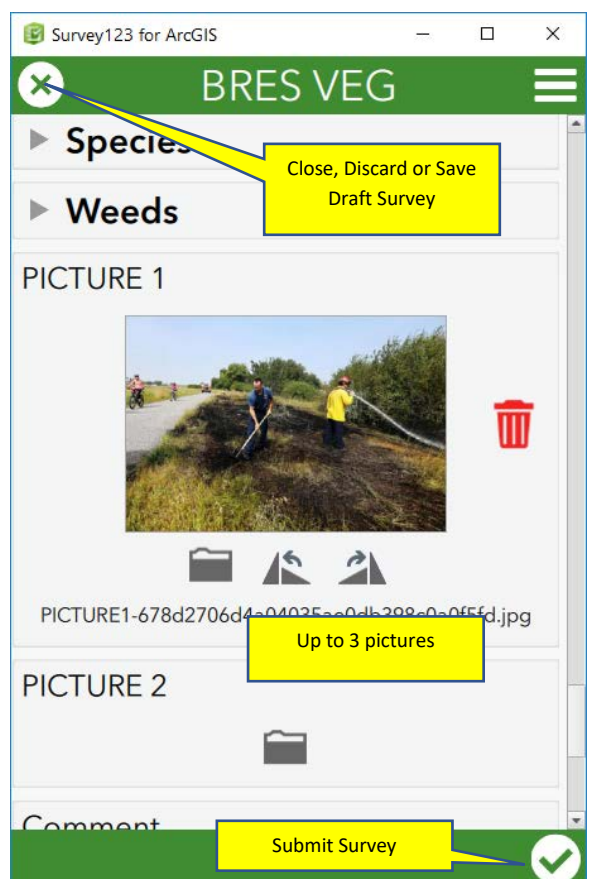
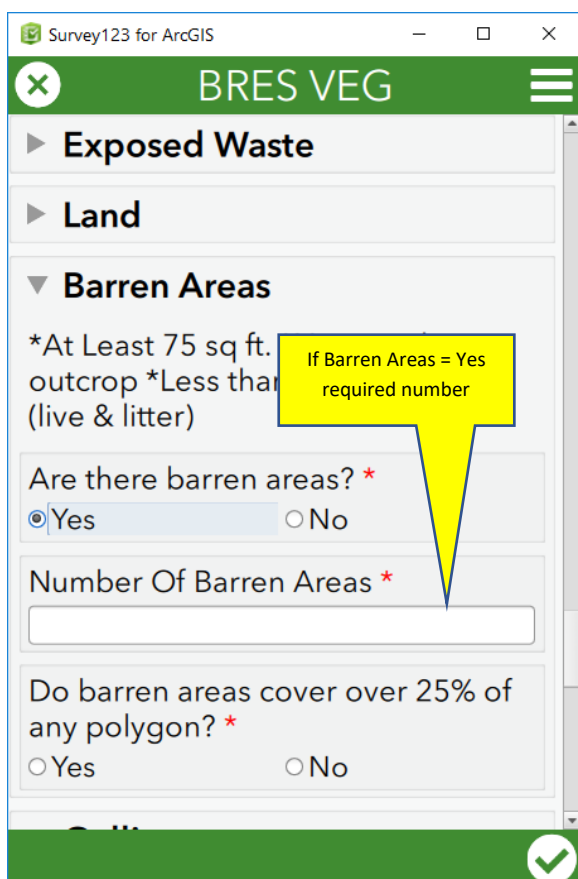
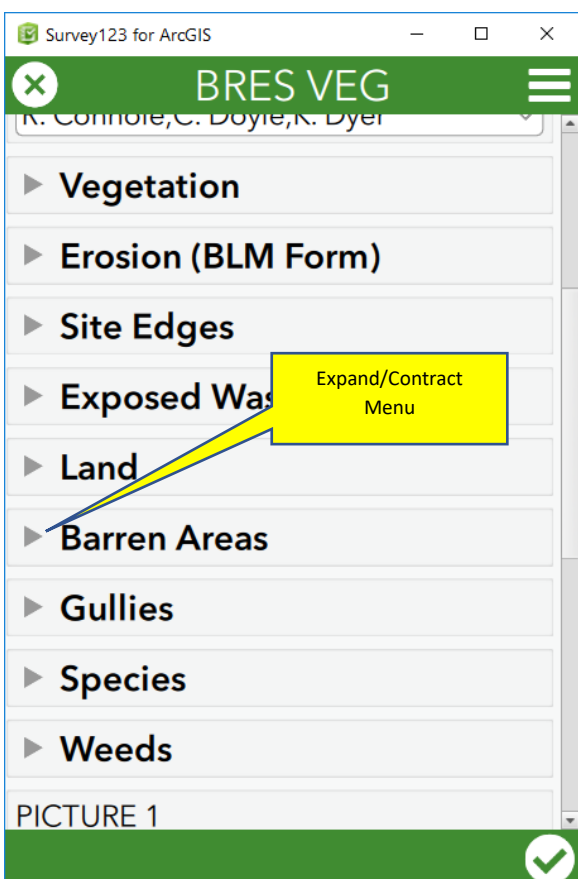
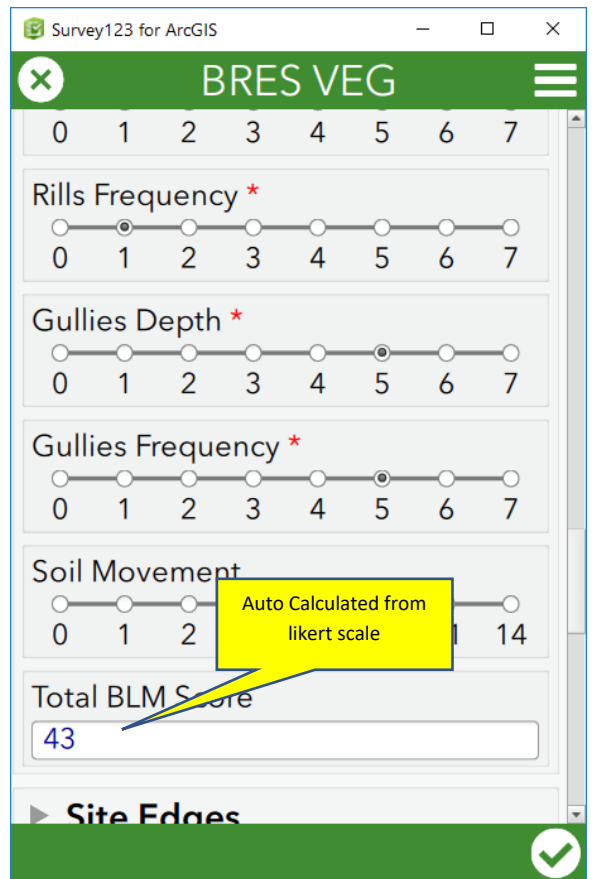
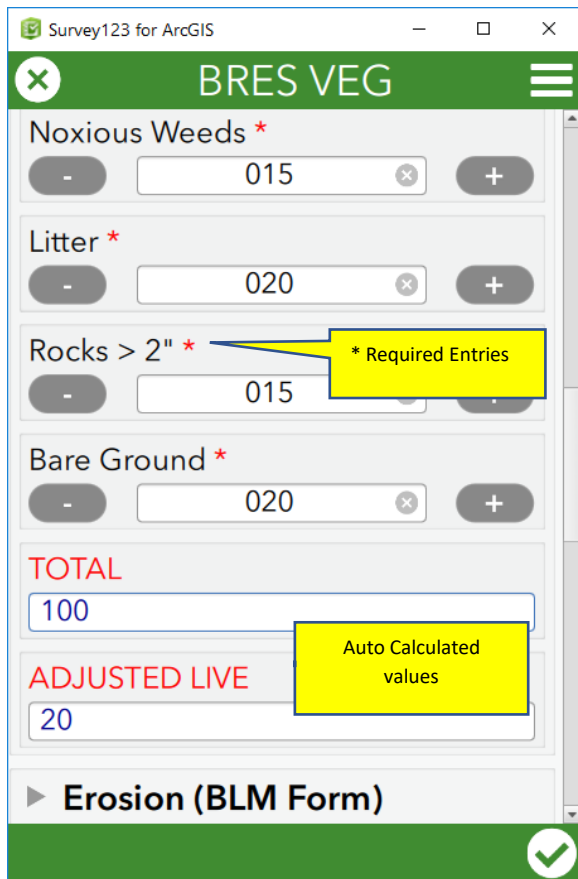
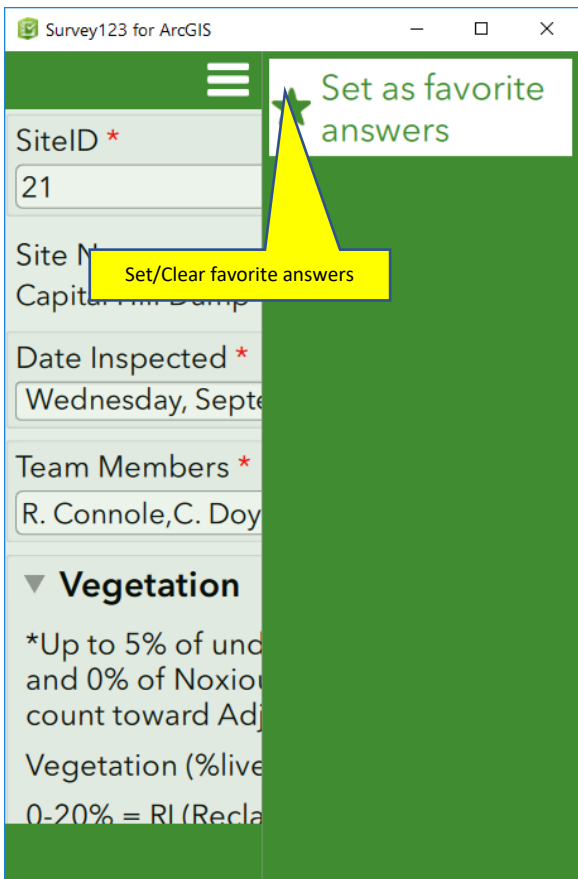
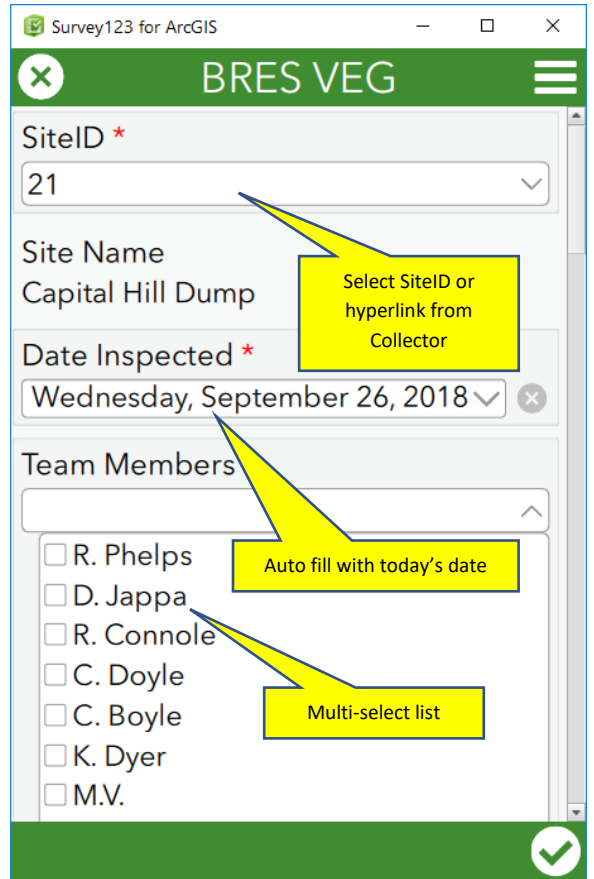
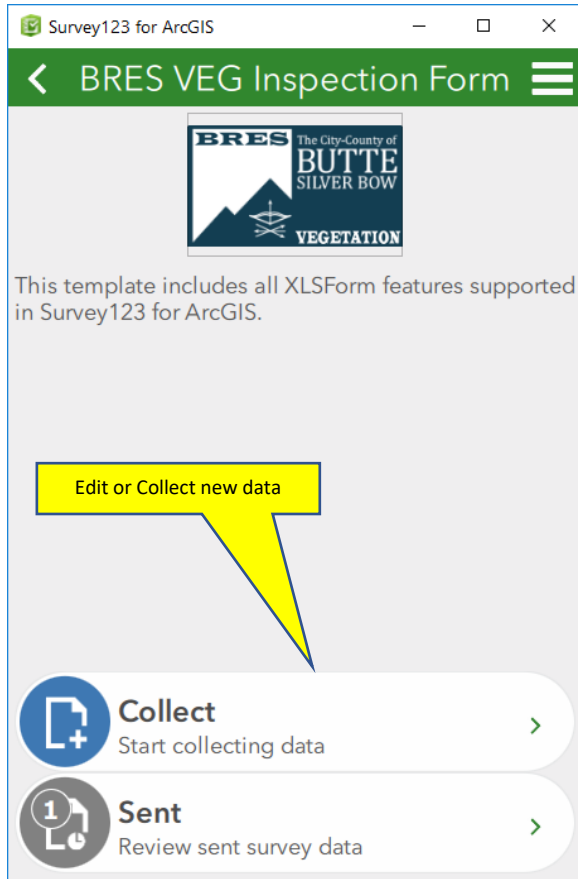
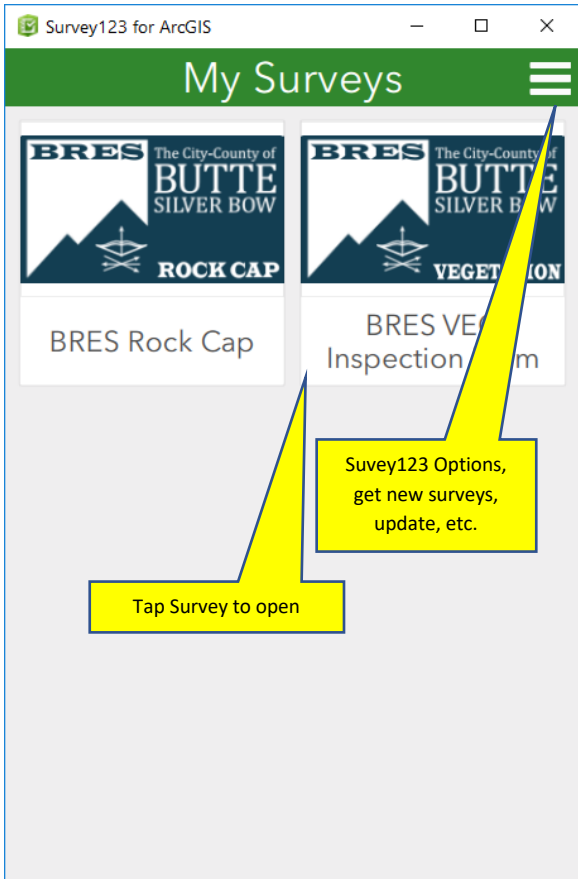
Quick Reference Guides

Appendix A – Quick Reference Guides

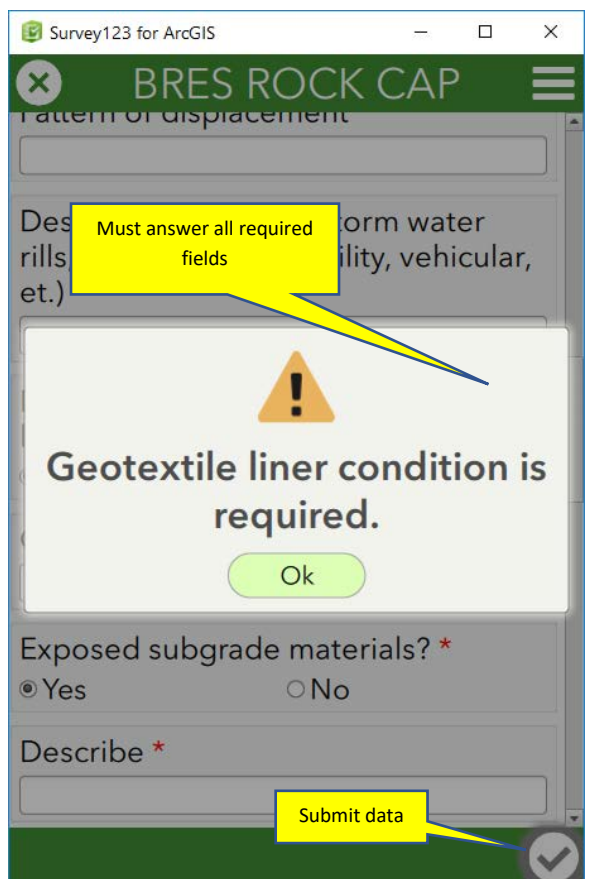
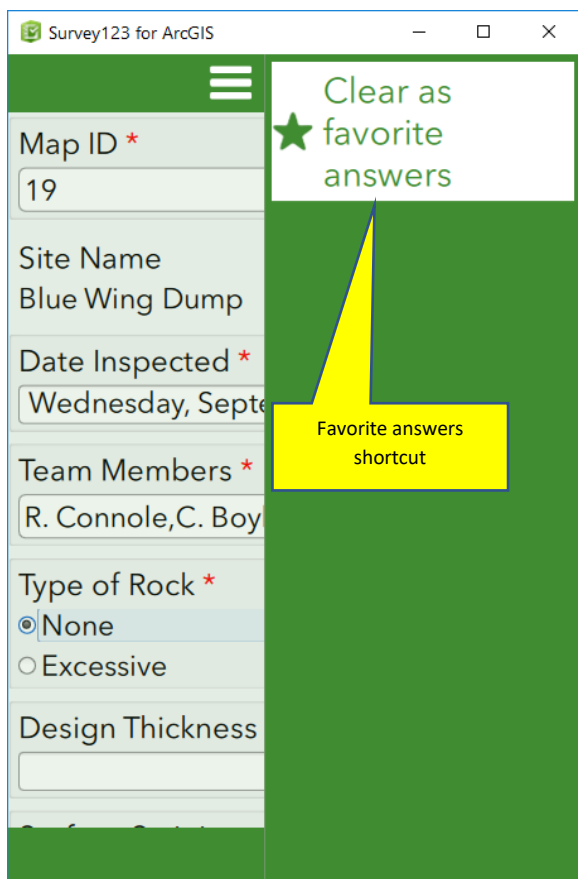
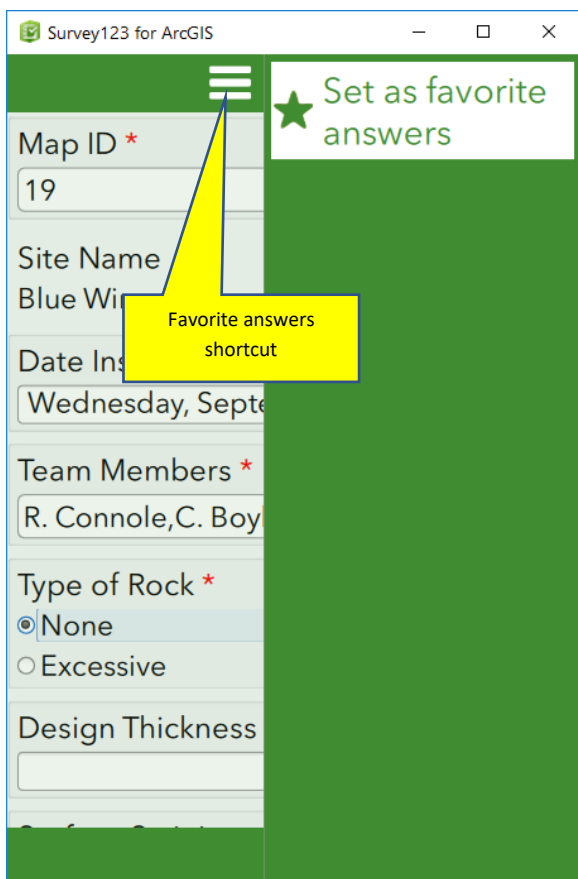
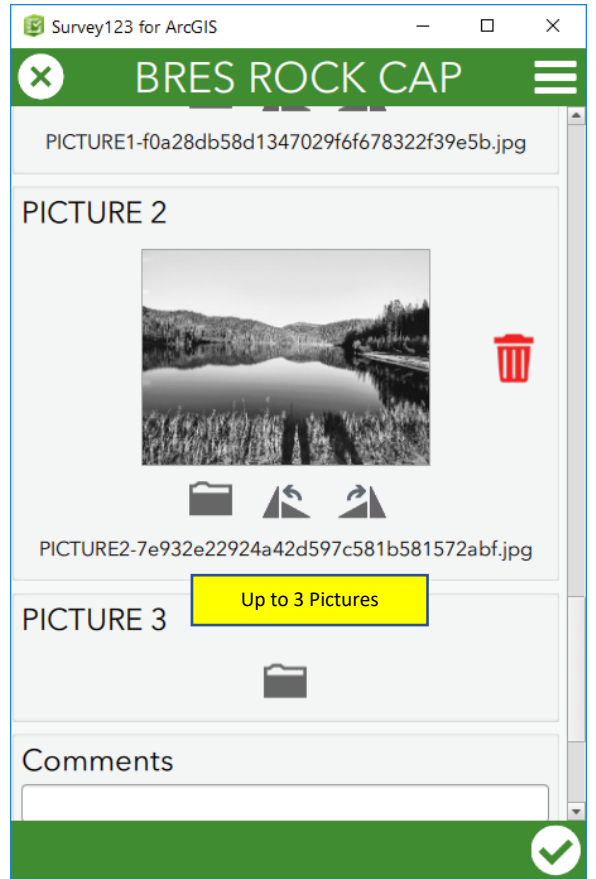
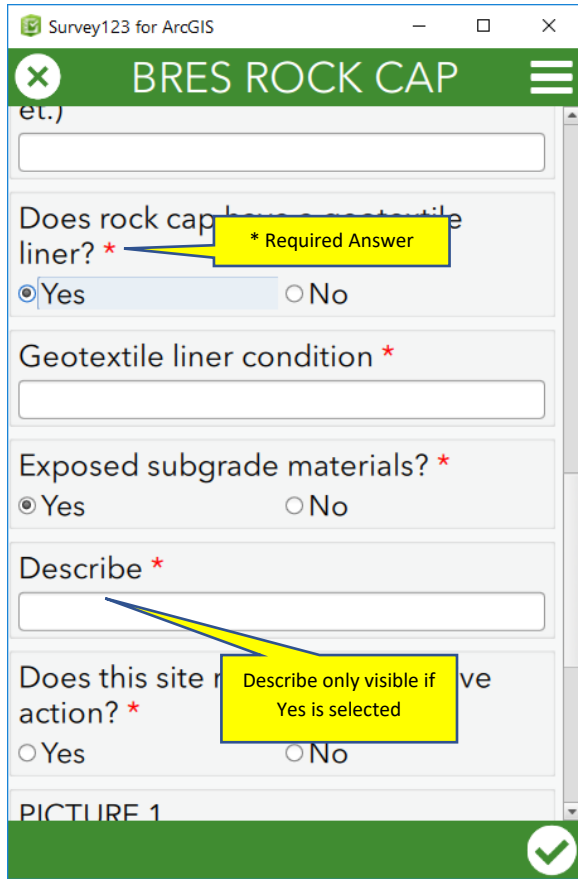
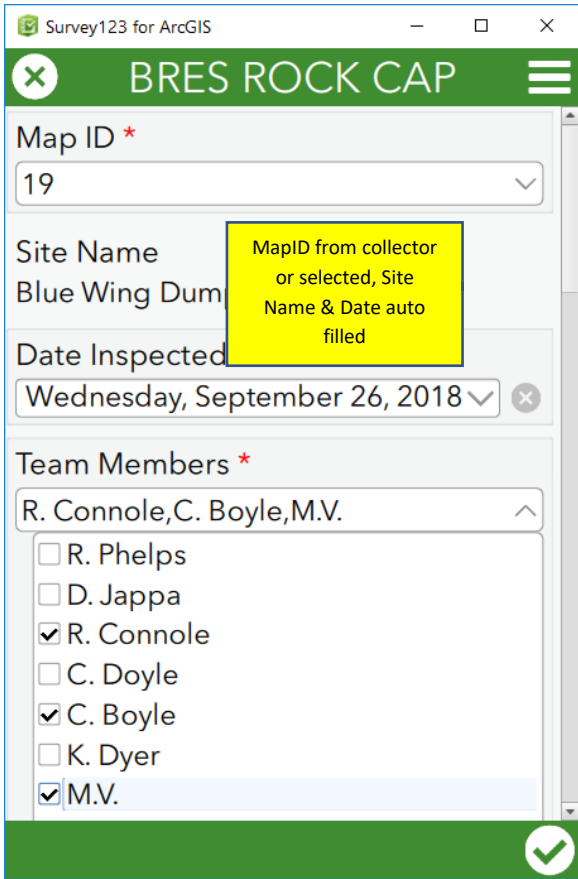
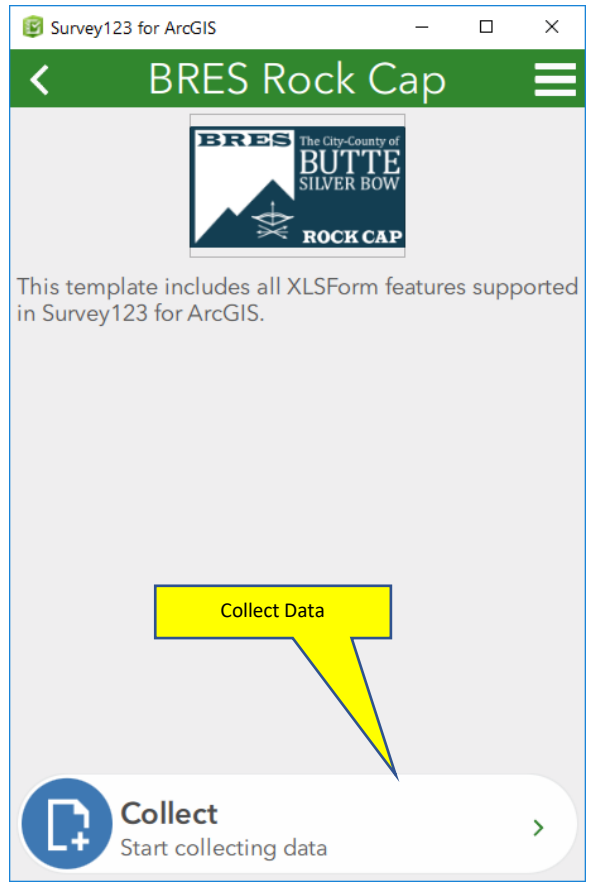
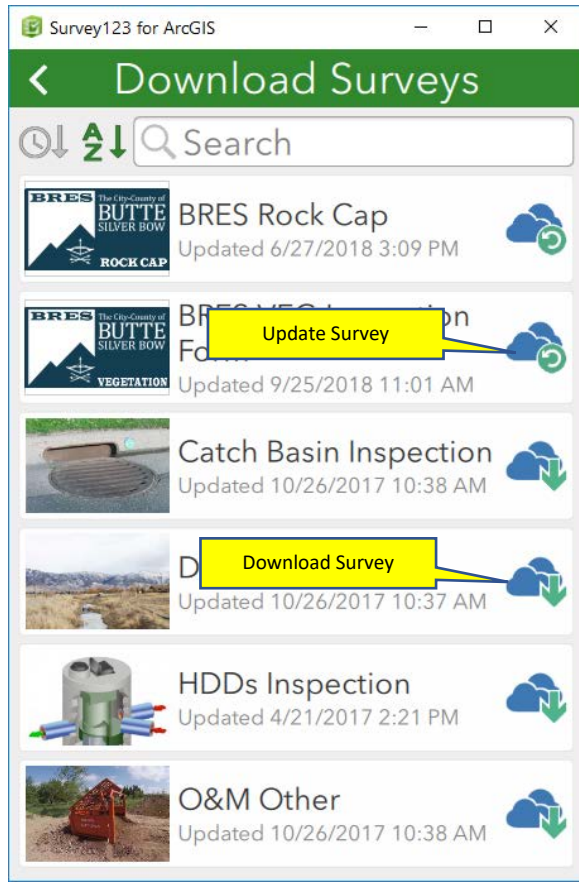
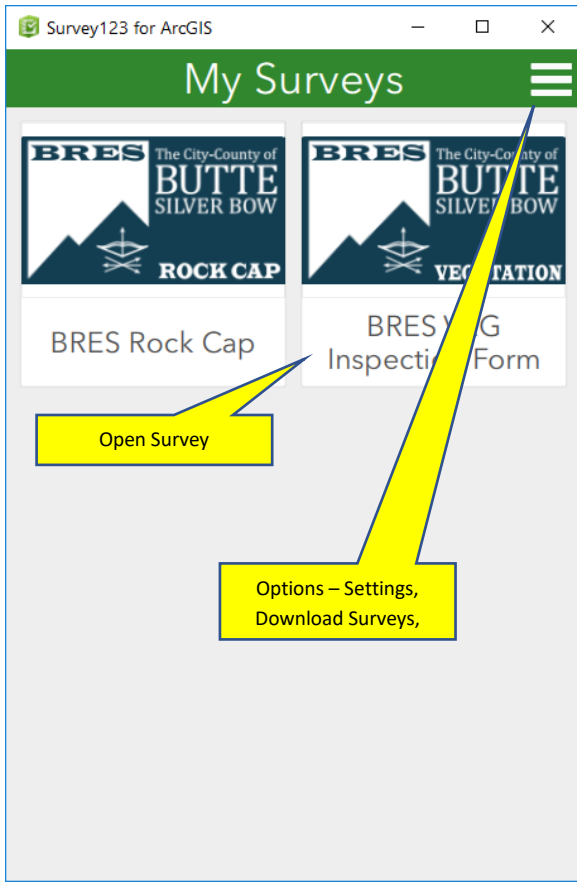
ESRI Collector



Survey123 Vegetation Inspection



Survey123 Rock Cap Inspection



Appendix B

Schema Design of Feature Classes

Feature = Vegetation Inspection			
Name	Field_Type	Alias	Length
objectid	OID	ObjectID	
globalid	GlobalID	GlobalID	38
SiteID	String	SiteID	9
sitecal	String	sitecal	255
SiteName	String	Site Name	255
Date_Insp	Date	Date Inspected	255
TeamM	String	Team Members	255
LiveDesirableSpecies	Integer	Live (desirable species)	
LiveUndesirableWeedySpecies	Integer	Undesirable (weedy species)	
NoxiousWeeds	Integer	Noxious Weeds	
LitterIncMoss	Integer	Litter	
RocksGT2Inches	Integer	Rocks > 2"	
BareGround	Integer	Bare Ground	
Total	Integer	TOTAL	
AdjustedLive	Integer	ADJUSTED LIVE	
blmnote	String	BLM Score 0-55 = M (Monitor) 56-100 = EV (Engineering Evaluation)	255
SurfaceLitter	String	Surface Litter	2
SurfaceRockMovement	String	Surface Rock Movement	2
Pedestalling	String	Pedestalling	2
FlowPatterns	String	Flow Patterns	2
RillsDepth	String	Rills Depth	1
RillsFrequent	String	Rills Frequency	1
GulliesDepth	String	Gullies Depth	1
GulliesFrequency	String	Gullies Frequency	1
SoilMovement	String	Soil Movement	2
TotalBLM	Integer	Total BLM Score	
SiteEdgesYN	String	Are outer edges of the site significantly different than the remainder of the site?	3
LimeRockBarrier	String	Lime Rock Barrier	3
DepositionalArea	String	Depositional Area	3
MoreWeeds	String	More Weeds	3
SteeperSlope	String	Steeper Slope	3
IncreasedErosion	String	Increased Erosion	3
LessVegetation	String	Less Vegetation	3
Gullies	String	Gullies	3
ExposedWasteMaterial	String	Exposed Waste Material?	3
NumberOfAreasWithExposedWaste	Integer	Number of Areas with Exposed Waste	
BulkSoilFailure	String	Bulk Soil Failure	3
Subsidence	String	Subsidence	3
LandSlumps	String	Land Slumps	3
atleast	String	*At Least 75 sq ft. *Not a rock outcrop *Less than 10% total cover (live & litter)	255
BarrenAreasYN	String	Are there barren areas?	3
NumberOfBarrenAreas	Integer	Number Of Barren Areas	
DoBarrenAreasCoverOver25	String	Do barren areas cover over 25% of any polygon?	3
GulliesOver6InchesYN	String	Are there any gullies over 6" in depth	3
AreAnyGulliesActivelyEroding	String	Are any gullies actively eroding	3
DSpecies	String	Dominant	255
FSpecies	String	Frequent	255
ifSpecies	String	Infrequent	255

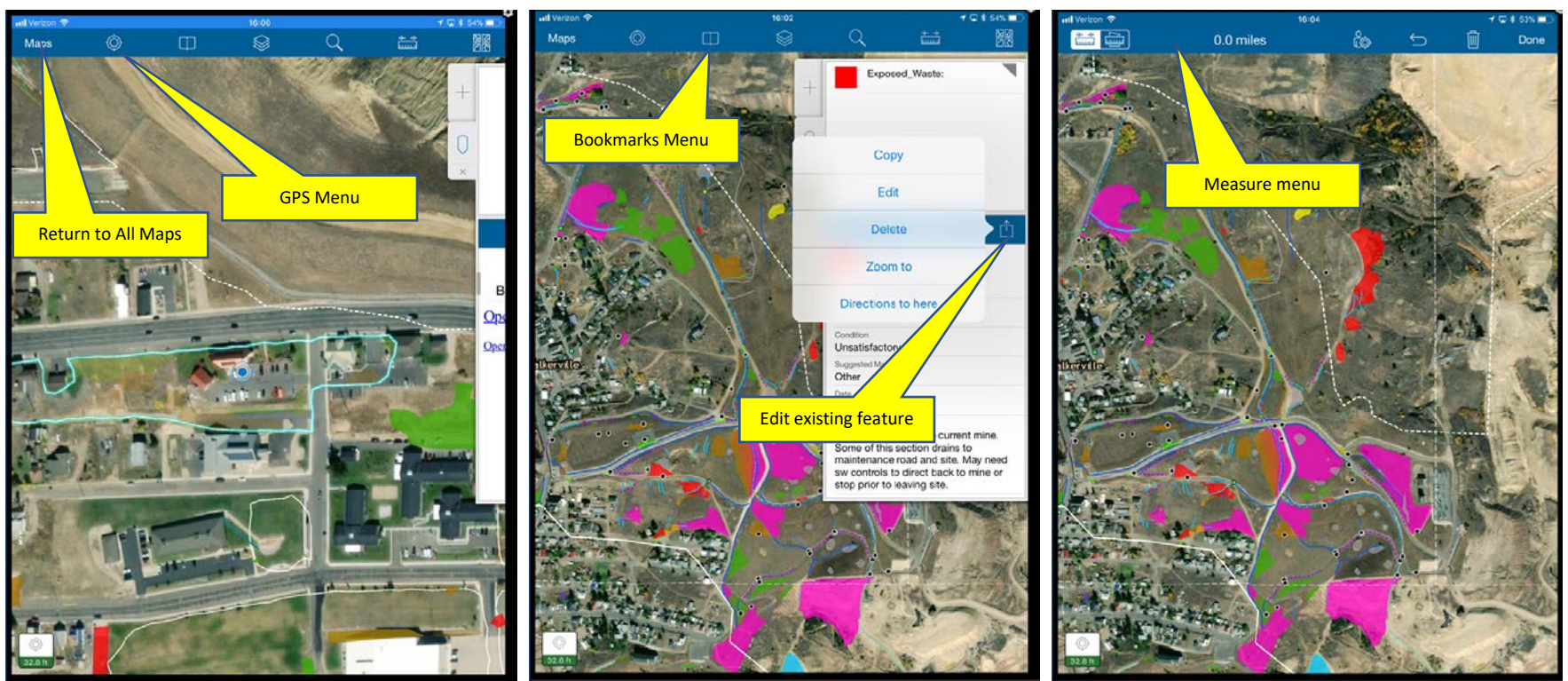
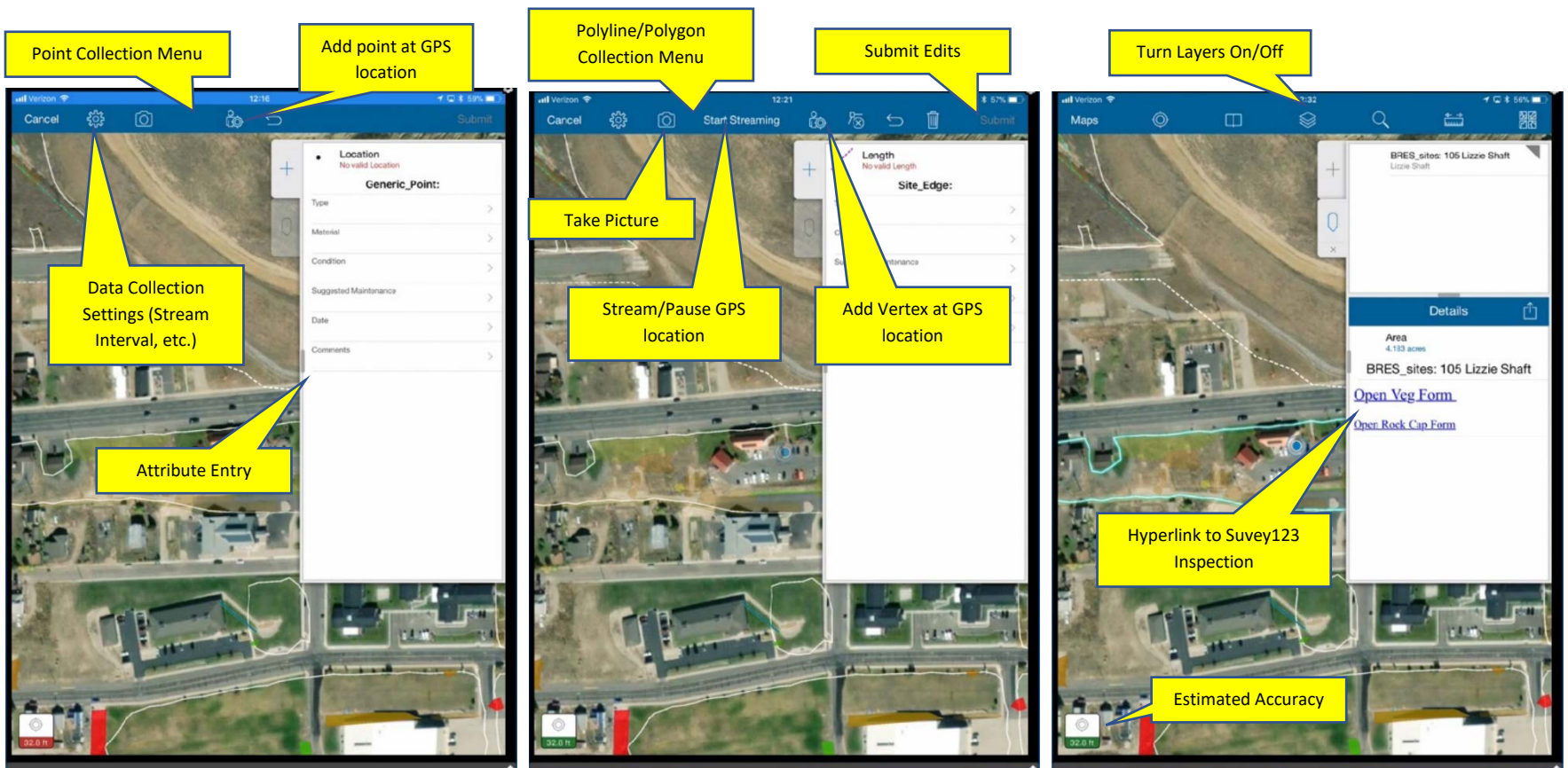
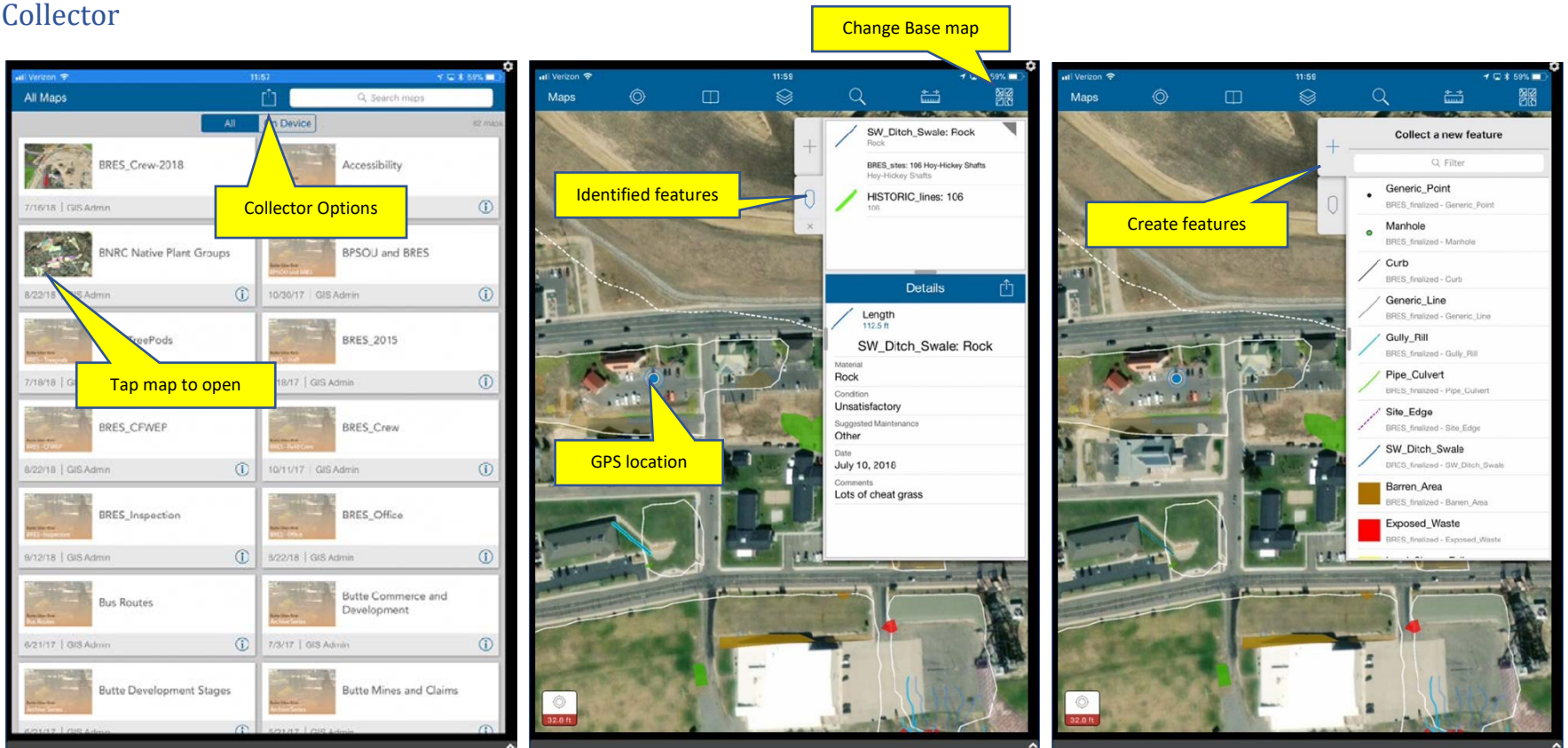
Dweeds	String	Dominant	255
Fweeds	String	Frequent	255
ifweeds	String	Infrequent	255
Comment	String	Comment	255
CreationDate	Date	CreationDate	8
Creator	String	Creator	128
EditDate	Date	EditDate	8
Editor	String	Editor	128

Feature = Rock Cap Inspection			
Name	Field_Type	Alias	Length
objectid	OID	ObjectID	
globalid	GlobalID	GlobalID	38
SiteID	String	Map ID	9
sitecal	String	sitecal	255
SName	String	Site Name	255
Date_Insp	Date	Date Inspected	255
TeamM	String	Team Members	255
ROCK_TYPE	String	Type of Rock	9
DESIGN_THICK	String	Design Thickness	255
SUR_STAIN	String	Surface Staining	255
SUR_STAIN_COMMENT	String	Describe stain pattern/color	255
DISP_ROCK	String	Displaced rock	9
DISP_ROCK_PATT	String	Pattern of displacement	255
MOVEMENT	String	Describe movement (storm water rills	255
GEOTEX_LINER	String	Does rock cap have a geotextile liner?	3
GEOTEX_LINER_COND	String	Geotextile liner condition	255
EXP_SUBGRADE	String	Exposed subgrade materials?	3
EXP_SUBGRADE_DETAIL	String	Describe	255
REQUIRE_CAP	String	Does this site require a corrective action?	3
COMMENTS	String	Comments	255
CreationDate	Date	CreationDate	8
Creator	String	Creator	128
EditDate	Date	EditDate	8
Editor	String	Editor	128

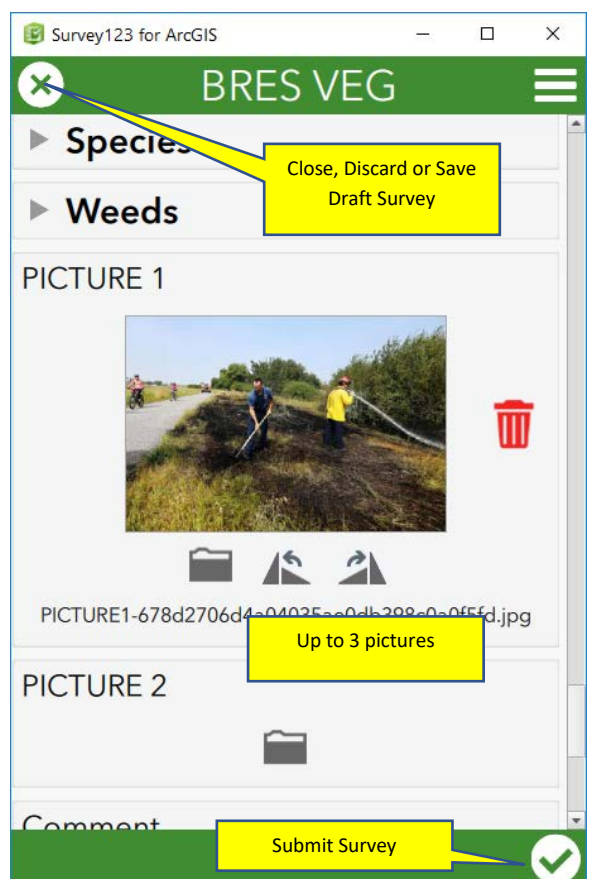
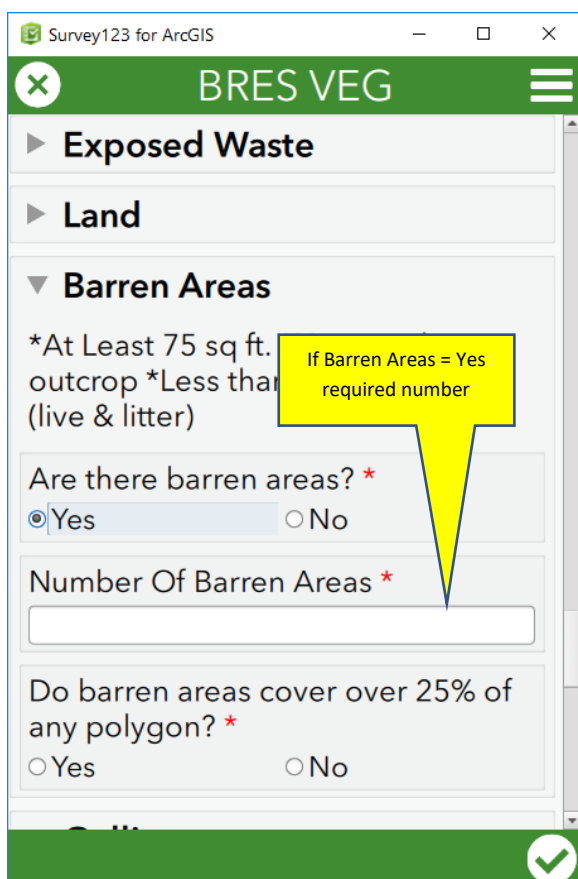
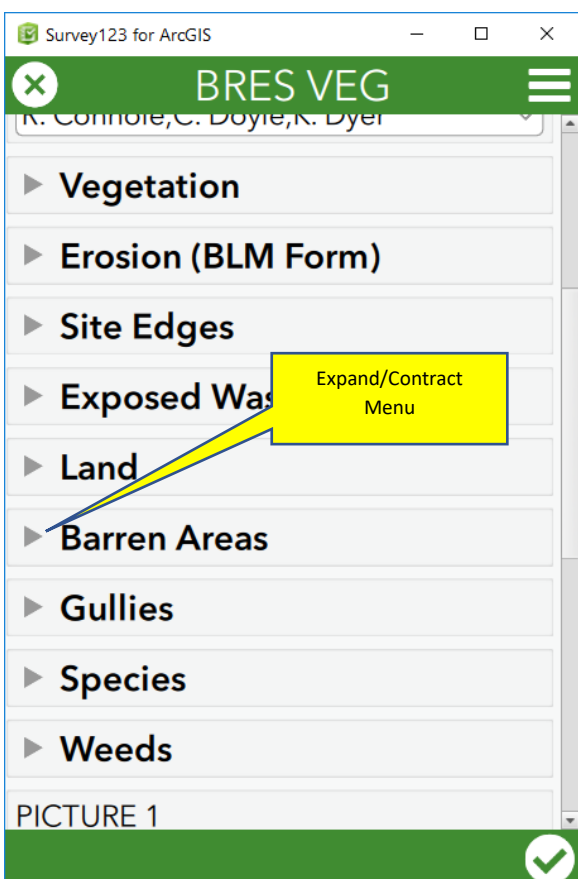
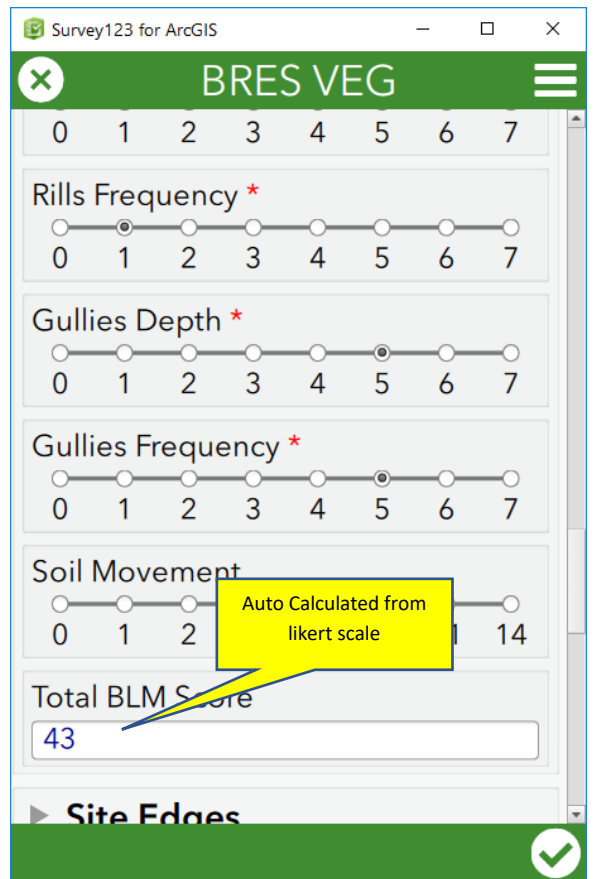
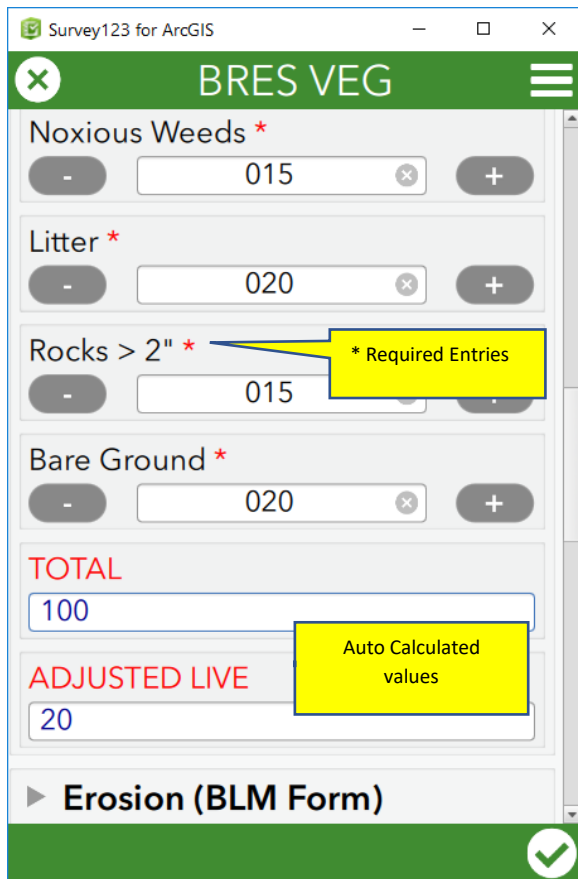
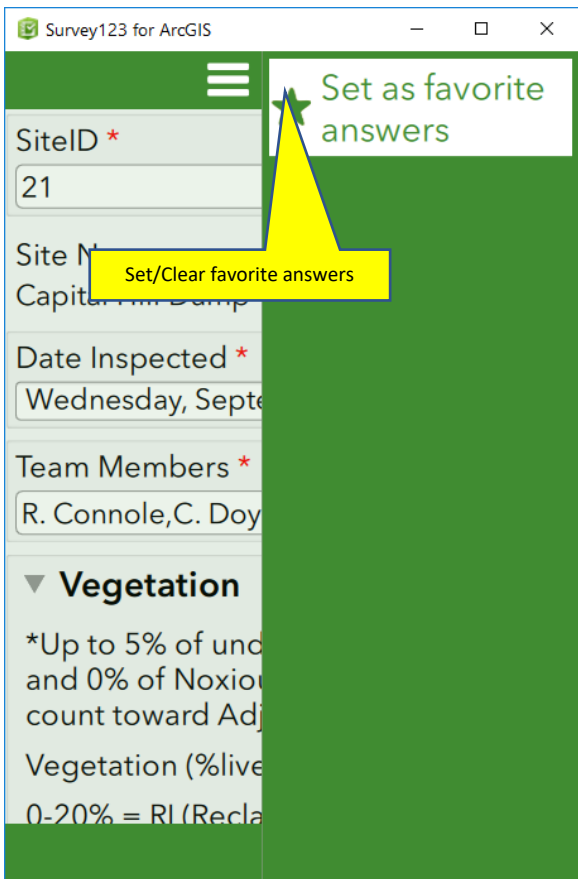
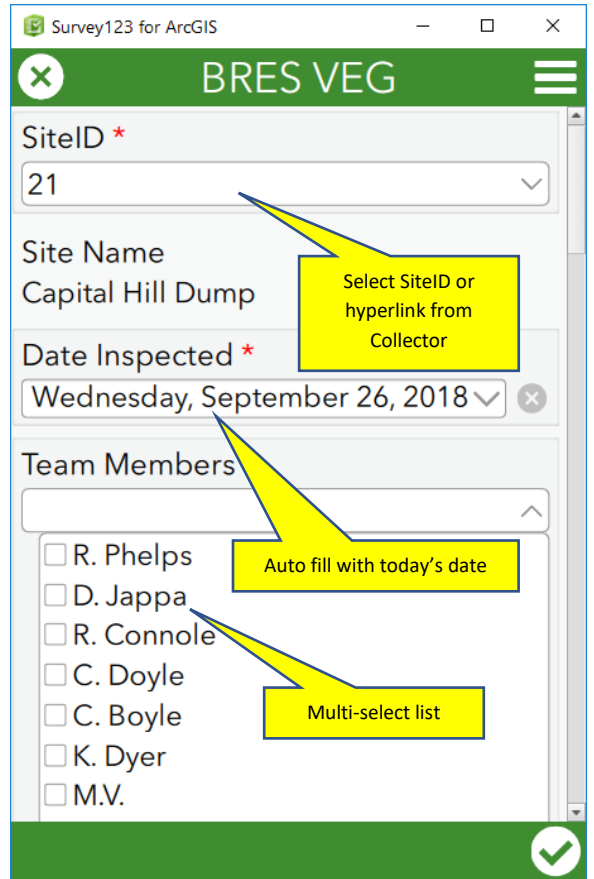
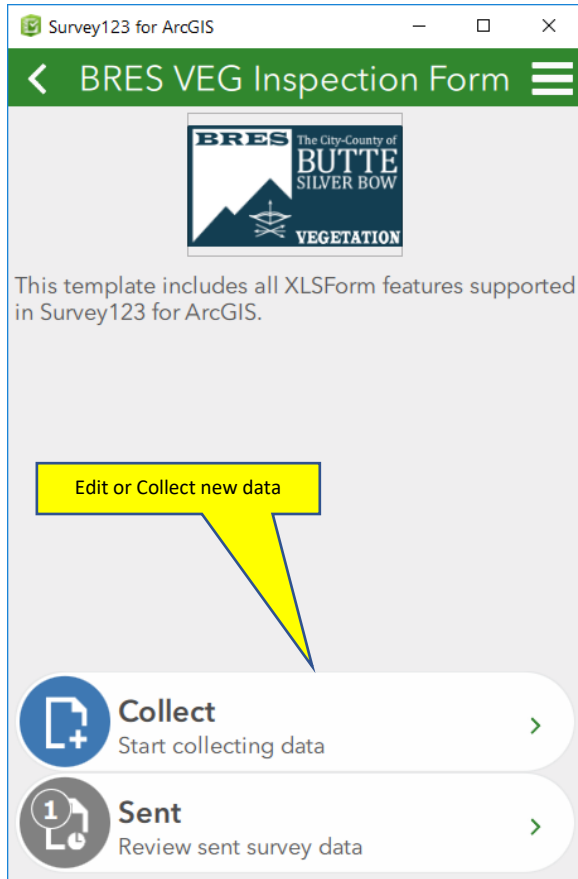
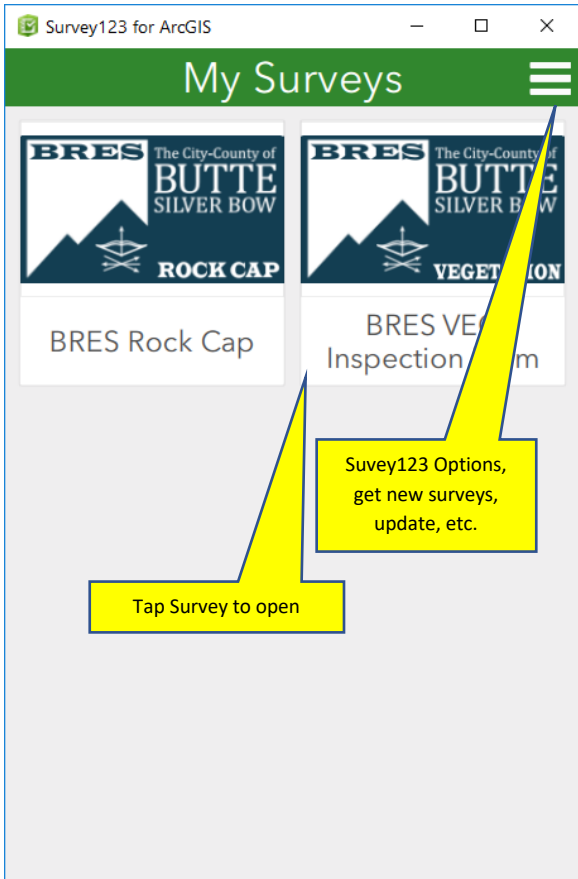
Appendix A.2
Quick Reference Guide to Assist Field Personnel
Performing Assessments

Appendix A – Quick Reference Guides

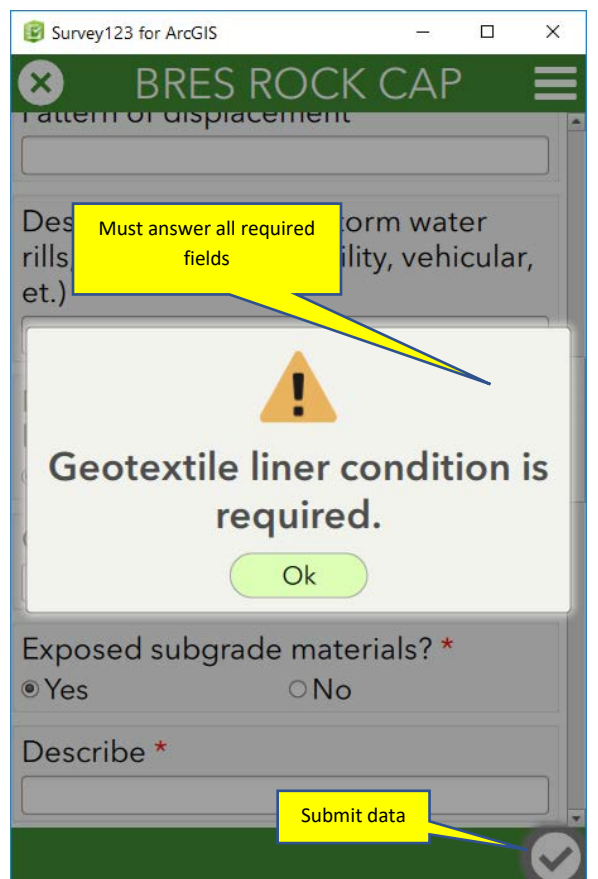
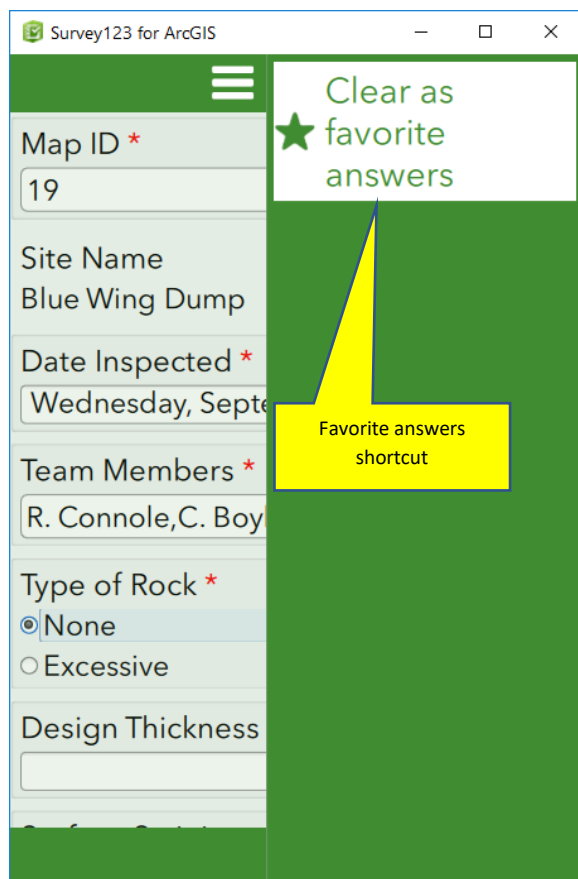
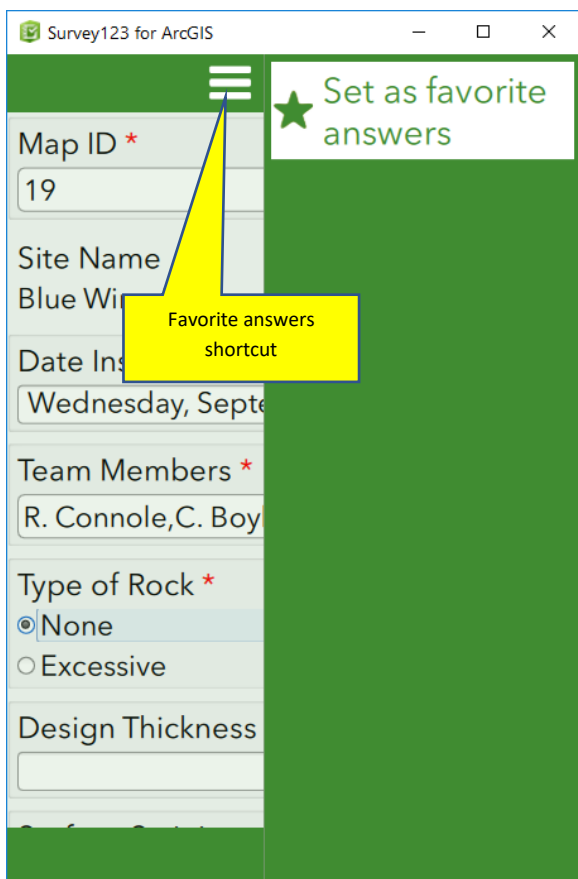
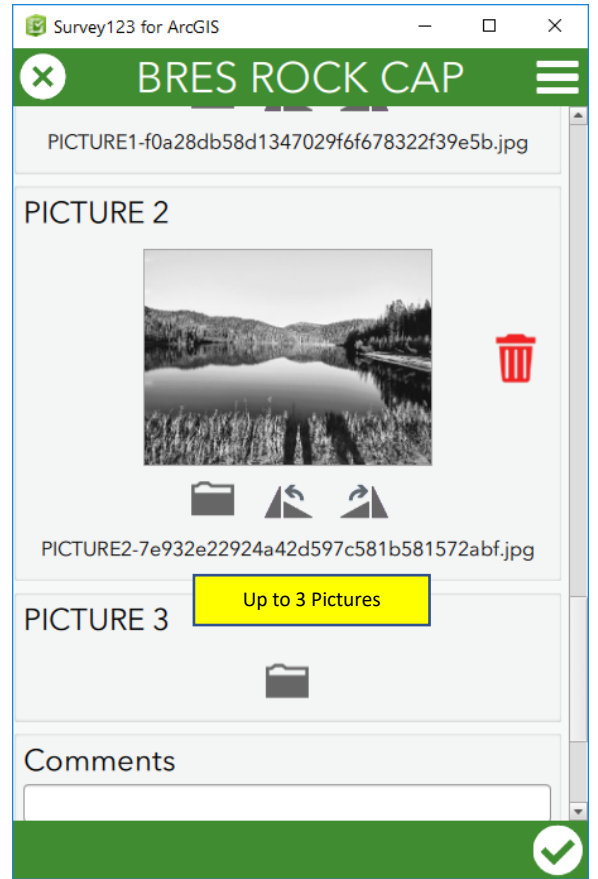
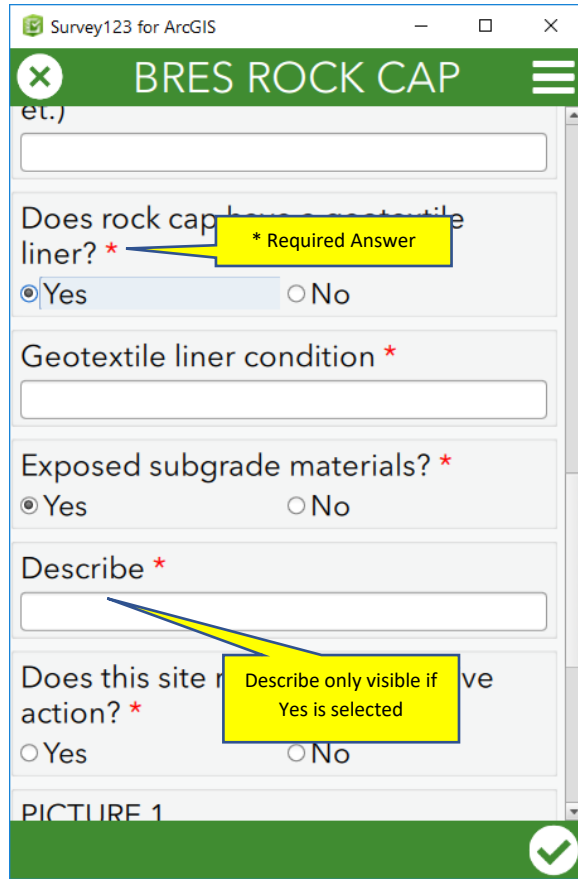
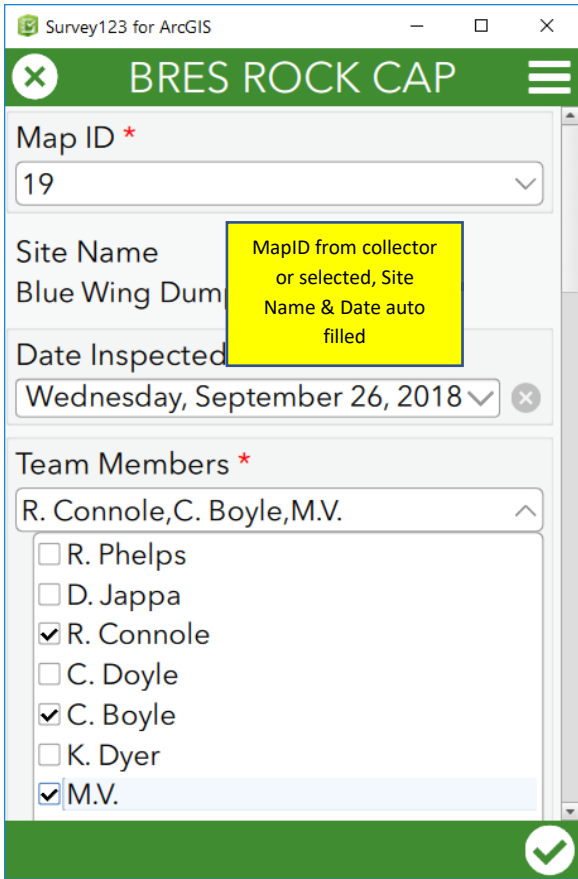
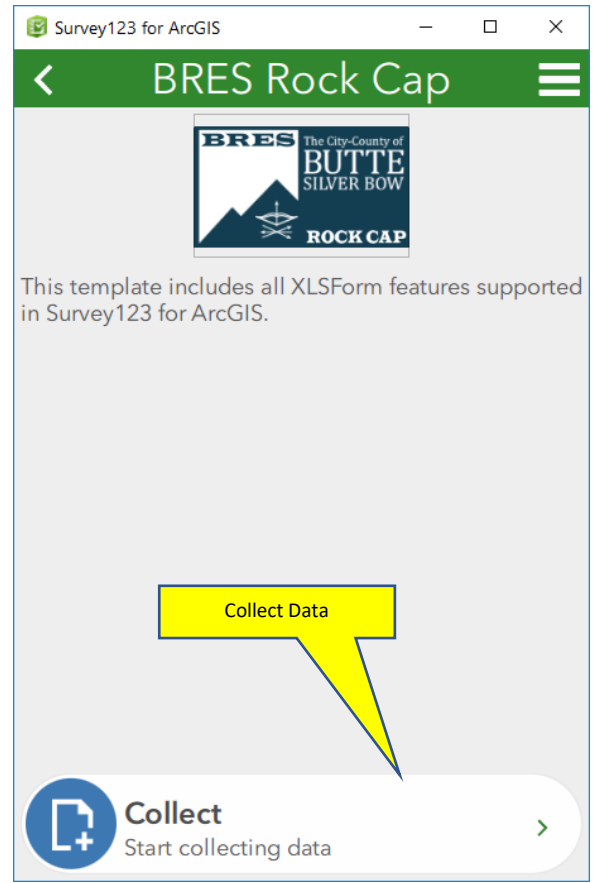
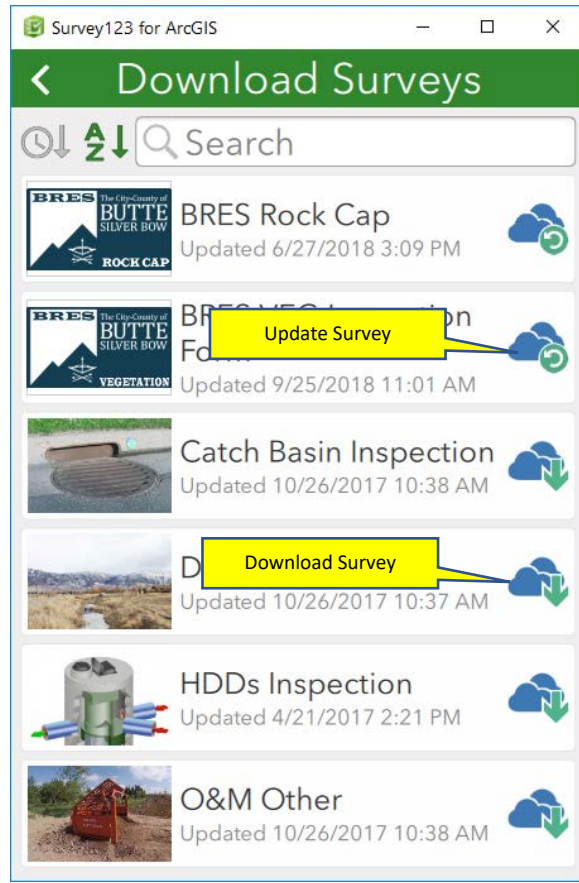
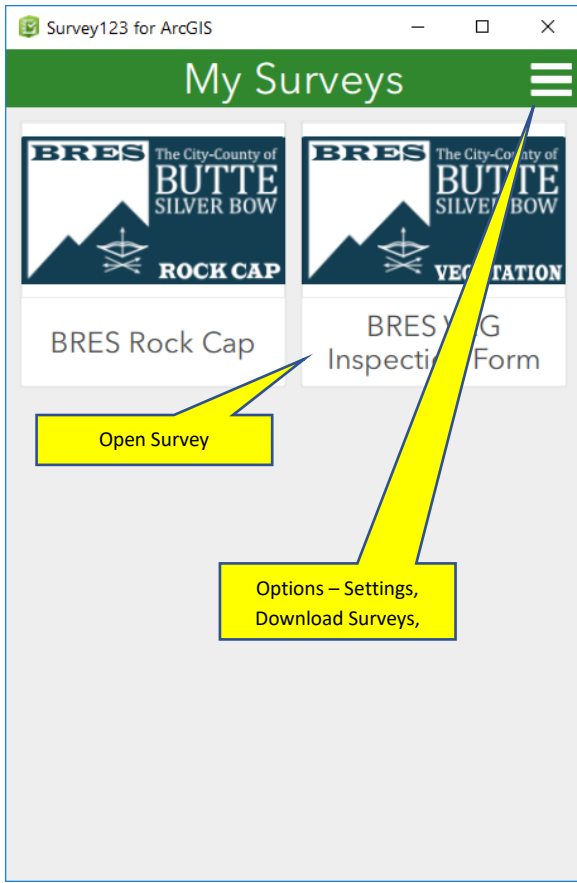
ESRI Collector



Survey123 Vegetation Inspection



Survey123 Rock Cap Inspection



Appendix B

Required Reports

Appendix B.1

Summary and Technical Recommendations Report

**SILVER BOW CREEK/BUTTE AREA NPL SITE
BUTTE PRIORITY SOILS OPERABLE UNIT**

*Reclaimed Areas Maintenance and Monitoring
20XX Evaluations Summary Report*

Butte Silver Bow

January 20XX

**SILVER BOW CREEK/BUTTE AREA NPL SITE
BUTTE PRIORITY SOILS OPERABLE UNIT**

***BPSOU Reclaimed Areas Maintenance and
Monitoring***

20XX Evaluations Summary Report

Prepared for:

US Environmental Protection Agency
US EPA Region 8, Montana Office
Baucus Federal Building
10 West 15th Street, Suite 3200
Helena, Montana 59626

Montana Department of Environmental Quality
Remediation Division
P.O. Box 200901
Helena, Montana 59620-0901

Prepared by:

Butte Silver Bow
155 W. Granite
Butte, Montana 59701

January 20XX

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2.0 SITE SUMMARIES.....	1
2.1 Site Aerial Images.....	1
2.2 Field Evaluation Notes.....	1
3.0 CONCLUSION AND RECOMMENDATIONS.....	1
3.1 Corrective Action Plans	1
3.1.1 Additional Site Sampling.....	1
3.2 Engineering Evaluations	1
3.3 Localize Corrective Action	1
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Figure 1. BPSOU, BRES Quadrant.

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Table 1. Recommendation Summary Report

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LIST OF APPENDICES

Appendix A Field Evaluation Reports

Appendix B Site Aerial Photos

REVISION SUMMARY

Revision No.	Author	Version	Description	Date
0	Name	Draft	Issued for Internal Review	Xx/xx/xxxx
01	Name	Draft Final	Issued for Agency Review	Xx/xx/xxxx

1.0 INTRODUCTION

Add the introduction here or change the title as necessary.

- Date of Site Evaluation – mm/dd/yyyy
- Date of Report – mm/dd/yyyy
- Year of Inspection – yyyy

2.0 SITE SUMMARIES

- Site summaries including conditions and trigger items are provided in tabular format.

2.1 Site Aerial Images

2.2 Field Evaluation Notes

3.0 CONCLUSION AND RECOMMENDATIONS

3.1 Corrective Action Plans

3.1.1 Additional Site Sampling

3.2 Engineering Evaluations

3.3 Localize Corrective Action

3.3.1 Standard Procedures

FIGURES

Figure 1. BPSOU, BRES Quadrant.

TABLES

Table 1. Recommendation Summary Report

Appendix A Field Evaluation Reports

Appendix B Site Aerial Photos

Appendix B.2

Corrective Action Plan

**SILVER BOW CREEK/BUTTE AREA NPL SITE
BUTTE PRIORITY SOILS OPERABLE UNIT**

*BPSOU Reclaimed Areas Maintenance and
Monitoring*

20XX Corrective Action Plan

Butte Silver Bow

January 20XX

**SILVER BOW CREEK/BUTTE AREA NPL SITE
BUTTE PRIORITY SOILS OPERABLE UNIT**

***Reclaimed Areas Maintenance and Monitoring
20XX Corrective Action Plan***

Prepared for:

US Environmental Protection Agency
US EPA Region 8, Montana Office
Baucus Federal Building
10 West 15th Street, Suite 3200
Helena, Montana 59626

Montana Department of Environmental Quality
Remediation Division
P.O. Box 200901
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Prepared by:

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January 20XX

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Appendix A Field Evaluation Reports

Appendix B Sampling and Analysis Plan

REVISION SUMMARY

Revision No.	Author	Version	Description	Date
0	Name	Draft	Issued for Internal Review	Xx/xx/xxxx
01	Name	Draft Final	Issued for Agency Review	Xx/xx/xxxx

1.0 INTRODUCTION

Add the introduction here or change the title as necessary.

- Date of Site Evaluation – mm/dd/yyyy
- Date of Report – mm/dd/yyyy
- Year of Inspection – yyyy

2.0 CORRECTIVE ACTION PLAN SUMMARY

Provide a summary description of BRES Field Evaluations including:

- Polygon related scores and required action;
- Local trigger items

2.1 Polygon Related Scores and Action

2.1.1 Vegetation Score (VI/RI)

2.1.2 Erosion Score (Monitor/Evaluation)

2.2 Local Trigger Items

- Vegetation Related Action Items
- Reclamation Related Action Items
- Erosion Related Action Items
- Site Edges Related Action Items
- Exposed Waste Related Action Items
- Land Slump Related Action Items
- Barren Areas Related Action Items
- Gullies Related Action Items
- Administration Related Action Items

2.3 Summary of Sampling

2.3.1 pH Soil Sampling

2.3.2 Composite Sampling

3.0 SITE SPECIFIC CORRECTIVE ACTION PLAN

Provide specific corrective action to address trigger items(s) described above. Include approximate material quantities, depths, application rates, SMPs, etc.

3.1 Recommendation Summary Report

4.0 REPORTING REQUIREMENTS

A summary final material quantities and equipment to complete corrective actions for each site listed are recorded and used to complete the Annual report.

5.0 SITE REVIEW

Site review may be completed by Agencies and BSB as needed.

6.0 APPROVALS

All CAPs require approval signatures and approval date by:

EPA Representative

Approval Date

MDEQ Representative

Approval Date

Butte Silver Bow Representative:

Approval Date

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Appendix B Sampling and Analysis Plan

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Annual Maintenance Report

**SILVER BOW CREEK/BUTTE AREA NPL SITE
BUTTE PRIORITY SOILS OPERABLE UNIT**

***BPSOU Reclaimed Areas Maintenance and
Monitoring***

20XX Annual Maintenance and Monitoring Report

Butte Silver Bow

March 20XX

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Appendix A Summary Reports

Appendix B Analytical Sample Results

REVISION SUMMARY

Revision No.	Author	Version	Description	Date
0	Name	Draft	Issued for Internal Review	Xx/xx/xxxx
01	Name	Draft Final	Issued for Agency Review	Xx/xx/xxxx

1.0 INTRODUCTION

Add the introduction here or change the title as necessary.

1.1 Quadrant and Year Reported

2.0 BRES DIRECTED CORRECTIVE ACTION SUMMARY

2.1 Boundary Adjustments

2.2 Summary of Corrective Action Plan Implementation

2.2.1 Summary of Field Sampling Results

2.2.2 Summary of Material Removal

2.2.3 Summary of Materials and Labor

2.3 Summary of Erosion Control Systems Installed

3.0 CONVENTIONAL ROUTINE MAINTENANCE SUMMARY

3.1 Site Access and Security

3.2 Fences and Signage

3.3 Trash and Debris

4.0 STORM WATER MAINTENANCE SUMMARY

4.1 Culvert Jetting

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4.3 Repairs

5.0 ISSUES/ADDITIONAL WORK

6.0 CONCLUSION

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Figure 1. BPSOU, BRES Quadrant.

Figure 2. BPSOU, BRES Boundary Adjustments.

Figure 3. BPSOU, Erosion Control Features (as applicable).

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Table 1. Qualitative Summary

Appendix A Summary Reports

Appendix A.1 Recommendations Summary Report

Appendix A.2 Approved Corrective Action Plan

Appendix A.3 Materials and Labor Summary Report

Appendix B Analytical Sample Results

Appendix C
Desired and Undesired Plant Species List and
Plant Guide

NATIVE AND UNDESIRABLE PLANT SPECIES IN THE BUTTE PRIORITY SOILS OPERABLE UNIT

BUTTE-SILVER BOW CITY-COUNTY, MONTANA

Prepared for
BUTTE-SILVER BOW, BUTTE, MONTANA

Prepared by
Robert Pal, Montana Tech



Butte, 2018

Introduction

The goal of material is to provide a plant species list that expands upon the existing species list within the Butte Reclamation Evaluation System (BRES Document). It includes native vascular species (grasses, forbs, trees, and shrubs) making their way into the sites as well as mosses, and lichens not originally included. This list also expands upon the existing undesirable weedy species list within the BRES Document, and includes species found in the field.

This list categorizes only the native and the undesirable weedy species. However, on the BPSOU there are several non-native, but desirable reclamation species, which are listed in a separate section. In the future we strongly advice the use of native species as they are the most adapted to the local habitat conditions, and have long lasting benefits on the reclaimed/restored environment.

Species that are already part of the BRES list are marked **bold** in the following tables.

BPSOU Plant Species List

Native Plant Species

All cryptogamic crust (mosses and lichens) on the sites should be considered as native cover. They perform important ecological functions including carbon fixation, nitrogen fixation, soil stabilization, alter soil albedo and water relations, and affect germination and nutrient levels in vascular plants.

Desirable Species List

Latin Name	Common Name	Original BRES Species	Life Cycle	Lifeform Code	Desirability Code	Origin
<i>Achillea millefolium</i>	Common yarrow	Yes	Perennial	Forb	Acceptable	Native
<i>Agoseris glauca</i>	Mountain dandeloin	Yes	Perennial	Forb	Acceptable	Native
<i>Agropyron smithii</i>	Western wheatgrass	Yes	Perennial	Graminoid	Acceptable	Native
<i>Agropyron trachycaulum</i>	slender wheatgrass	Yes	Perennial	Graminoid	Acceptable	Native
<i>Agrostis scabra</i>	Rough bentgrass	Yes	Perennial	Graminoid	Acceptable	Native
<i>Allium brevistylum</i>	Short-styled onion	No	Perennial	Forb	Acceptable	Native
<i>Allium cernuum</i>	nodding onion	Yes	Perennial	Forb	Acceptable	Native
<i>Allium textile</i>	Textile onion	No	Perennial	Forb	Acceptable	Native
<i>Amsinckia lycopsoides</i>	Tarweed fiddleneck	No	Perennial	Forb	Acceptable	Native
<i>Androsace occidentalis</i>	Western rockjasmine	No	Annual	Forb	Acceptable	Native
<i>Antennaria microphylla</i>	Littleleaf pussytoes	No	Perennial	Forb	Acceptable	Native
<i>Apocynum androsaemifolium</i>	Spreading dogbane	No	Perennial	Forb	Acceptable	Native
Arabis holboellii	Holbøll's Rockcress	Yes	Biennial	Forb	Acceptable	Native
<i>Arctostaphylos uva-ursi</i>	Kinnikinnick	No	Perennial	Forb	Acceptable	Native
<i>Artemisia cana</i>	Silver sagebrush	No	Perennial	Forb	Acceptable	Native
<i>Artemisia drancunculus</i>	Tarragon	No	Perennial	Forb	Acceptable	Native
Artemisia frigida	Fringed sage	Yes	Perennial	Forb	Acceptable	Native
Artemisia ludoviciana	Silver wormwood	Yes	Perennial	Forb	Acceptable	Native
Artemisia tridentata	Big sage	Yes	Perennial	Forb	Acceptable	Native
Aster ascendens	Western aster	Yes	Perennial	Forb	Acceptable	Native
<i>Astragalus atropubescens</i>	Hangingpod milkvetch	No	Perennial	Forb	Acceptable	Native
<i>Astragalus canadensis</i>	Canadian milkvetch	No	Perennial	Forb	Acceptable	Native
<i>Astragalus crassicaarpus</i>	Groundplum milkvetch	No	Perennial	Forb	Acceptable	Native
<i>Astragalus laxmannii</i>	prairie milkvetch	No	Perennial	Forb	Acceptable	Native
Balsamorhiza sagittata	Arrowleaf balsamroot	Yes	Perennial	Forb	Acceptable	Native
Barbarea orthoceras	American yellowrocket	Yes	Perennial	Forb	Acceptable	Native
<i>Beckmannia syzgachne</i>	American sloughgrass	No	Perennial	Forb	Acceptable	Native
Berberis repens	Oregon grape	Yes	Perennial	Forb	Acceptable	Native
<i>Bouteloua gracilis</i>	Blue grama	No	Perennial	Forb	Acceptable	Native
<i>Bromus carinatus</i>	California brome	No	Perennial	Graminoid	Acceptable	Native
<i>Campanula rotundifolia</i>	Bluebell bellflower	No	Perennial	Forb	Acceptable	Native
<i>Carex douglasii</i>	Douglas' sedge	No	Perennial	Graminoid	Acceptable	Native

Latin Name	Common Name	Original BRES Species	Life Cycle	Lifeform Code	Desirability Code	Origin
<i>Carex microptera</i>	Smallwing sedge	No	Perennial	Graminoid	Acceptable	Native
<i>Carex nebrascensis</i>	Nebraska sedge	No	Perennial	Graminoid	Acceptable	Native
<i>Carex rostrata</i>	<i>Beaked sedge</i>	No	Perennial	Graminoid	Acceptable	Native
<i>Castilleja lutescens</i>	Yellow paintbrush	No	Perennial	Forb	Acceptable	Native
<i>Cercocarpus ledifolius</i>	Mountain mahogany	Yes	Perennial	Shrub	Acceptable	Native
<i>Chaenactis douglasii</i>	Dusty maiden	Yes	Perennial	Forb	Acceptable	Native
<i>Chamaesyce glyptosperma</i>	Ribseed sandmat	No	Annual	Forb	Acceptable	Native
<i>Chrisothamnus nauseosus</i>	Rubber rabbitbrush	Yes	Perennial	Shrub	Acceptable	Native
<i>Chrysothamnus viscidiflorus</i>	Green rabbitbrush	No	Perennial	Shrub	Acceptable	Native
<i>Cirsium undulatum</i>	Wavyleaf thistle	Yes	Biennial/Perennial	Forb	Acceptable	Native
<i>Clematis ligusticifolia</i>	Western virgin's bower	No	Perennial	Vine	Acceptable	Native
<i>Cleome serrulata</i>	Rocky Mountain beeplant	Yes	Annual	Forb	Acceptable	Native
<i>Collinsia parviflora</i>	Blue-eyed Mary	No	Annual	Forb	Acceptable	Native
<i>Collomia linearis</i>	Collomia	Yes	Annual	Forb	Acceptable	Native
<i>Comandra umbellata</i>	Bastard toadflax	Yes	Perennial	Forb	Acceptable	Native
<i>Conyza canadensis</i>	Horseweed	No	Annual	Forb	Acceptable	Native
<i>Cornus sericea</i>	Redosier dogwood	No	Perennial	Shrub	Acceptable	Native
<i>Cryptantha celosioides</i>	Miner's candle	No	Biennial/Perennial	Forb	Acceptable	Native
<i>Danthonia unispicata</i>	Onespike danthonia	No	Perennial	Graminoid	Acceptable	Native
<i>Dasiphora fruticosa</i>	Shrubby cinquefoil	Yes	Perennial	Forb	Acceptable	Native
<i>Delphinium bicolor</i>	Low larkspur	No	Perennial	Forb	Acceptable	Native
<i>Deschampsia cespitosa</i>	Tufted hair grass	Yes	Perennial	Graminoid	Acceptable	Native
<i>Distichlis striata</i>	Saltgrass	No	Perennial	Graminoid	Acceptable	Native
<i>Dodecatheon pulchellum</i>	Darkthroat shootingstar	No	Perennial	Forb	Acceptable	Native
<i>Douglasia montana</i>	Douglasia	Yes	Perennial	Forb	Acceptable	Native
<i>Eleocharis palustris</i>	Common spikerush	No	Perennial	Graminoid	Acceptable	Native
<i>Elymus canadensis</i>	Canada wildrye	Yes	Perennial	Graminoid	Acceptable	Native
<i>Elymus elongatus</i>	Tall wheatgrass	Yes	Perennial	Graminoid	Acceptable	Native
<i>Elymus elymoides</i>	Squirreltail	No	Perennial	Graminoid	Acceptable	Native
<i>Elymus hispidus</i>	Intermediate wheatgrass	No	Perennial	Graminoid	Acceptable	Native
<i>Elymus lanceoulatus</i>	Thickspike wheatgrass	Yes	Perennial	Graminoid	Acceptable	Native
<i>Epilobium angustifolium</i>	Fireweed	Yes	Perennial	Forb	Acceptable	Native
<i>Epilobium ciliatum</i>	Fringed willowherb	Yes	Perennial	Forb	Acceptable	Native
<i>Equisetum arvense</i>	Field horsetail	No	Perennial	Forb	Acceptable	Native

Latin Name	Common Name	Original BRES Species	Life Cycle	Lifeform Code	Desirability Code	Origin
<i>Equisetum laevigatum</i>	Smooth horsetail	No	Perennial	Forb	Acceptable	Native
<i>Erigeron compositus</i>	Cutleaf daisy	Yes	Perennial	Forb	Acceptable	Native
<i>Erigeron pumilus</i>	Shaggy daisy	No	Perennial	Forb	Acceptable	Native
<i>Eriogonum ovalifolium</i>	Cushion buckwheat	No	Perennial	Forb	Acceptable	Native
<i>Eriogonum umbellatum</i>	Sulphur buckwheat	No	Perennial	Forb	Acceptable	Native
<i>Erythronium grandiflorum</i>	Yellow avalanche-lily	No	Perennial	Forb	Acceptable	Native
<i>Festuca idahoensis</i>	Idaho fescue	No	Perennial	Graminoid	Acceptable	Native
<i>Fraxinus pennsylvanica</i>	Green ash	Yes	Perennial	Tree	Acceptable	Native
<i>Fritillaria pudica</i>	Yellow fritillary	No	Perennial	Forb	Acceptable	Native
<i>Gaillardia aristata</i>	Blanket flower	Yes	Perennial	Forb	Acceptable	Native
<i>Galium boreale</i>	Northern bedstraw	No	Perennial	Forb	Acceptable	Native
<i>Gaura coccinea</i>	Scarlet gaura	No	Perennial	Forb	Acceptable	Native
<i>Geranium viscosissimum</i>	Sticky geranium	Yes	Perennial	Forb	Acceptable	Native
<i>Geum macrophyllum</i>	Largeleaf avens	No	Perennial	Forb	Acceptable	Native
<i>Geum triflorum</i>	Prairie smoke	No	Perennial	Forb	Acceptable	Native
<i>Grindelia squarrosa</i>	Curlycup gumweed	Yes	Perennial	Forb	Acceptable	Native
<i>Gutierrezia sarothrae</i>	Broom snakeweed	No	Perennial	Shrub	Acceptable	Native
<i>Hedysarum boreale</i>	Utah sweetvetch	No	Perennial	Forb	Acceptable	Native
<i>Hedysarum occidentale</i>	Western sweetvetch	No	Perennial	Forb	Acceptable	Native
<i>Helianthus annuus</i>	Common sunflower	Yes	Annual	Forb	Acceptable	Native
<i>Heterotheca villosa</i>	Golden aster	Yes	Perennial	Forb	Acceptable	Native
<i>Heuchera cylindrical</i>	Roundleaf alumroot	No	Perennial	Forb	Acceptable	Native
<i>Ipomopsis aggregate</i>	Scarlet gilia	No	Perennial	Forb	Acceptable	Native
<i>Iris missouriensis</i>	Rocky Mountain iris	No	Perennial	Forb	Acceptable	Native
<i>Juncus balticus</i>	Baltic rush	Yes	Perennial	Graminoid	Acceptable	Native
<i>Juniperus communis</i>	Common juniper	Yes	Perennial	Shrub/Tree	Acceptable	Native
<i>Juniperus horizontalis</i>	Creeping juniper	No	Perennial	Shrub/Tree	Acceptable	Native
<i>Juniperus scopulorum</i>	Rocky Mountain juniper	Yes	Perennial	Shrub/Tree	Acceptable	Native
<i>Koeleria cristata</i>	Prairie Junegrass	No	Perennial	Graminoid	Acceptable	Native
<i>Lappula occidentalis</i>	Western stickweed	No	Annual/Biennial	Forb	Acceptable	Native
<i>Lemna minor</i>	Common duckweed	No	Perennial	Forb	Acceptable	Native
<i>Lewisia rediviva</i>	Bitterroot	No	Perennial	Forb	Acceptable	Native
<i>Leymus cinereus</i>	Great Basin wildrye	Yes	Perennial	Graminoid	Acceptable	Native
<i>Liatris punctata</i>	Dotted blazing star	No	Perennial	Forb	Acceptable	Native

Latin Name	Common Name	Original BRES Species	Life Cycle	Lifeform Code	Desirability Code	Origin
<i>Linum lewisii</i>	Wild blue flax	Yes	Perennial	Forb	Acceptable	Native
<i>Lithospermum ruderale</i>	Western groomwell	Yes	Perennial	Forb	Acceptable	Native
<i>Lomatium triternatum</i>	Nineleaf biscuitroot	No	Perennial	Forb	Acceptable	Native
<i>Lupinus sericeus</i>	Silky lupine	No	Perennial	Forb	Acceptable	Native
<i>Machaeranthera canescens</i>	Hoary tansyaster	Yes	Perennial	Forb	Acceptable	Native
<i>Maianthemum stellatum</i>	Starry false lily of the valley	No	Perennial	Forb	Acceptable	Native
<i>Mentha arvensis</i>	Wild mint	No	Perennial	Forb	Acceptable	Native
<i>Mentzelia laevicaulis</i>	Blazing star	No	Perennial	Forb	Acceptable	Native
<i>Mertensia oblongifolia</i>	Oblongleaf bluebells	No	Perennial	Forb	Acceptable	Native
<i>Oenothera biennis</i>	Common evening primrose	Yes	Perennial	Forb	Acceptable	Native
<i>Oryzopsis hymenoides</i>	Indian ricegrass	Yes	Perennial	Graminoid	Acceptable	Native
<i>Panicum capillare</i>	Witchgrass	Yes	Annual	Graminoid	Acceptable	Native
<i>Panicum virgatum</i>	Switchgrass	No	Perennial	Graminoid	Acceptable	Native
<i>Pascopyrum smithii</i>	Western wheatgrass	No	Perennial	Graminoid	Acceptable	Native
<i>Penstemon aridus</i>	Stiffleaf penstemon	No	Perennial	Forb	Acceptable	Native
<i>Penstemon eatonii</i>	Firecracker penstemon	No	Perennial	Forb	Acceptable	Native
<i>Penstemon eriantherus</i>	Fuzzytongue penstemon	No	Perennial	Forb	Acceptable	Native
<i>Penstemon procerus</i>	Small-flowered penstemon	No	Perennial	Forb	Acceptable	Native
<i>Phacelia hastata</i>	Silverleaf phacelia	Yes	Perennial	Forb	Acceptable	Native
<i>Phacelia linearis</i>	Threadleaf phacelia	No	Annual	Forb	Acceptable	Native
<i>Philadelphus lewisii</i>	Mockorange	No	Perennial	Shrub	Acceptable	Native
<i>Phlox hoodii</i>	Spiny phlox	No	Perennial	Forb	Acceptable	Native
<i>Pinus contorta</i>	Lodgepole pine	Yes	Perennial	Tree	Acceptable	Native
<i>Pinus flexilis</i>	Limber pine	Yes	Perennial	Tree	Acceptable	Native
<i>Pinus ponderosa</i>	Ponderosa pine	Yes	Perennial	Tree	Acceptable	Native
<i>Plantago patagonica</i>	Woolly plantain	No	Annual	Forb	Acceptable	Native
<i>Poa palustris</i>	Fowl Bluegrass	Yes	Perennial	Graminoid	Acceptable	Native
<i>Poa secunda</i>	Sandberg bluegrass	Yes	Perennial	Graminoid	Acceptable	Native
<i>Poa stenantha</i>	Northern bluegrass	No	Perennial	Graminoid	Acceptable	Native
<i>Polemonium pulcherrimum</i>	Jacob's-ladder	No	Perennial	Forb	Acceptable	Native
<i>Populus angustifolia</i>	Narrowleaf cottonwood	Yes	Perennial	Tree	Acceptable	Native
<i>Populus balsamifera</i>	Balsam poplar	No	Perennial	Tree	Acceptable	Native
<i>Populus deltoides</i>	Eastern cottonwood	No	Perennial	Tree	Acceptable	Native

Latin Name	Common Name	Original BRES Species	Life Cycle	Lifeform Code	Desirability Code	Origin
<i>Populus tremuloides</i>	Quaking aspen	Yes	Perennial	Tree	Acceptable	Native
<i>Populus x acuminata</i> = <i>P. deltoides</i> + <i>P. angustifolia</i>	Lanceleaf cottonwood	Yes	Perennial	Tree	Acceptable	Native
<i>Potamogeton pectinatus</i>	Fennel-leaved pondweed	No	Perennial	Forb	Acceptable	Native
<i>Potentilla anserina</i>	Silverweed cinquefoil	No	Perennial	Forb	Acceptable	Native
<i>Potentilla gracilis</i>	Slender cinquefoil	No	Perennial	Forb	Acceptable	Native
<i>Prunus virginiana</i>	Chokecherry	Yes	Perennial	Shrub/Tree	Acceptable	Native
<i>Pseudoroegneria spicata</i>	Bluebunch wheatgrass	Yes	Perennial	Graminoid	Acceptable	Native
<i>Pseudotsuga menziesii</i>	Douglas-fir	Yes	Perennial	Tree	Acceptable	Native
<i>Purshia tridentata</i>	Antelope bitterbrush	Yes	Perennial	Shrub	Acceptable	Native
<i>Ranunculus glaberrimus</i>	Sagebrush buttercup	No	Perennial	Forb	Acceptable	Native
<i>Ratibida columnifera</i>	Prairie coneflower	Yes	Perennial	Forb	Acceptable	Native
<i>Ribes aureum</i>	Golden currant	No	Perennial	Shrub	Acceptable	Native
<i>Ribes cereum</i>	Wax currant	No	Perennial	Shrub	Acceptable	Native
<i>Ribes inerme</i>	Whitestem gooseberry	No	Perennial	Shrub	Acceptable	Native
<i>Rosa woodsii</i>	Wood's Rose	Yes	Perennial	Shrub	Acceptable	Native
<i>Rubus idaeus</i>	American red raspberry	Yes	Perennial	Shrub	Acceptable	Native
<i>Rumex salicifolius</i>	Willow dock	Yes	Perennial	Forb	Acceptable	Native
<i>Salix boothii</i>	Blueberry willow	No	Perennial	Shrub	Acceptable	Native
<i>Salix exigua</i>	Narrowleaf willow	No	Perennial	Shrub	Acceptable	Native
<i>Salix geyeriana</i>	Geyer willow	No	Perennial	Shrub	Acceptable	Native
<i>Sambucus racemosa</i>	Red Elderberry	No	Perennial	Shrub	Acceptable	Native
<i>Sarcobatus vermiculatus</i>	Greasewood	No	Perennial	Shrub	Acceptable	Native
<i>Scirpus pallidus</i>	Pale bulrush	No	Perennial	Graminoid	Acceptable	Native
<i>Sedum stenopetalum</i>	Wormleaf stonecrop	No	Perennial	Forb	Acceptable	Native
<i>Senecio integerrimus</i>	Lambstongue ragwort	No	Perennial	Forb	Acceptable	Native
<i>Shepherdia canadensis</i>	Buffaloberry	No	Perennial	Shrub	Acceptable	Native
<i>Solidago canadensis</i>	Canada goldenrod	No	Perennial	Forb	Acceptable	Native
<i>Solidago gigantea</i>	Giant goldenrod	Yes	Perennial	Forb	Acceptable	Native
<i>Solidago missouriensis</i>	Missouri goldenrod	No	Perennial	Forb	Acceptable	Native
<i>Sorbus scopulina</i>	Greene's mountain ash	No	Perennial	Shrub/Tree	Acceptable	Native
<i>Sphaeralcea coccinea</i>	Scarlet globemallow	No	Perennial	Forb	Acceptable	Native
<i>Stellaria longifolia</i>	Longleaf starwort	No	Perennial	Forb	Acceptable	Native
<i>Stenotus acaulis</i>	Stemless mock goldenweed	No	Perennial	Shrub	Acceptable	Native

Latin Name	Common Name	Original BRES Species	Life Cycle	Lifeform Code	Desirability Code	Origin
<i>Stipa comata</i>	Needle-and-thread	Yes	Perennial	Graminoid	Acceptable	Native
<i>Stipa viridula</i>	Green needlegrass	Yes	Perennial	Graminoid	Acceptable	Native
<i>Symphoricarpos albus</i>	White snowberry	No	Perennial	Shrub	Acceptable	Native
<i>Symphyotrichum spathulatum</i>	Western mountain aster	No	Perennial	Forb	Acceptable	Native
<i>Tetradymia canescens</i>	Spineless horsebrush	No	Perennial	Shrub	Acceptable	Native
<i>Thalictrum occidentale</i>	Western meadow-rue	No	Perennial	Forb	Acceptable	Native
<i>Thermopsis montana</i>	Mountain goldenbanner	No	Perennial	Forb	Acceptable	Native
<i>Verbena bracteata</i>	Bracted vervain	Yes	Perennial	Forb	Acceptable	Native
<i>Veronica americana</i>	American speedwell	No	Perennial	Forb	Acceptable	Native
<i>Vicia americana</i>	American vetch	No	Perennial	Forb	Acceptable	Native
<i>Viola nuttallii</i>	Nuttall's violet	No	Perennial	Forb	Acceptable	Native
<i>Zigadenus elegans</i>	Mountain death camas	No	Perennial	Forb	Acceptable	Native

Non-Native Desirable Species

Latin Name	Common Name	Original BRES	Life Cycle	Lifeform Code	Desirability Code	Origin
<i>Agropyron cristatum</i>	Crested wheatgrass	Yes	Perennial	Graminoid	Acceptable	Exotic
<i>Agrostis stolonifera</i>	Redtop	Yes	Perennial	Graminoid	Acceptable	Exotic
<i>Astragalus cicer</i>	Cicer milkvetch	Yes	Perennial	Forb	Acceptable	Exotic
<i>Bromus inermis</i>	Smooth brome	No	Perennial	Graminoid	Acceptable	Exotic
<i>Dactylis glomerata</i>	Orchard grass	Yes	Perennial	Graminoid	Acceptable	Exotic
<i>Festuca ovina</i>	Sheep fescue	Yes	Perennial	Graminoid	Acceptable	Exotic
<i>Festuca pratensis</i>	Meadow fescue	Yes	Perennial	Graminoid	Acceptable	Exotic
<i>Festuca rubra</i>	Red fescue	No	Perennial	Graminoid	Acceptable	Exotic
<i>Lotus corniculatus</i>	Bird's-foot trefoil	Yes	Perennial	Forb	Acceptable	Exotic
<i>Malus domestica</i>	Apple	No	Perennial	Forb	Acceptable	Exotic
<i>Medicago sativa</i>	Alfalfa	Yes	Perennial	Forb	Acceptable	Exotic
<i>Melilotus officinalis</i>	Yellow Sweetclover	Yes	Annual/Biennial/Perennial	Forb	Acceptable	Exotic
<i>Phleum pretense</i>	Timothy grass	Yes	Perennial	Graminoid	Acceptable	Exotic
<i>Poa pratensis</i>	Kentucky bluegrass	Yes	Perennial	Graminoid	Acceptable	Exotic
<i>Psathyrostachys juncea</i>	Russian wildrye	No	Perennial	Graminoid	Acceptable	Exotic
<i>Trifolium pratense</i>	Red clover	Yes	Perennial	Forb	Acceptable	Exotic
<i>Trifolium repens</i>	White clover	Yes	Perennial	Forb	Acceptable	Exotic

Undesirable Species List

Latin Name	Common Name	Original BRES	Life Cycle	Lifeform Code	Desirability Code	Origin
<i>Chondrilla juncea</i>	Rush skeletonweed	No	Perennial	Forb	Undesirable	Noxious
<i>Gypsophila paniculata</i>	Baby's breath	Yes	Perennial	Forb	Undesirable	Noxious
<i>Lycium balamisolium</i>	Matrimony vine	Yes	Perennial	Forb	Undesirable	Noxious
<i>Alopecurus arundinaceus</i>	Creeping meadow foxtail	No	Perennial	Graminoid	Undesirable	Exotic
<i>Alyssum alyssoides</i>	Pale madwort	Yes	Annual	Forb	Undesirable	Exotic
<i>Alyssum desertorum</i>	Desert madwort	Yes	Annual	Forb	Undesirable	Exotic
<i>Alyssum murale</i>	Yellowtuft	Yes	Perennial	Forb	Undesirable	Exotic
<i>Amaranthus albus</i>	Prostrate pigweed	No	Annual	Forb	Undesirable	Exotic
<i>Amaranthus hybridus</i>	Slim amaranth	No	Annual	Forb	Undesirable	Exotic
<i>Amaranthus retroflexus</i>	Pigweed	Yes	Annual	Forb	Undesirable	Exotic
<i>Arenaria serpyllifolia</i>	Thymeleaf sandwort	No	Annual	Forb	Undesirable	Exotic
<i>Artemisia absinthium</i>	Absinthium	Yes	Perennial	Forb	Undesirable	Exotic
<i>Asparagus officinalis</i>	Garden asparagus	No	Perennial	Forb	Undesirable	Exotic
<i>Asperugo procumbens</i>	German madwort	No	Annual	Forb	Undesirable	Exotic
<i>Atriplex patula</i>	Spear saltbush	No	Annual	Forb	Undesirable	Exotic
<i>Bassia scoparia</i>	Burningbush (KOCHIA)	Yes	Annual	Forb	Undesirable	Exotic
<i>Berteroa incana</i>	Whitetop (hoary alyssum)	Yes	Perennial	Forb	Undesirable	Exotic
<i>Bromus inermis</i>	Smooth brome	Yes	Perennial	Graminoid	Undesirable	Exotic
<i>Bromus japonicus</i>	Japanese brome	Yes	Annual	Graminoid	Undesirable	Exotic
<i>Bromus tectorum</i>	Cheat grass	Yes	Annual	Forb	Undesirable	Exotic
<i>Camelina microcarpa</i>	Littlepod false flax	No	Annual	Forb	Undesirable	Exotic
<i>Campanula rapunculoides</i>	Rampion bellflower	No	Perennial	Forb	Undesirable	Exotic
<i>Capsella bursa-pastoris</i>	Sheperd's pirse	Yes	Annual	Forb	Undesirable	Exotic
<i>Centaurea stoebe</i>	Spotted knapweed	Yes	Perennial	Forb	Undesirable	Exotic
<i>Cerastium fontanum</i>	Common mouse-ear chickweed	No	Perennial	Forb	Undesirable	Exotic
<i>Chenopodium album</i>	Goosefoot	Yes	Annual	Forb	Undesirable	Exotic
<i>Chenopodium foliosum</i>	Leafy goosefoot	No	Annual	Forb	Undesirable	Exotic
<i>Cirsium vulgare</i>	Bull thistle	No	Perennial	Forb	Undesirable	Exotic

Latin Name	Common Name	Original BRES	Life Cycle	Lifeform Code	Desirability Code	Origin
<i>Conium maculatum</i>	Poison hemlock	No	Biennial	Forb	Undesirable	Exotic
<i>Cotoneaster acutifolius</i>	Peking cotoneaster	No	Perennial	Shrub	Undesirable	Exotic
<i>Descurainia sophia</i>	Herb Sophia	Yes	Annual	Forb	Undesirable	Exotic
<i>Elymus repens</i>	Quackgrass	Yes	Perennial	Graminoid	Undesirable	Exotic
<i>Erodium cicutarium</i>	redstem stork's bill	Yes	Perennial	Forb	Undesirable	Exotic
<i>Filago arvensis</i>	Field filago	Yes	Annual	Forb	Undesirable	Exotic
Galium aparine	Stickywilly	No	Annual	Forb	Undesirable	Exotic
<i>Hordeum jubatum</i>	Foxtail barley	Yes	Perennial	Graminoid	Undesirable	Exotic
<i>Lactuca serriola</i>	Prickly lettuce	Yes	Annual	Forb	Undesirable	Exotic
Lamium amplexicaule	Henbit deadnettle	No	Annual/Biennial	Forb	Undesirable	Exotic
<i>Lepidium densiflorum</i>	Common pepperweed	Yes	Perennial	Forb	Undesirable	Exotic
<i>Lepidium latifolium</i>	Broadleaved pepperweed	No	Perennial	Forb	Undesirable	Exotic
<i>Lepidium perfoliatum</i>	Clasping pepperweed	Yes	Annual/Biennial	Forb	Undesirable	Exotic
<i>Linaria vulgaris</i>	Butter and eggs	Yes	Perennial	Forb	Undesirable	Exotic
<i>Lonicera tatarica</i>	Tatarian honeysuckle	No	Perennial	Forb	Undesirable	Exotic
<i>Matricaria matricarioides</i>	Pineapple weed	Yes	Annual	Forb	Undesirable	Exotic
<i>Medicago lupulina</i>	Black medick	Yes	Annual/Perennial	Forb	Undesirable	Exotic
<i>Melilotus alba</i>	White sweetclover	Yes	Annual/Biennial/Perennial	Forb	Undesirable	Exotic
<i>Melilotus officinalis</i>	Yellow Sweetclover	Yes	Annual/Biennial/Perennial	Forb	Undesirable	Exotic
<i>Myriophyllum spicatum</i>	Spiked water milfoil	No	Perennial	Forb	Undesirable	Exotic
<i>Papaver rhoeas</i>	Common poppy	No	Annual	Forb	Undesirable	Exotic
<i>Plantago lanceolata</i>	Narrowleaf plantain	No	Perennial	Forb	Undesirable	Exotic
<i>Plantago major</i>	Common plantain	No	Perennial	Forb	Undesirable	Exotic
<i>Poa annua</i>	Annual bluegrass	No	Annual	Graminoid	Undesirable	Exotic
<i>Poa compressa</i>	Canada bluegrass	Yes	Perennial	Graminoid	Undesirable	Exotic
<i>Poa trivialis</i>	Rough bluegrass	No	Perennial	Graminoid	Undesirable	Exotic
<i>Polygonum aviculare</i>	Prostrate knotweed	Yes	Annual	Forb	Undesirable	Exotic
<i>Portulaca oleracea</i>	Little hogweed	No	Annual	Forb	Undesirable	Exotic
<i>Rumex acetosella</i>	Common sheep sorrel	Yes	Perennial	Forb	Undesirable	Exotic
<i>Rumex crispus</i>	Curlyleaf Dock	Yes	Perennial	Forb	Undesirable	Exotic

Latin Name	Common Name	Original BRES	Life Cycle	Lifeform Code	Desirability Code	Origin
<i>Salix alba</i>	White willow	No	Perennnial	Tree	Undesirable	Exotic
<i>Senecio vulgaris</i>	Oold-man-in-the-spring	No	Annual	Forb	Undesirable	Exotic
<i>Setaria viridis</i>	Green bristlegrass	Yes	Annual	Graminoid	Undesirable	Exotic
<i>Silene latifolia ssp. alba</i>	Bladder campion	Yes	Perennnial	Forb	Undesirable	Exotic
<i>Silene vulgaris</i>	Maidenstears	Yes	Perennnial	Forb	Undesirable	Exotic
<i>Sisymbrium altissimum</i>	Tall tumbledustard	Yes	Annual	Forb	Undesirable	Exotic
<i>Sisymbrium loeselii</i>	Small tumbleweed mustard	Yes	Annual	Forb	Undesirable	Exotic
<i>Solanum dulcamara</i>	Climbing nightshade	No	Annual	Vine	Undesirable	Exotic
<i>Solanum triflorum</i>	Cutleaf nightshade	No	Annual	Forb	Undesirable	Exotic
<i>Sonchus arvensis</i>	Field sowthistle	No	Annual	Forb	Undesirable	Exotic
<i>Stellaria media</i>	Common chickweed	No	Annual	Forb	Undesirable	Exotic
<i>Taraxacum officinale</i>	Dandelion	Yes	Perennnial	Forb	Undesirable	Exotic
<i>Thlaspi arvense</i>	Field pennycress	Yes	Annual	Forb	Undesirable	Exotic
<i>Tragopogon dubius</i>	Yellow salsify	Yes	Annual	Forb	Undesirable	Exotic
<i>Verbascum thapsus</i>	Common mullein	Yes	Biannual	Forb	Undesirable	Exotic
<i>Cardaria draba</i>	Whitetop	Yes	Annual	Forb	Noxious	Exotic
<i>Cirsium arvense</i>	Canada thistle	Yes	Perennnial	Forb	Noxious	Exotic
<i>Convolvulus arvensis</i>	Field Bindweed	Yes	Perennnial	Forb	Noxious	Exotic
<i>Cynoglossum officinale</i>	Houndstongue	Yes	Biennial	Forb	Noxious	Exotic
<i>Euphorbia essula</i>	Leafy spurge	Yes	Perennnial	Forb	Noxious	Exotic
<i>Linaria dalmatica</i>	Dalmatian toadflax	Yes	Perennnial	Forb	Noxious	Exotic
<i>Tanacetum vulgare</i>	Common tansy	No	Perennnial	Forb	Noxious	Exotic

**BUTTE RECLAMATION EVALUATION SYSTEM (BRES)
PLANT GUIDE TO THE
NATIVE AND UNDESIRABLE PLANT SPECIES
IN THE BUTTE PRIORITY SOILS OPERABLE UNIT**

BUTTE-SILVER BOW CITY-COUNTY, MONTANA

Prepared for
BUTTE-SILVER BOW, BUTTE, MONTANA

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Butte, Montana 2019/Revised 2020

Introduction

This Plant Manual is organized by flower color (blue, purple, pink, etc.), trees (deciduous, coniferous), vines, water species, shrubs and bushes, and grasses (non-bunch and bunch). Each of these categories is also divided into acceptable and undesirable plant species. Each is under the respective bookmark in the PDF.

Most of the plants are described using non-technical language. However, the following terms are used to differentiate grass species.

Inflorescence: Flowering portion of a grass

Ligule: A thin outgrowth at the junction of the stem and leaf.

Spikelet: The spikelet is comprised of the following components (see Figure 1.)

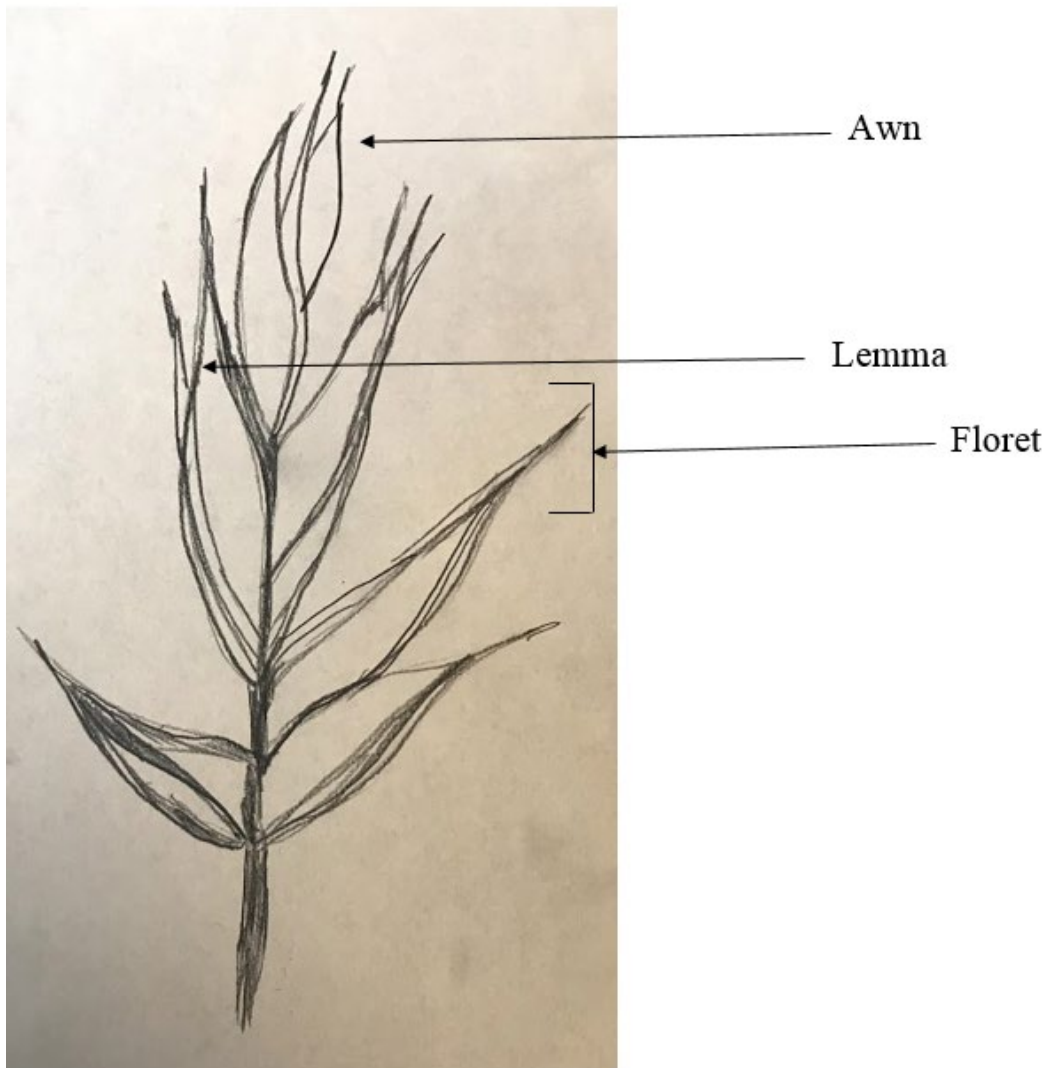


Figure 1. Components of a Spikelet (Grace Kurtz)

References

Unless otherwise noted with the below symbols (Ψ), Robert Pal of Montana Tech provided the plant photographs. The following sites provided photographs as well as taxonomy information. Please see the corresponding Ψ in the manual for references.

Montana Field Guide Ψ

USDA NRCS Plant Materials Center, Aberdeen, Idaho.

Montana State University Extension MontGuide.

USDA US Forest Service Fire Effects Information System (FEIS) Index of Species Information.

Acceptable

Visual Identification:



Scientific Nomenclature:	Campanula rotundifolia
Common Name:	Bluebell bellflower
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description: *Campanula rotundifolia* is known for its violet bell shaped flowers that usually nod towards the ground. The flowers can either be found in bunches in or solitary. The leaves are smooth, about 2cm long and have rough edges. Bluebells are found in a variety of climates and are wide spread across Montana.

Key Characteristic:

Height 4in-1ft

Bloom Color: blue/purple

Visual Identification:



Ψ

Scientific Nomenclature:	<i>Collinsia parviflora</i>
Common Name:	Blue-eyed Mary
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Blue-eyed Mary is a small and delicate flower found across Montana, mostly in shady forested areas. Its stem is thin and can be covered in short thick hairs. The flowers are small (less than a few mm across) and range from blue to purple. Light purple keels extend from the rear of the plant.

Collinsia parviflora usually grows in clusters that blanket sections of a forest in light blue.

Key Characteristic:

Height (7-30cm) 3in to 1ft

Bloom Color: blue to purple

Visual Identification:



Scientific Nomenclature:	<i>Lappula occidentalis</i>
Common Name:	Western stickweed
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Lappula occidentalis has long fuzzy leaves with light blue or white flowers clusters growing from the base of the leaves. The flowers are small, less than a cm wide, and usually consist of 5 round petals. Fruits form in late summer and have dark brown prickles covering the nutlets.

Western stickweed is commonly found in dry central Montana soils.

Key Characteristic:

Height .1-.6m (1-2ft)

Bloom Color: blue or white (fruit may be yellow)

Visual Identification:



Scientific Nomenclature:	<i>Mertensia oblongifolia</i>
Common Name:	Oblongleaf bluebells
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Mertensia oblongifolia is also known as Sage Bluebells. This species of bluebells has unique leaves. The leaves are about 7.6 cm (3in) long with obvious lateral vein. The leaves also have rounded tips and usually point upwards.

The flowers are purple, bell shaped and are known to droop downward. These variety of bluebells has dense clusters of flowers that hang from the tip of the stem.

It grows well in meadows and is relatively uncommon in most areas of Montana.

Key Characteristic:

Height 7.6cm to .3m(3in to 1ft)

Bloom Color: purple

Visual Identification:

Scientific Nomenclature:	<i>Myosotis arvensis</i>
Common Name:	Forget me not
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Forget me nots are small blue flowering forbs with .4-3in (1-8cm) long leaves. The leaves have smooth margins and the stems have small rough hairs. This forb grows best near slow moving streams and wet forested areas.

Key Characteristic:

Height 10-40 cm (4-16in)

Bloom Color: blue

Visual Identification:

Scientific Nomenclature:	<i>Penstemon nitidus</i>
Common Name:	Waxleaf penstemon
Lifefrom Code:	Forb
Desirability Code:	Acceptable

Description:

Waxleaf penstemon has several stems, usually 10-30 cm (4-12 in) tall, from a branched root crown. The thick and entire-margined basal leaves are broadly lance-shaped, and up to 10 cm (4 in) long. Herbage is glabrous and covered with a thin, waxy coating. The bright blue corolla is 13-18 mm long. Anthers are glabrous. Small populations of this species occur in grasslands in the foothills of the Sapphire Range. This plant flowers in May, earlier than other penstemons.

Key Characteristic:

Height 10-25cm (4-10in)

Bloom Color: blue

Acceptable

Acceptable

Visual Identification:

May be confused for *Agropyron trachycaulum*



Ψ *Western wheatgrass spikelet in spring (left) and late summer (right)*

Scientific Nomenclature:	<i>Agropyron smithii</i>
Common Name:	Western wheatgrass
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description:

Agropyron smithii is a common rhizomanous native grass that grows .3-1m (1-3 ft) tall. The inflorescence is stiff, tapered and about 5-16cm (2-6 in) long. The leaves are flat, about a quarter inch wide and sometimes coated in a white/silver film. The leaves can have prominent veins and connect to hairy sheaths with red nodes at the stem.

Agropyron smithii can be found in wooded areas, meadows, ditches or other areas with moist and dry soil.

Key Characteristics

Height .3-1m (1-3 feet)

Bloom Color: white or yellow

Visual Identification:

May be confused for *Agropyron smithii*
(western wheatgrass)



Ψ

Scientific Nomenclature:	<i>Agropyron trachycaulum</i>
Common Name:	Slender wheatgrass
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description:

Agropyron trachycaulum is a native bunch grass with flat, narrow leaves. Stems can have a reddish or purple tint near the base with hairless stems and sheaths.

Its inflorescences are tightly packed and are usually shorter than those of western wheatgrass 2.5-7cm (1-3in). *Agropyron trachycaulum* is found mostly in sandy soil but can handle a variety of growing conditions. It is widely used on reclamation sites, especially along rivers.

Key Characteristics

Height .3-1m (1-3 feet)

Bloom Color: white or yellow

Visual Identification:



Rough bentgrass in spring (left) and late summer (right)

Ψ Ψ

Scientific Nomenclature:	<i>Agrostis scarbra</i>
Common Name:	Rough bentgrass
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description:

Agrostis scabr is a native bunch grass with narrow leaves and stems, each only a few mm wide. The stems and seed pods can be coated with tiny hairs and can appear red. This plant usually grows in sunny, relatively dry soils. This narrow plant looks wispy or fluffy from a distance and is soft to the touch.

Key Characteristics

Height .3-.6m (1-2 feet)

Bloom Color: Pink or white

Visual Identification:



Ψ

Scientific Nomenclature:	<i>Beckmannia syzigachne</i>
Common Name:	American sloughgrass
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Beckmannia syzigachne is a bunch grass widespread across Montana. It grows in wet soil and full sun. The inflorescences are this grass's most distinctive feature. They 25cm (10in) long with horizontally compressed florets. The leaves are about 6 mm wide, flat and hairless. The leaves are about 13cm (5in) long and can be rough on the edges. *Beckmannia syzigachne* can best be found by rivers and lakes.

Key Characteristic:

Height .3-.6m (1-2 ft)

Bloom Color: green/yellow

Visual Identification:



Scientific Nomenclature:	<i>Bromus carinatus</i>
Common Name:	California brome
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description:

Bromus carinatus is a bunch grass. Its leaves are roughly 10mm wide with tiny hairs covering both the leaves and the stem. The inflorescences are stiff, about 15cm (6in) long and covered in flattened spikelets. The inflorescences are usually 20 cm (8in) long and can either be erect or drooping. This brome grows in full sunshine and is widely found across Montana.

Key Characteristic:

Height .6-1m (2-3ft)

Bloom Color: yellow/red

Visual Identification:



Scientific Nomenclature:	<i>Deschampsia cespitosa</i>
Common Name:	<i>Tufted hair grass</i>
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description:

From a distance this bunch grass can appear silver. The leaves are usually flat and 2mm wide. The spikelets range from 3-5 mm (.1-.2in) long. The best way to identify this grass is by its open panicle inflorescence that is about 12cm (4.7in) long. The stems are round and extend from the large bunch of flat leaves.

Deschampsia cespitosa usually grows in well drained soils and shady areas.

Key Characteristic:

Height .3-1m (1ft-3ft)

Bloom Color: yellow/white

Visual Identification:



May be confused for Elymus elymoides



Canada wildrye seeds (left) and full plant (right)

Scientific Nomenclature:	<i>Elymus canadensis</i>
Common Name:	Canada wildrye
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description:

Elymus canadensis is a bunchgrass that is not commonly found in Montana but can grow in road cut areas. The seeds usually droop downward and can appear gold late in the summer. The leaves are wide, about 10 mm, and are covered in short hairs. The lemmas, usually 3 to 4 per spikelet, are short and hairy and form a curved awn.

Key Characteristic:

Height 1-1.5m (3-5ft)

Bloom Color: green

Visual Identification:



Scientific Nomenclature:	<i>Elymus elongatus</i>
Common Name:	Tall wheatgrass
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description:

The inflorescence is studded with fan shaped spikelets that can grow about an inch long and are made up of 12 flowers. The leaves are ribbed and about 2mm wide.

Elymus elongatus can grow in a variety of soils and is a common forage species for a variety of wildlife.

Key Characteristic:

Height 1.2-2m (4ft-6ft)

Bloom Color: green

Visual Identification:*May be confused for Elymus canadensi*

Ψ



Scientific Nomenclature:	<i>Elymus elymoides</i>
Common Name:	Squirreltail
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description:

Elymus elymoides is most known for its seeds which have long tails protruding from the ends. The spikelets can appear purple from a distance and give the grass a furry appearance.

The leaves can be rolled or flat and are a few mm wide. Found in old gravel roads or otherwise disturbed soil, *Elymus elymoides* is commonly found in Montana. It can look like *Elymus canadensi*. *Elymus elymoides*, however, is more common and has sharpened points extending from the seeds.

Key Characteristic:**Height** 1-1.5m (3-5ft)**Bloom Color:** green

Visual Identification:

May be confused for Elymus lanceoulatus



Scientific Nomenclature:	<i>Elymus hispidus</i>
Common Name:	Intermediate wheatgrass
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description:

Elymus hispidus is a short-stiffed stem grass known for its blueish hue and erect spikelets. The leaves are usually straight but roll upon drying. Its stems are stiff and narrow (about a 2 mm thick). The leaf sheaths are hairless with tiny hairs growing from the margins. It has blunt and pointed lemmas with a very small awn. It usually grows along trails or road sides.

Key Characteristic:

Height .2-1m (1-3ft)

Bloom Color: green

Visual Identification:

May be confused for Elymus hispidus



Ψ

Scientific Nomenclature:	<i>Elymus lanceoulatus</i>
Common Name:	Thickspike wheatgrass
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description:

Elymus lanceoulatus can appear similar to *Elymus hispidus*. *Elymus lanceoulatus*, however, grows at lower elevations and drier/sandy soils than *Elymus hispidus*. *Elymus lanceoulatus* also has a hollow stem that is more green than blue and has hairy leaf sheaths. This grass also grows less bunched than *Elymus hispidus*. The stems are slender and can be covered in a silvery film. The spikelets are hairy and about an inch long.

Key Characteristic:

Height .3-1m (1-3ft)

Bloom Color: green

Visual Identification:

May be confused for Festuca ovina (sheep fescue)



Scientific Nomenclature:	<i>Festuca idahoensis</i>
Common Name:	Idaho fescue
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description:

Festuca idahoensis is very common across Montana (especially compared to Sheep fescue). It has 1 mm wide leaf blades that can be in-rolled. The flowers are attached directly to an unbranched inflorescence. The lemmas have an awn tip and surround purple seeds that mature in late summer.

It has a deep roots system and can grow in very alkaline soils and other non-favorable soils. It also prefers full sun or slight shade conditions.

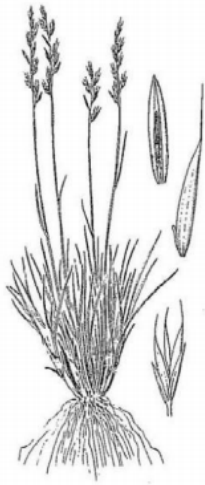
Key Characteristic:

Height 20-40cm (8in-1.5ft)

Bloom Color: white, yellow or purple

Visual Identification:

*May be confused for Festuca idahoensis
(Idaho Fescue)*



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Scientific Nomenclature:	Festuca ovina
Common Name:	Sheep fescue
Life-form Code:	Graminoid
Desirability Code:	Acceptable

Description

The best way to differentiate this grass from Idaho fescue is by the flowers that grow from a branched inflorescence rather than directly from the stem. The stems are very narrow (only about a mm long) with hairy leaf sheaths. The leaves are rough to the touch and usually in rolled.

Festuca ovina grows best in dry gravelly soils and is not commonly found in Montana

Key Characteristic

Height: 1-4ft

Bloom Color: yellow

Visual Identification:



Scientific Nomenclature:	<i>Festuca rubra</i>
Common Name:	Meadow fescue
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description

Festuca rubra is a non-native bunch grass that grows well in meadows and grasslands across Montana. It has narrow leaves (less than 2mm wide) that are often inrolled. The lower portion of the leaf sheaths are usually red. The lemmas have a 3mm long awn. The ligule is very short and blunt.

Key Characteristic

Height: .3-.6m (1-2ft)

Bloom Color: purple

Visual Identification:



Scientific Nomenclature:	<i>Koeleria cristata</i>
Common Name:	Prairie Junegrass
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description:

Koeleria cristata is also known as *Koeleria macrantha*. It is one of Montana's most common grass species. It grows as a bunch grass and is most recognizable by its soft flowering portion that is about 6cm (2.3in). *Koeleria cristata* has hairy sheaths that cover portions of a reddish to green stem. It has flat leaves about 2 mm wide and is very common in open dry sites across Montana.

Key Characteristic:

Height .3-.6m (1-2ft)

Bloom Color: yellow

Visual Identification:



Scientific Nomenclature:	<i>Leymus cinereus</i>
Common Name:	Great Basin wildrye
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description:

Leymus cinereus is a tall bunch grass that grows in shrubby grasslands or in the forest understory. It has flat leaves that are a few cm wide with inflorescence about 7.6cm (3in) long. The spikelet is usually tapered to a narrow-pointed tip. At the intersection of the leaf blade and stem a small, hairless ligule can be found.

This grass is commonly found across western Montana.

Key Characteristic:

Height .3-2m (1-6ft)

Bloom Color: green

Visual Identification:



Ψ



Scientific Nomenclature:	<i>Panicum capillare</i>
Common Name:	Witchgrass
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description:

Witchgrass is an annual bunchgrass that has leaves that are about 3cm (1in) wide. The flowering portion looks like a firework with light pink ends that contain the seeds. The leaves and sheaths are hairy.

Panicum capillare can appear gold from a distance and is found along roadsides, railroad tracks and lawns.

Key Characteristic:

Height .3-.6m(1-2ft)

Bloom Color: purple

Visual Identification:



Switchgrass seeds (left) and full grown bunches (right)

Scientific Nomenclature:	<i>Panicum virgatum</i>
Common Name:	Switchgrass
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description:

Switchgrass is known for its well-established root system, with tap roots sometimes reaching up to 2m (6ft). The leaves are wide and hairless. The spikelets are, bell shaped, red to purple and stay upright through the summer.

Switchgrass isn't very common in Montana, however, can it can be noticed near disturbance-prone areas.

Key Characteristic:

Height .6-1.5m (2-5ft)

Bloom Color: purple

Visual Identification:



Ψ



Scientific Nomenclature:	<i>Poa palustris</i>
Common Name:	Fowl Bluegrass
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description:

Poa palustris grows in bunches at middle to low elevations across Montana. The intersection of leaf/stem has several semi opaque hairs.

The stems are usually purple at their bases and are topped with a flowering portion that is usually 6 in-1ft long with tightly grouped seeds.

Key Characteristic:

Height .6-1.2m (2-4ft)

Bloom Color: green

Visual Identification:

Scientific Nomenclature:	<i>Poa pratensis</i>
Common Name:	Kentucky bluegrass
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description

Poa pratensis is a short variety of bluegrass and can be disguised by its square tipped ligule. The leaves are about 15cm (6in) long with a boat shaped tip. It usually grows as a sod forming grass and can aggressively take over a variety of Montana areas. The flowering portion is loosely packed with dark purple flowers blooming in late summer.

Key Characteristic

Height: .3-.6m (1-2ft)

Bloom Color: purple

Visual Identification:



Sandberg bluegrass in late summer (left) and full plant (right) Ψ

Scientific Nomenclature:	<i>Poa secunda</i>
Common Name:	Sandberg bluegrass
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description:

Poa secunda is a bunchgrass that grows in small tufts. This tuft growth pattern is a way to differentiate it from other blue grass species. It is one of the first bunchgrasses to become green in the spring. The stem is smooth with only a few leaves marked with two lateral veins (common in bluegrass leaves). *Poa secunda* has mostly smooth seeds except for a few stiff hairs forming on the lemmas.

Key Characteristic:

Height .3-.6m (1-2ft)

Bloom Color: gold to green

Visual Identification:



Ψ *Northern bluegrass in fall (left) and spring (left)*

Scientific Nomenclature:	<i>Poa stenantha</i>
Common Name:	Northern bluegrass
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description:

Poa stenantha is the least common bluegrass in Montana. It has narrow leaves (just 3mm wide) and a nodding inflorescence about 3 in long. It can be identified by its hairy and keeled lemmas. The flowering portion takes up roughly a fourth of the plant and forms purple, soft seeds.

Key Characteristic:

Height .3-.6m (1-2ft)

Bloom Color: purple

Visual Identification:



Ψ



Scientific Nomenclature:	<i>Psathyrostachys juncea</i>
Common Name:	Russian wildrye
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description

Psathyrostachys juncea is a non-native bunch grass historically introduced in re-veg areas. The leaves are about 5mm wide with smooth margins. The spikelets are about 10mm long with 2-3 lemmas each. The lemmas are distinctly hairy with awned tips. The seeds grow vertically along the stems.

Key Characteristic

Height: .3-1m (1-3ft)

Bloom Color: yellow

Visual Identification:



Ψ

Scientific Nomenclature:	<i>Pseudoroegneria spicata</i>
Common Name:	Bluebunch wheatgrass
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description

Bluebunch wheatgrass, as the name suggests, is a bunchgrass that grows in isolated bunches or large groups. It is very common across Montana in open dry areas. *Pseudoroegneria spicata* has flat and rolled leaves. Its stem sheaths are hairless, and the seed portion is upright with 3-7 florets per spikelet. The seeds usually have a bristly awn.

Key Characteristic:

Height .15-.3m (6in to 1ft)

Bloom Color: white

Visual Identification:

Scientific Nomenclature:	<i>Stipa comata</i>
Common Name:	Needle and thread
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description

Stipa comate grows in open, dry areas as well as well grazed areas. It is a bunchgrass that forms erect stems with a narrowing flowering portion. This flowering portion bears a spiral, hairy needle that gives the plant its name sake.

The spikelet is very sharp and often gets stuck to clothes and animals, can be dark brown to purple.

Key Characteristic:

Height .3-.6m (1-2ft)

Bloom Color: green

Visual Identification:



May be confused for needle and thread (*stipa comata*)

Scientific Nomenclature:	<i>Stipa viridula</i>
Common Name:	Green needlegrass
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description

Stipa viridula is a bunch grass that grows in fine textured soils in plains across Montana. It has a 20cm (8in) seed head. Each seed has long bristle attached to end. These bristles are curved with a sharp bend in the middle. This sharp bend is the best way to tell it from needle and thread. The leaves are rolled and threadlike about 25cm (10in) long. The leaf sheaths are hairy.

Key Characteristic:

Height .3-1m (1-3ft)

Bloom Color: green

Undesireable

Visual Identification:



Scientific Nomenclature:	<i>Bromus inermis</i>
Common Name:	Smooth brome
Lifefrom Code:	Graminoid
Desirability Code:	Undesirable

Description

Bromus inermis is most known for a “W” wrinkle about halfway along the leaf blade. It has smooth lemmas. The flowering portion is made up loosely packed seeds about a cm long. When in bloom the orange flowers droop off the seeds which can become purple late in the summer.

Bromus inermis is very common in Montana.

Key Characteristic:

Height .6-1m (2-3ft)

Bloom Color: orange

Visual Identification:

Scientific Nomenclature:	<i>Bromus japonicus</i>
Common Name:	Japanese brome
Lifeform Code:	Graminoid
Desirability Code:	Undesirable

Description

This exotic bunch grass has straight lemmas and very hairy leaf sheaths. It has seeds about a cm long with 5 to 11 white flowers that bloom in early summer. The stems are narrow and branch at the top to yield the seed pods. It has narrow leaves, about 3mm wide.

Bromus japonicus grows in areas with highly variable water levels and otherwise open/disturbed sites.

Key Characteristic:

Height .6-1m (2-3ft)

Bloom Color: green

Visual Identification:



Scientific Nomenclature:	<i>Bromus tectorum</i>
Common Name:	Cheat grass
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Cheat grass is a nonnative forb that is most known for its ability to dislodge from the main plant and stick to humans and animals. The blades are 3mm wide that surround multiple nodding seed pods.

Bromus tectorum grows in open and dry areas and can aggressively dominate areas.

Key Characteristic:

Height 25-50cm (10-20in)

Bloom Color: green

Visual Identification:



Scientific Nomenclature:	<i>Dactylis glomerata</i>
Common Name:	Orchard grass
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description

Dactylis glomerata is a common bunchgrass found in meadows across Montana. The leaves are flat usually about 6 mm wide and sometimes wrinkled. The leaf sheaths are hairless and folded. The inflorescence is about 10 cm long with spikelets 5-8mm long. The lemmas are keeled and surrounding a fluffy flower when this grass is in bloom.

Key Characteristic

Height: 1-2m (3-6ft)

Bloom Color: white

Visual Identification:



Ψ

Scientific Nomenclature:	<i>Elymus repens</i>
Common Name:	Quackgrass
Lifeform Code:	Graminoid
Desirability Code:	Undesirable

Description

Elymus repens is an aggressively invasive grass species and grows in most Montana climates. It has wide leaves, about 8 mm, with hairy leaf sheaths. It has tapered lemmas with 3 to 7 flowers per seed pod. The stems are slender with an extensive root system.

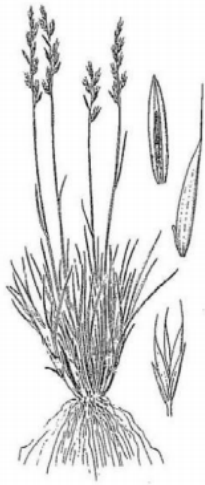
Key Characteristic

Height .3-1m (1-3ft)

Bloom Color: purple/red

Visual Identification:

*May be confused for Festuca idahoensis
(Idaho Fescue)*



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Ψ

Scientific Nomenclature:	<i>Festuca ovina</i>
Common Name:	Sheep fescue
Life-form Code:	Graminoid
Desirability Code:	Acceptable

Description

The best way to differentiate this grass from Idaho fescue is by the flowers that grow from a branched inflorescence rather than directly from the stem. The stems are very narrow (only about a mm long) with hairy leaf sheaths. The leaves are rough to the touch and usually in rolled.

Festuca ovina grows best in dry gravelly soils and is not commonly found in Montana

Key Characteristic

Height: .3-1.2m (1-4ft)

Bloom Color: yellow

Visual Identification:

Scientific Nomenclature:	<i>Hordeum jubatum</i>
Common Name:	Foxtail barley
Lifeform Code:	Graminoid
Desirability Code:	Undesirable

Description .

Hordeum jubatum is a shorter graminoid with a very soft flowering portion. The leaf sheaths are hairless. The stems are blue/green and hairless. In fall the soft seed tufts harden and expand in to a broom like formation.

This is a common species found in overgrazed rangeland or saline areas.

Key Characteristic

Height 15-25cm (6-10in)

Bloom Color: green

Acceptable

Visual Identification:

Scientific Nomenclature:	<i>Agropyron cristatum</i>
Common Name:	Crested wheatgrass
Lifefrom Code:	Graminoid
Desirability Code:	Acceptable

Description

Agropyron cristatum grows best in fine textured soils in disturbed areas. It can aggressively take over dry areas. The leaves are 2-6mm with smooth undersides and rough top sides. The leaves are flat in the spring, however, roll inward in the late summer. The seeds form a bristle top and have short and sharp points at the end. The inflorescence is about 5cm (2in) long.

Key Characteristic

Height: .3-.8m (1-2.5ft)

Bloom Color: green

Visual Identification:



Scientific Nomenclature:	<i>Agrostis stolonifera</i>
Common Name:	Redtop
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description

Also known as *Agrostis stolonifera* is a sod forming grass that can create dense mats. It has stems that grow parallel to the ground with red spikelets at the end. The leaves are 2-6mm wide with ligules about 2-7mm long. It is commonly found in western Montana and grows best in wet meadows or by stream sides.

Key Characteristic

Height: .6-1.2m (2-4ft)

Bloom Color: yellow/red

Visual Identification:



Ψ

Scientific Nomenclature:	<i>Bouteloua gracilis</i>
Common Name:	Blue grama
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Bouteloua gracilis has 1-2 mm curled leaves. The seed pods range from light brown to purple and extend at right angles from the top of the stem. The stem is also thin and can appear blueish from a distance. This bunch grass is widespread across central/eastern Montana and grows well in open dry slopes.

Key Characteristic:

Height 20-50cm (8-20 in)

Bloom Color: yellow

Visual Identification:

May be confused for Carex microptera (smallwing sedge)



Scientific Nomenclature:	<i>Carex douglasii</i>
Common Name:	Douglas' sedge
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description:

Carex douglasii grows in moist sandy soils and is not very common in Montana. The leaves grow on the lower part of the stem and are 1-2mm wide and sometimes rolled. The flowers bear long/tangled blades. The stem is thin and not ribbed (as opposed to the ribbed stem of Small wing sedge).

Key Characteristic:

Height .1-4m (4in-1.5ft)

Bloom Color: yellow

Visual Identification:

May be confused for Carex douglasii
(Douglas sedge)



Ψ

Scientific Nomenclature:	<i>Carex microptera</i>
Common Name:	Smallwing sedge
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description:

Smallwing sedges grow to a variety of heights. It has small leaves at the base of the stem. The stem is rough to with square edges. The flowering portion is about 2 in wide and is covered tightly packed spikes. Flowers it can range from yellow to purple. This is a relatively uncommon plant to find but can grow in a variety of soils. The best way to tell this forb from Douglas sedge is the ribbed stem.

Key Characteristic:

Height 6in to 2ft

Bloom Color: yellow, purple

Visual Identification:

Scientific Nomenclature:	<i>Carex nebrascensis</i>
Common Name:	Nebraska sedge
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description:

This grass is relatively common across Montana. The leaves are basal and about 10cm (4 in) long with flat tapered ends. The seeds pods small and dark brown with a pale midstrip. The seeds form a cylinder around the top two inches of the stem. It grows in wet meadows in western Montana.

Key Characteristic:

Height .3-6m (1-2ft)

Bloom Color: dark brown

Visual Identification:

May be confused for Carex uticulata



Scientific Nomenclature:	<i>Carex rostrata</i>
Common Name:	Beaked sedge
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description:

Carex rostrate is a rare species in Montana. The leaves are narrow, round and covered in a whitish, waxy coating that rubs off. The flowers are light yellow and have spikes at the end. This grass is easy to confuse with *Carex utriculata*. *Carex rostrate* can be distinguished by its rolled versus flat leaves.

Key Characteristic:

Height .15-.3m (6in to 1 ft)

Bloom Color: light yellow

Visual Identification:



Ψ

Scientific Nomenclature:	<i>Danthonia unispicata</i>
Common Name:	Onespike danthonia
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description:

Also known as Few-flowered oat grass, Onespike danthonia, grows in a variety of grasslands across Montana. This species can be disgusted by its very hairy rolled leaves . Its leaves are also a few mm thick and turn gold in late summer/fall.

Danthonia unispicata grows in the understory of subalpine environments.

Key Characteristic:

Height .5m (1.5ft)

Bloom Color: dark gold

Visual Identification:

Scientific Nomenclature:	<i>Distichlis striata</i>
Common Name:	Saltgrass
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description:

Distichlis striata grows in dry grasslands in very well drained and alkali soil. The leaf blades are usually 4mm wide, folded inward and tapered to a sharp point. When in bloom small purple flowers form off the tip of spikelets, which are about 10-17 mm long. The lemmas are awnless and thin. In the fall the seed close and form a tight tan pod.

Key Characteristic:

Height .3-.6m (1ft-2ft)

Bloom Color: purple

Visual Identification:



Ψ

Scientific Nomenclature:	<i>Eleocharis palustris</i>
Common Name:	Common spikerush
Lifform Code:	Graminoid
Desirability Code:	Acceptable

Description:

Eleocharis palustris grows in shallow waters or wet meadows. The bases are usually purple or dark brown and can be hollow. Brown to purple scales form midstem. Common spikerush usually grows up to 2ft tall in large numbers or solitary. Flowers are a few cm long and are brown or yellow when in bloom.

Key Characteristic:

Height 1ft-2ft

Bloom Color: yellow or brown

Visual Identification:



Ψ



Scientific Nomenclature:	<i>Festuca pratensis</i>
Common Name:	Meadow fescue
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description

Festuca pratensis grows at low elevation meadows that receive ample moisture. The inflorescence is usually nodding with purple to red spikelets. The lemmas are awnless. The leaves of this grass are about 5mm wide and flat. The intersection of leaf and stem is hairless.

Key Characteristic

Height: .3-1m (1-3ft)

Bloom Color: purple

Visual Identification:



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Ψ Ψ



Scientific Nomenclature:	<i>Juncus balticus</i>
Common Name:	Baltic rush
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description:

Juncus balticus has a similar flower structure as *Carex microptera*. This grass however, is much more common and grows in wetter, more alkaline areas. It has brown sheaths over slim, green stems. The flowers are range from purple to brown and in mid-summer form 3mm long fruits with about 3 seeds inside.

Key Characteristic:

Height .3-1m (1-3ft)

Bloom Color: brown to purple

Visual Identification:



Ψ

Scientific Nomenclature:	<i>Oryzopsis hymenoides</i>
Common Name:	Indian ricegrass
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description:

Indian ricegrass is known for its diminutive, single flowered spikelet's. They can be purple to brown with yellow flowers blooming in June. The leaves are very narrow, only about a 1mm wide. The stem and leaves are hairless, and the leaves usually curl inwards. Ricegrass prefers sandy soils in open and exposed areas.

Key Characteristic:

Height .3-.6m (1-2ft)

Bloom Color: brown

Visual Identification:



Western wheatgrass stem and leaves (left) and seeds (right)

Scientific Nomenclature:	<i>Pascopyrum smithii</i>
Common Name:	Western wheatgrass
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description:

Pascopyrum smithii is a sod forming grass found in much of Montana. It has abundant fine, blue, green leaves that are usually about 5 in long with a sharp point at the tip. These sharp tipped leaves are a good way to tell this grass from Thickspike wheatgrass (*Elymus lanceolatus*). The spikelets are made of two flowers that bloom yellow mid summer. It is commonly found in areas that seasonally flood, such as agricultural areas.

Key Characteristic:

Height 1-2ft

Bloom Color: green/yellow

Visual Identification:



Ψ

Scientific Nomenclature:	<i>Phleum pratense</i>
Common Name:	Timothy grass
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description

Phleum pratense is very common at middle to high elevations across Montana. It can have leaves up to a half inch that are rolled and hairless. The lower sheaths are brown. The flower head is a cylinder that when in bloom is covered in pink fluffy flowers.

Key Characteristic

Height: .6-1.2m (2-4ft)

Bloom Color: pink

Visual Identification:



Ψ Ψ



Scientific Nomenclature:	<i>Scirpus pallidus</i>
Common Name:	Pale bulrush
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description

Pale bullbrush grows in alkaline marshes or damp valleys. Although uncommon in Montana, it can be identified by its flowers. The flowers form bristle like clusters at the tip of the stem with blackish spikelet's extending for about an inch of the stem. The leaves are about a half and inch wide and 12.7cm (5in) long. It usually forms fruits, which look like oblong hard seed pods, fruit in late July or August.

Key Characteristic:

Height 1-1.2m (3-4ft)

Bloom Color: green to yellow

Undesireable

Visual Identification:

Scientific Nomenclature:	<i>Alopecurus arundinaceus</i>
Common Name:	Creeping meadow foxtail
Lifeform Code:	Graminoid
Desirability Code:	Undesirable

Description

Alopecurus arundinaceus is an exotic and undesirable species found in alkaline seeps and wet meadows. It has short leaf blades 1-2cm (.4-8in) wide. The top fourth of the plant is hairy cylinder. This cylinder is about 8cm (3in) long and about 8mm (.3in) in diameter. It is covered in silky seed pods with frilly seed pods extending from it in June.

Key Characteristic:

Height 1-2m (3-6ft)

Bloom Color: white

Visual Identification:



Ψ

Scientific Nomenclature:	<i>Poa annua</i>
Common Name:	Annual bluegrass
Lifeform Code:	Graminoid
Desirability Code:	Undesirable

Description

Poa annua has characteristically wider leaves (about 3 mm compared to 2 mm) and shorter stems (under 1 ft) than native bluegrasses. It has also slightly hairy/keeled lemmas. It is not commonly found in Montana, however it can succeed in moist disturbed soils.

Key Characteristic

Height 10-20cm (4-8 in)

Bloom Color: green

Visual Identification:



Scientific Nomenclature:	<i>Poa compressa</i>
Common Name:	Canada bluegrass
Lifeform Code:	Graminoid
Desirability Code:	Undesirable

Description

The best way to identify *Poa compressa* is by its obvious brown nodes that cause obvious bends in the stem. It rarely forms basal leaves; however, the upper stem leaves are usually about 2 mm wide. The lemmas have fuzzy hairs at the base. The inflorescence is narrow and usually about 3 in long.

Key Characteristic

Height 25-45cm (10in-1.5 ft)

Bloom Color: green

Visual Identification:



Ψ



Scientific Nomenclature:	<i>Poa trivialis</i>
Common Name:	Rough bluegrass
Lifeform Code:	Graminoid
Desirability Code:	Undesirable

Description

Poa trivialis has leaves 2-5 mm wide with an oblong inflorescence about 8–25 cm long. Compared to other blue grasses its leaves are tapered to a sharper point. It is also known for its rough leaf sheaths. It has slightly fuzzy and keeled lemmas. It is most likely to be found in moist disturbed areas.

Key Characteristic

Height .3-1m (1-3ft)

Bloom Color: green

Visual Identification:

Scientific Nomenclature:	<i>Setaria viridis</i>
Common Name:	Green bristlegrass
Lifefrom Code:	Graminoid
Desirability Code:	Undesirable

Description

Setaria viridis has wide leaves with an obvious center vein and small hairs on the margins. The inflorescence can grow up to 12.7cm (5in) long with bristle like formations about inch long. The bristle seed portion has barbed seeds and lightly veined lemmas. It grows best in disturbed habitats.

Key Characteristic

Height 15-30cm (6in -1ft)

Bloom Color: yellow/green

Acceptable

Visual Identification:



Kinnikinic appearance for most of the year

Scientific Nomenclature:	Arctostaphylos uva-ursi
Common Name:	Kinnikinic
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

This forb grows low to the ground and can form a thick carpet in forested areas or meadows. The berries are bright red with white insides. The leaves are 2 cm in length with a waxy appearance. Before fruit formation, it has light pink, small bell shaped flowers. This low to the ground bush-like plant has woody stems and grows in sandy soils and prefers indirect sunlight.

Key Characteristic:

Height 2-3in

Bloom Color: red

Visual Identification:



Scientific Nomenclature:	Chamaesyce glyptosperma
Common Name:	Ribseed sandmat
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Chamaesyce glyptosperma is also known as *Euphorbia glyptosperma* (Corrugate-seed Broomspurge). It grows low to the ground with oblong laves and woody, highly branched stems. It is mostly found in north eastern Montana in prairies and mountain valleys. The flowers are small and can be white to light yellow.

Key Characteristic:

Height 1-3.5ft.

Bloom Color: green

Visual Identification:



Scientific Nomenclature:	<i>Douglasia montana</i>
Common Name:	Douglasia
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Douglasia montana forms a cushion on rocky slopes of tiny white or pink flowers. The leaves are short and thick and can be covered in short hairs. The flowers have 5-7 petals and have yellow centers.

Douglasia montana is common in the alpine of Montana and prefers to grow on exposed rocky slopes

Key Characteristic:

Height 5-10cm (2-4in)

Bloom Color: pink or white

Visual Identification:



Scientific Nomenclature:	Verbena bracteata
Common Name:	Bracted vervain
Lifefrom Code:	Forb
Desirability Code:	Acceptable

Description

Verbena bracteata grows in disturbed soils and the margins of small wetlands. It forms thick mats of densely leafed branches. The leaves are deeply lobed with small hairs on the stem. A deep red spot lies at the intersection of the leaflets and the main stem. The flowers are light purple and form at the ends of the lateral branches.

Key Characteristic:

Height 2-4in

Bloom Color: pink

Undesireable

Visual Identification:

Scientific Nomenclature:	Amaranthus retroflexus
Common Name:	Pigweed
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Amaranthus retroflexus grows low to the ground and branches out in multiple directions. It can be found in rocky soils near stream sides and cultivated fields. Its leaves are gently toothed about 3 in long and slightly waxy. The stems have a purple tinge that end in a cone like flower. The flowering portion is made up of short, pointed petals roughly 3mm long. These sepals are usually green with reddish tips.

Key Characteristic:

Height 6in to 3ft (long, however not very tall)

Bloom Color: green

Visual Identification:



Scientific Nomenclature:	Matricaria matricarioides
Common Name:	Pineapple weed
Lifform Code:	Forb
Desirability Code:	Undesirable

Description .

Matricaria matricarioides has clover like leaflets with small (2-3mm long) yellow flowers dispersed throughout the leaves. The stems are usually green and can become tangled, forming a mat. The seeds are black, fleshy and about 2-3mm long.

Matricaria matricarioides grows best in lawns, grasslands or forests.

Key Characteristic

Height 4in-1.5ft (sometimes mat forming)

Bloom Color: yellow

Visual Identification:

Scientific Nomenclature:	<i>Polygonum aviculare</i>
Common Name:	Prostrate knotweed
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Polygonum aviculare can grow successfully in a variety of Montana climates including subalpine and roadsides. It is a mat forming species with short and smooth leaves. The flowers are small and light pink with green support back leaves. These flowers in mid summer form dandelion like seeds.

Key Characteristic

Height surface

Bloom Color: light pink

Visual Identification:



Scientific Nomenclature:	<i>Portulaca oleracea</i>
Common Name:	Little hogweed
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Portulaca oleracea spreads to form a mat of tangled red stems and succulent like leaves. The leaves are 5-20mm, have rounded tips and a waxy feeling. The flowers are tiny, growing with 5 petals that are usually closed during the afternoon. It grows best in cultivated fields or lawns.

Key Characteristic

Height 2.5-7.6cm (1-3in)

Bloom Color: yellow

Visual Identification:



Cutleaf-nightshade flower (left) and leaves (right)

Scientific Nomenclature:	Solanum triflorum
Common Name:	Cutleaf nightshade
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Solanum triflorum has thick, deeply veined leaves growing from a rough stem. The leaves are about an inch long with teeth in between the lobes. The flowers have five white petals fused to a yellow tube center. In mid fall a fleshy green/orange fruit forms. The fruit is roughly a mm long and when crushed green seeds and slime squish out.

Solanum triflorum may form mats and can often be found close to prairie dog towns.

Key Characteristic

Height 3in to 1ft

Bloom Color: white

Visual Identification:

May be confused for *Stellaria longifolia* (Long Leaf Starwort)



sta

Scientific Nomenclature:	<i>Stellaria media</i>
Common Name:	Field sowthistle
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Stellaria media can overwinter and has very similar small white flowers as Long Leaf Starwort. *Stellaria media*, however, has oblong, tear drop shaped leaves rather than narrow leaves. The stems are reddish and can form tangled mats. This non-native plant grows best along lakes, ponds and other waterways.

Key Characteristic

Height: 1-3in

Bloom Color: yellow

Acceptable

Visual Identification:



Nodding onion flower in June-July

Scientific Nomenclature:	Allium cernuum
Common Name:	Nodding onion
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Allium cernuum has light pink to white flowers with orange stamens. The stem is smooth with minimal leaves located towards the ground. Flowers are generally smaller than the Short Styled onion. This onion is also more common and can be found in meadows, forests and grasslands. The flowering portion is often seen pointing downward or “nodding” towards the ground.

Key Characteristic

Height 6 in-1 ft

Bloom Color: Pink, purple or white

Visual Identification:



Textile onion blooming in pink and white varieties

Scientific Nomenclature:	Allium textile
Common Name:	Textile onion
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

This onion variety has upright, usually white flowers. The egg-shaped flowers are usually 2.5 cm long and can have pink striping in the petals. Leaves, a couple of cm wide, grow as tall or taller than the flowering section. This onion grows in dry soil in direct sunshine.

Key Characteristic

Height 6 in-1 ft

Bloom Color: white or pinkish white

Visual Identification:



Ψ

Scientific Nomenclature:	<i>Chaenactis douglasii</i>
Common Name:	Dusty maiden
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Chaenactis douglasii grows in rocky alpine environments in relatively dry soils. Commonly found in sparsely vegetated areas, its basal leaves spread out in a lacy fan around the stem. The stems range from green to a woody brown and can be covered in small hairs.

The flowering portion can be pink to white and is made up of numerous small, five-petaled flowers. The stamens are usually darker than the rest of the flowering portion and can curl inwards.

Dusty maiden has not been observed in large numbers across Montana.

Key Characteristic:

Height: .15-.3m (6in-1 ft)

Bloom Color: white or pink

Visual Identification:

Collomia flowers falling off in July

Scientific Nomenclature:	<i>Collomia linearis</i>
Common Name:	Collomia
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Collomia linearis is commonly distributed across Montana meadows. The basal leaves are jagged while the rest of the leaves are smooth and oblong. The flowers are light purple to pink with small round petals blooming from a short stamen.

There are other species of *Collomia*, however this version, known as Narrow Leaf *Collomia* is the most common in the western United States.

Key Characteristic:

Height .5m (1.5ft)

Bloom Color: pink to light blue

Visual Identification:

Scientific Nomenclature:	Gaura coccinea
Common Name:	Scarlet gaura
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Scarlet gaura grows in sandy or gravelly soils and is most known for their irregular pink flowers. The flowers are made up of 4-15cm long stamens that often droop downward. The petals are pink, delicate and shovel shaped.

The stems are often covered in short stiff hairs with oval shaped leaves about 5 cm long. The fruit that form in late summer is a woody capsule about a couple of cm long.

Key Characteristic:

Height 6in -1ft

Bloom Color: white to pink

Visual Identification:



Scientific Nomenclature:	<i>Geranium viscosissimum</i>
Common Name:	Sticky geranium
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Geranium viscosissimum has mainly basal leaves with sharply toothed divisions. The leaves and stems are often sticky and hairy. The flowers are made up of five rounded petals and joined at a sticky and fuzzy base. The petals have darker purple veins and light pink center. The fruits are stiff with hairy capsules less than a cm long. It can be found in forest and meadows in relatively moist soil.

Key Characteristic:

Height .3-1m (1-3ft)

Bloom Color: rose to purple

Visual Identification:

Scientific Nomenclature:	<i>Geum triflorum</i>
Common Name:	Prairie smoke
Lifefrom Code:	Forb
Desirability Code:	Acceptable

Description:

Geum triflorum has flat leaves only a few mm long at the base of the flowering portion. The stems are often dark brown and covered in short rough hairs. It grows in sandy soils and is most known for its wispy, plumed seed heads. The flower is light pink/rose and has thick petals that can droop downward.

Key Characteristic:

Height .15-.3m (6in to 1ft)

Bloom Color: dark pink

Visual Identification:

May be confused for Hedysarum occidentale



Utah sweetvetch flower (left) and seed (right)

Scientific Nomenclature:	Hedysarum boreale
Common Name:	Utah sweetvetch
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Also known as Boreal Sweet vetch, *Hedysarum boreale* grows by river banks, valleys and a variety of open areas. It is most known for its heart shaped, folded leaves that are a few cm long. The leaves are covered in gentle hairs. It has dark pink flowers with lighter pink keels extending from the rear of the plant. The fruit is dark purple/brown and made up connected disks.

Hedysarum boreale usually grows in densely populated groups in well-drained soil.

Key Characteristic:

Height 6 in to 1ft

Bloom Color: dark pink

Visual Identification:



Scientific Nomenclature:	<i>Lewisia rediviva</i>
Common Name:	Bitterroot
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Bitterroot is most known for its bright pink solitary flower that blooms early summer in mountain meadows. Bitterroot grows low to ground with fleshy, narrow basal leaves. Following the bloom, multiple nearly round capsules form. They are about 2mm long, dark brown and shiny.

Key Characteristic:

Height 2.5-10cm (1-4in)

Bloom Color: pink

Visual Identification:



Ψ



Scientific Nomenclature:	<i>Penstemon eriantherus</i>
Common Name:	Fuzzytongue penstemon
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

This forb has pink flowers with purple stripes and yellow beards. These flowers grow out of a hairy tube center and are framed by thick rounded leaves. The basal leaves are often saw-toothed. The stem is also hairy and soft.

Penstemon eriantherus grows well in rocky soils and forms about an inch-long capsules around July.

Key Characteristic:

Height .15-.3m (6in to 1ft)

Bloom Color: pink

Visual Identification:



Spiny phlox white flower present in spring (left) and mat formation on rocky slope (right)

Scientific Nomenclature:	Phlox hoodii
Common Name:	Spiny phlox
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Phlox hoodii forms loose to dense mats in areas that have been overgrazed or subalpine exposed slopes. The mat is formed by numerous small branches with tiny leaves tangling together. From this tangle small white or pink flowers grow in dense clusters. The flowers usually have five petals and yellow centers.

Phlox hoodia is found across Montana and can be differentiated from other similar mat like plants (*Douglasia montana*) by its flat and larger, five petaled flowers.

Key Characteristic:

Height ground level

Bloom Color: purple or white

Visual Identification:



Maidens Tears balloon shaped flowers

Scientific Nomenclature:	Silene vulgaris
Common Name:	Maidens tears
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Silene vulgaris is easily identified by its inflated flowers. White heart shaped petals are fused to a pink, netted tube at the base of the flower. These flowers form ovoid capsules which split into six slits at the top. The leaves and stem are smooth with gently lanceolate leaves. It grows near streambanks and moist valleys.

Key Characteristic

Height 1-2.5ft

Bloom Color: white to pink

Undesireable

Visual Identification:

May be confused for mustard species

Scientific Nomenclature:	<i>Camelina microcarpa</i>
Common Name:	Littlepod false flax
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Camelina microcarpa looks similar to a mustard plant with yellow flowers. *Camelina microcarpa*, however, forms green to pink disk fruits that later fade to a thin membrane.

The seed pods have a beak about an mm long.

This undesirable forb is reasonably common in western Montana and grows by roadsides and grasslands.

Key Characteristic:

Height .3-.6m (1-2ft)

Bloom Color: white to pink

Visual Identification:

May be confused for *Phacelia linearis* (threadleaf)



Scientific Nomenclature:	<i>Convolvulus arvensis</i>
Common Name:	Field Bindweed
Lifform Code:	Forb
Desirability Code:	Noxious

Description

Convolvulus arvensis may be mistaken for *Phacelia linearis*. This species can be identified by its arrow shaped leaves as opposed to narrow/oblong leaves. It grows low to the ground with tangled stems extending to about 1m (3ft). The leaves are arrow shaped with rounded edges. Dispersed throughout the stems are white or pink flowers with smudged yellow centers and white stamens. The petals are connected with two large leaves at the base of the flowers. It can also be identified by its small green flowers growing on the upper side of the leaves.

Convolvulus arvensis grows in fields and vacant lots across Montana.

Key Characteristic:

Height 5-15cm (2in to 6in)

Bloom Color: white to pink

Visual Identification:



Scientific Nomenclature:	Erodium cicutarium
Common Name:	Redstem stork's bill
Lifform Code:	Forb
Desirability Code:	Undesirable

Description

Erodium cicutarium has thin and succulent like leaves tinged with red and serrated edges. The petals are pink, roughly 5 mm long, surrounding a group of gold stamens. The stems have purple veins and are smooth.

This is a relatively uncommon forb and can survive low Montana spring time temperatures.

Key Characteristic

Height 1-2ft

Bloom Color: pink

Visual Identification:

Scientific Nomenclature:	<i>Lamium amplexicaule</i>
Common Name:	Henbit deadnettle
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description .

Lamium amplexicaule is an exotic species less than 15cm (6in) tall. It has disk shaped leaves spaced at irregular intervals up the entire length of the stem. The flowers are magenta with darker keels extending from the rear. They are about 7 mm long and very delicate looking. The fruits are small red fuzz balls at the base of the leaves

Lamium amplexicaule grows in lawns and valleys and is not commonly found across Montana.

Key Characteristic

Height .3-1m (1-3ft)

Bloom Color: pink

Visual Identification:



Tatarian honeysuckle in mid summer (left) and fall (right)

Scientific Nomenclature:	Lonicera tatarica
Common Name:	Tatarian honeysuckle
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description .

This nonnative species can be found along streams, road sides and valleys. In mid-summer/spring pink flowers bloom from between the leaves. The flowers are about 15 mm long with lobes longer than the light pink center tube. The leaves have rounded tips, are about an inch long and have slightly jagged edges. *Lonicera tatarica* usually grows in a bush like fashion with tan and smooth twigs.

Key Characteristic

Height 3-6ft

Bloom Color: pink

Visual Identification:



Sheep sorrel flower (left) and leaves (right)

Scientific Nomenclature:	Rumex crispus
Common Name:	Curlyleaf Dock
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Rumex acetosella can grow successfully in valleys and subalpine and is known for its dark red to pink flowers that grow directly from the top third of the stem. The stem is hairless with leaves roughly an inch long growing from the base and growing shorter towards the top of the plant. The leaves are oblong and hairless.

Key Characteristic

Height 1-1.5ft

Bloom Color: dark pink

Acceptable

Visual Identification:



Scientific Nomenclature:	Allium brevistylum
Common Name:	Short-styled onion
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Allium brevistylum grows along streams or swampy meadows and is a relatively rare native plant species. Flowers are often purple or pink and located close together in a tight sphere at the top of the stem. Leaves are mostly basal, hairless and oblong. The stem is smooth and circular.

Key Characteristics

Height 1 ft

Bloom Color: Pink, purple

Visual Identification:

May be confused for *Centaurea*
(Spotted knapweed)



Scientific Nomenclature:	Aster ascendens
Common Name:	Western aster
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Aster ascendens grows up to two ft tall with purple petals and yellow centers. It has 2in wide flowers at the end of branched stems. The stems take on a purple hue and are rough to the touch. This aster is relatively common and grows in a variety of soils and part shade. When not in bloom this plant can be identified by its rough stems/leaves and oblong/pointed leaves. The flowers of this forb are much more daisy like (rather than cone like) compared to knapweed.

Key Characteristic:

Height 1ft-2ft

Bloom Color: purple

Visual Identification:



Groundplum in bloom (left) and producing fruit (right)

Scientific Nomenclature:	Astragalus crassicaarpus
Common Name:	Groundplum milkvetch
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

When Groundplum milkvetch is in bloom the flowers are purple with a 15mm keel coming out of the base of the flower. The flowers bloom later in the season transition to a globose, round plum. These plums are hard, leathery and contain the seed pod inside. The leaves are small, less than a couple cm, and oblong. Groundplum is not that common across Montana but grows in relatively dry climates

Key Characteristic:

Height 1ft-3ft

Bloom Color: purple or white

Visual Identification:

May be confused for *Astragalus crassicaarpus* (Groundplum Milkvetch)



Prairie milkvetch blooming in June-July

Scientific Nomenclature:	<i>Astragalus laxmannii</i>
Common Name:	Prairie milkvetch
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Astragalus laxmannii looks a lot like Groundplum milkvetch in bloom, however, these flowers are darker purple/blue. This species of milkvetch is also more commonly found in Montana. It grows in dry soils in full to partial sunlight. When not flowering the seed pods look like peas and stand upright from the stem. The stem is narrow, flexible and can often be covered in tiny hairs.

Key Characteristic:

Height 6 in to 2 ft

Bloom Color: blue or purple

Visual Identification:



Scientific Nomenclature:	Campanula rotundifolia
Common Name:	Bluebell bellflower
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description: *Campanula rotundifolia* is known for its violet bell shaped flowers that usually nod towards the ground. The flowers can either be found in bunches in or solitary. The leaves are smooth, about 2cm long and have rough edges. Bluebells are found in a variety of climates and are wide spread across Montana.

Key Characteristic:

Height 4in-1ft

Bloom Color: blue/purple

Visual Identification:

Wavyleaf thistle blooming (June to July)

Scientific Nomenclature:	Cirsium undulatum
Common Name:	Wavyleaf Thistle
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Cirsium undulatum is commonly found across Montana and grows in a variety of dry soil types and climates. The stems and leaves are covered in gray wooly hairs. Sharp yellow spines project from the leaves and flower heads. The leaves, as the name suggests, are wavy and interictally cut.

Although similar to its invasive cousin Canadian thistle, Wavy leaf only spreads through its seeds and has fragrant flowers. Canadian thistle also has more spear shaped leaves.

Key Characteristic:

Height 1-2ft

Bloom Color: pink to purple

Visual Identification:



Beeplant in bloom and producing fruit pods

Scientific Nomenclature:	<i>Cleome serrulata</i>
Common Name:	Rocky mountain beeplant
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Rocky Mountain beeplant is commonly found in dry soils near road ways. The stem has alternating oblong leaves along the entire length of the plant. The flowering portion, ranging from light pink to purple has darker stamens covered in pollen. The fruit is a distinct bean like pod that hangs from the flower head.

This plant is most known for its unpleasant odor.

Key Characteristic:

Height .6-1.2m (2-4ft)

Bloom Color: pink to purple

Visual Identification:



Ψ

Scientific Nomenclature:	<i>Collinsia parviflora</i>
Common Name:	Blue-eyed Mary
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Blue-eyed Mary is a small and delicate flower found across Montana, mostly in shady forested areas. Its stem is thin and can be covered in short thick hairs. The flowers are small (less than a few mm across) and range from blue to purple. Light purple keels extend from the rear of the plant.

Collinsia parviflora usually grows in clusters that blanket sections of a forest in light blue.

Key Characteristic:

Height (7-30cm) 3in to 1ft

Bloom Color: blue to purple

Visual Identification:

Scientific Nomenclature:	<i>Delphinium bicolor</i>
Common Name:	Low larkspur
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Delphinium bicolor grows in well drained soils in full to partial sun. It is most known for its five petaled purple flowers blooming around noticeably darker stamens. The back of the flower extends a few cm and gives the flowering portion the appearance of a tail.

Most of the leaves are basal and are made up of many fanning lobes.

The stems are woody and can be covered in small hairs. This plant is also known as little larkspur.

Key Characteristic:

Height .3-1m (1-3ft)

Bloom Color: purple

Visual Identification:

Scientific Nomenclature:	<i>Dodecatheon pulchellum</i>
Common Name:	Darkthroat shootingstar
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Dodecatheon pulchellum is known for its dark purple with yellow centered, star shaped flowers. This delicate plant has mostly basal leaves with a reddish thin stem. The leaves are thinly veined and about 7.6cm (3in) long. The flowers usually droop downward with 5 anthers joining together to form a point in front of the swept back petals

Key Characteristic:

Height .15-.3m (6in-1ft)

Bloom Color: purple

Visual Identification:



Scientific Nomenclature:	<i>Epilobium angustifolium</i>
Common Name:	Fireweed
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

From avalanche chutes to stream banks and meadows, *Epilobium angustifolium* commonly grows in a variety of western Montana environments. It can grow up to 1.2m (4ft) tall and has bright magenta and fragrant flowers.

The stems are unbranched and the fruits form late in summer/early fall into narrow bean like pods.

Key Characteristic:

Height .3-1.2m (1-4ft)

Bloom Color: purple

Visual Identification:



Scientific Nomenclature:	<i>Erigeron pumilus</i>
Common Name:	Shaggy daisy
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Erigeron pumilus has purple or white flowers with thinner petals compared to *Erigeron compositus*. This daisy also has fuzzier stems and furry leaves that grow along the entire length of the stems.

When not in bloom the bulbs are oblong and also furry.

It grows in sandy or stony soil in grasslands and woodlands across Montana.

Key Characteristic:

Height 6-12in

Bloom Color: white to purple

Visual Identification:



Scientific Nomenclature:	<i>Geranium viscosissimum</i>
Common Name:	Sticky geranium
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Geranium viscosissimum has mainly basal leaves with sharply toothed divisions. The leaves and stems are often sticky and hairy. The flowers are made up of five rounded petals and joined at a sticky and fuzzy base. The petals have darker purple veins and light pink center. The fruits are stiff with hairy capsules less than a cm long. It can be found in forest and meadows in relatively moist soil.

Key Characteristic:

Height .3-1m (1-3ft)

Bloom Color: rose to purple

Visual Identification:

May be confused for Hedysarum boreale



Western sweetvetch in bloom (left) and seeds (right)

Scientific Nomenclature:	Hedysarum occidentale
Common Name:	Western sweetvetch
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Hedysarum occidentale looks very similar to *Hedysarum boreale*. It can be distinguished by its more drooping leaves and longer, less hairy leaves. It has also a different habitat preference than *Hedysarum boreale*. Western sweetvetch grows in more forested and subalpine areas in moister soil.

The flowering portion also extends for about a third of the stem with tube like flowers growing directly from the stem. The flowers look like purple slippers with darker purple tops. The seeds are flat pink and green connected disks.

Key Characteristic:

Height 1-2ft

Bloom Color: purple

Visual Identification:



Scientific Nomenclature:	<i>Iris missouriensis</i>
Common Name:	Rocky Mountain iris
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description: *Iris missouriensis* is relatively common in wet meadows and thickets. It is reasonably fragrant and is most known for its violet flowers with a yellow mid-stripe with a blue vein. The flowers are about an inch long.

Its leaves are usually basal and 15cm (6in) long with obvious membrane ribs. In midsummer an inch-long green capsule forms at the top of the stem.

Key Characteristic:

Height .15-.3m (6in- 1ft)

Bloom Color: white to purple

Visual Identification:



Scientific Nomenclature:	<i>Liatris punctata</i>
Common Name:	Dotted blazing star
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Liatris punctata grows up to 2ft tall with long narrow leaves extending from the entire length of the stem. It has 4 to 8 disk shaped flowers with bright purple narrow petals. The flowers grow from a hairy green base about 2 cm thick. In early fall fruits with white feathery bristles form.

It grows best in well drained soils across sage brush Plains of eastern Montana.

Key Characteristic:

Height 1-2ft

Bloom Color: purple

Visual Identification:

Scientific Nomenclature:	<i>Linum lewisii</i>
Common Name:	Wild blue flax
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Wild blue flax is also known as Prairie Flax. It blooms in early summer with light purple delicate flowers. The fruits that form in mid-summer are small and usually brown. It usually grows to be about .3m (1ft) tall and has numerous small, oblong leaves. It is commonly found in grasslands and meadows across Montana.

Key Characteristic:

Height .3-.5m (1-1.5ft)

Bloom Color: light purple

Visual Identification:



Scientific Nomenclature:	<i>Lupinus sericeus</i>
Common Name:	Silky lupine
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Silky lupine has highly branched leaves extending from a fuzzy and woody stem. It grows to be about a .3m (1ft) and about half of this forb is made up of the flowering portion. Lupine has tubed shaped, white or purple flowers that grow along the top third of the stem. The flowering portion tapers to a point at the top. In late summer bean shaped fruit pods form in place of the flowering portion. Lupine is common in the sub alpine of western Montana.

Key Characteristic:

Height .15-.6m (6in-2ft)

Bloom Color: white or light purple

Visual Identification:



Scientific Nomenclature:	Machaeranthera canescens
Common Name:	Hoary tansyaster
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Machaeranthera canescens can grow in a bush like pattern with lots of narrow branching flowers exploding in many different directions. Each stem has 5-10 purple flowers. The flowers are about an inch in diameter with layered ray-shaped purple petals. It has oblong leaves that can grow up to 10 cm long.

Insects are commonly found on this plant.

Key Characteristic:

Height 4in-2ft

Bloom Color: light purple

Visual Identification:



Scientific Nomenclature:	<i>Medicago sativa</i>
Common Name:	Alfalfa
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description

Medicago sativa is a hardy plant that can succeed in a variety of soil types and climates. The leaves are about 3 cm long, oblong and soft. It grows in bunches with purple to white flowers nestled within the branches. The flower petals grow around a tube center. In fall curly seeds form that mature from green to brown.

Key Characteristic

Height: .3-1m (1-3ft)

Bloom Color: purple to white

Visual Identification:



Scientific Nomenclature:	<i>Mentha arvensis</i>
Common Name:	Wild mint
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Wild mint is most known for its leaves. They are saw-toothed, about 2 in long and most noticeably minty in their aroma. Light purple flowers form compact clusters at the base of the leaves. The fruits are small light-colored spheres.

Wild mint prefers wet soils and grows along lake or stream shores.

Key Characteristic:

Height .3-.6m (1ft-2ft)

Bloom Color: purple or white

Visual Identification:



Scientific Nomenclature:	<i>Mertensia oblongifolia</i>
Common Name:	Oblongleaf bluebells
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Mertensia oblongifolia is also known as Sage Bluebells. This species of bluebells has unique leaves. The leaves are about 7.6 cm (3in) long with obvious lateral vein. The leaves also have rounded tips and usually point upwards.

The flowers are purple, bell shaped and are known to droop downward. These variety of bluebells has dense clusters of flowers that hang from the tip of the stem.

It grows well in meadows and is relatively uncommon in most areas of Montana.

Key Characteristic:

Height 7.6cm to .3m(3in to 1ft)

Bloom Color: purple

Visual Identification:

Scientific Nomenclature:	<i>Myosotis arvensis</i>
Common Name:	Forget me not
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Forget me nots are small blue flowering forbs with .4-3in (1-8cm) long leaves. The leaves have smooth margins and the stems have small rough hairs. This forb grows best near slow moving streams and wet forested areas.

Key Characteristic:

Height 10-40 cm (4-16in)

Bloom Color: blue

Visual Identification:



Stiffleaf penstemon leaves (left) and flowers (right)

Scientific Nomenclature:	Penstemon aridus
Common Name:	Stiffleaf penstemon
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Penstemon aridus is a short plant with purple trumpet shaped flowers that grow at right angles from the stem. It has large basal leaves with alternating smaller leaves up the stem. The middle of the flowers is often pink and the fruit forms to a small capsule in the early fall.

It is most commonly found in southwest Montana in the exposed subalpine.

Key Characteristic:

Height 1in to 4in

Bloom Color: blue/purple

Visual Identification:



Ψ



Scientific Nomenclature:	<i>Penstemon eriantherus</i>
Common Name:	Fuzzytongue penstemon
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

This forb has pink flowers with purple stripes and yellow beards. These flowers grow out of a hairy tube center and are framed by thick rounded leaves. The basal leaves are often saw-toothed. The stem is also hairy and soft.

Penstemon eriantherus grows well in rocky soils and forms about an inch-long capsules around July.

Key Characteristic:

Height .15-.3m (6in to 1ft)

Bloom Color: pink

Visual Identification:

Scientific Nomenclature:	<i>Penstemon nitidus</i>
Common Name:	Waxleaf penstemon
Lifefrom Code:	Forb
Desirability Code:	Acceptable

Description:

Waxleaf penstemon has several stems, usually 10-30 cm (4-12 in) tall, from a branched root crown. The thick and entire-margined basal leaves are broadly lance-shaped, and up to 10 cm (4 in) long. Herbage is glabrous and covered with a thin, waxy coating. The bright blue corolla is 13-18 mm long. Anthers are glabrous. Small populations of this species occur in grasslands in the foothills of the Sapphire Range. This plant flowers in May, earlier than other penstemons.

Key Characteristic:

Height 10-25cm (4-10in)

Bloom Color: blue

Visual Identification:



Small flowered penstemon flower (left) and stem with leaves (right)

Scientific Nomenclature:	Penstemon procerus
Common Name:	Small-flowered penstemon
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Penstemon procerus looks similar to *Penstemon aridus*, however, they grow in different environments. This species is found in moist meadows and valleys as opposed to rocky slopes.

Penstemon procerus has magenta trumpet shaped flowers that grow from a very smooth stem. It only has basal leaves that are about 2 in long. *Penstemon aridus* has much wider and softer leaves compared to this variety. The stem of *Penstemon procerus* has a purplish tinge to it.

Key Characteristic:

Height 6in to 1ft

Bloom Color: purple/blue

Visual Identification:



Silverleaf phacelia flower (left) and seed (right)

Scientific Nomenclature:	Phacelia hastata
Common Name:	Silverleaf phacelia
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Phacelia hastata can be found in stony soil where there is not a lot of vegetation present. Both the leaves and stem are very soft to the touch. The leaves have obvious veins and are oblong. The stem is reddish and appears to have a silver coating. On top of the stem can be found spherical purple flowers made up of clusters of 5 petaled flowers. The seeds form in early fall and explode into a white puffball.

Key Characteristic:

Height 4-6in

Bloom Color: purple

Visual Identification:

Scientific Nomenclature:	<i>Phacelia linearis</i>
Common Name:	Threadleaf phacelia
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Phacelia linearis is most recognizable by its light purple circular flowers. They are yellow in the middle with dark purple veins branching out to the 3-5 round, overlapping petals. It has dark green to brown stems with alternating short/pointed leaves along its entire length. It prefers to grow in sparsely vegetated grasslands in dry soils.

Key Characteristic:

Height 10-15 cm (4-6in)

Bloom Color: purple

Visual Identification:



Scientific Nomenclature:	Polemonium pulcherrimum
Common Name:	Jacob's-ladder
Lifefrom Code:	Forb
Desirability Code:	Acceptable

Description:

Polemonium pulcherrimum grows in stony patches in meadows. Most of the leaves are basal and fern like with many round leaflets. The flowers form funnels with yellow tubed centers. *Polemonium pulcherrimum* usually has 5 delicate purple flowers growing from a smooth stem.

This forb is not commonly found in Montana.

Key Characteristic:

Height 4in-1ft

Bloom Color: purple

Visual Identification:

Scientific Nomenclature:	Symphyotrichum spathulatum
Common Name:	Western mountain aster
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description

Symphyotrichum spathulatum is generally hairless. It usually grows in bunches with dark brown stems. It has narrow leaves (about a cm wide). The leaves grow upward from the stem and are 6 in long. The flowers are light purple with 20-50 layered rays extending from a fuzzy golden center.

It grows at low elevation mountain meadows in moist soils.

Key Characteristic:

Height 2-5ft

Bloom Color: purple

Visual Identification:



Scientific Nomenclature:	Trifolium pratense
Common Name:	Red clover
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description

Trifolium pratense grows best in western Montana. Found near stream sides and moist meadows, Red clover is most known for its purple flower. The flower is made up of many small purple petals forming a loosely packed sphere. The leaves grow in groups of three. The leaves are slightly oblong with white “v” shaped markings.

Key Characteristic

Height: 1-2ft

Bloom Color: purple

Visual Identification:



Scientific Nomenclature:	<i>Veronica americana</i>
Common Name:	American speedwell
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description

Veronica Americana grows in slow moving, shallow water to about a foot and a half tall at its maximum. Flowers, usually about 4 petals, form from branched stems. The stems are smooth and woody. The leaves are jagged, oblong and about 5cm (2in) long. The flowers have dark purple and speckled centers with yellow tubes that attach to the stems.

Key Characteristic:

Height .15-.6m (6in to 2ft)

Bloom Color: light purple/blue

Visual Identification:

May be confused for *Astragalus crassicaarpus* (Groundplum milkvetch)



Scientific Nomenclature:	Vicia americana
Common Name:	American vetch
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description

When blooming *Veronica americana* can look like *Astragalus crassicaarpus*

However, *Veronica americana* forms bean pod like fruits rather than spherical orbs.

Veronica americana also can have climbing stems. The stems are smooth and thin with leaflets branching off from the lower part of the stem.

Vicia americana is most likely found in open forests and meadows in moderately drained soil.

Key Characteristic:

Height 1-1.5ft

Bloom Color: purple

Undesireable

Visual Identification:



Scientific Nomenclature:	<i>Asperugo procumbens</i>
Common Name:	German madwort
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Occasionally grown as garden plant, this exotic forb has 7cm (3in) oblong leaves. Both the stems and leaves are thick and hairy. The leaves become smaller towards the top of the stem, ending in tiny purple flowers nestled in the top leaves. The flowers are usually compressed and quickly form fruit. The fruits have closed mouth clamp and are veiny and prickly.

Asperugo procumbens has a flexible stem and like most weeds, grows in disturbed areas.

Key Characteristic:

Height .3-1m (1-3ft)

Bloom Color: purple

Visual Identification:

Scientific Nomenclature:	Atriplex patula
Common Name:	Spear saltbush
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Atriplex patula is very common across Montana and often grows near roadsides and valleys. It has small (only a few mm wide) succulent like leaves that are gently diamond shaped. Swollen fruits form with dented margins in late summer.

This is an exotic plant species with a thick stem that gradually thins towards a branching top.

Key Characteristic:

Height 1-3ft

Bloom Color: purple

Visual Identification:



Scientific Nomenclature:	<i>Campanula rapunculoides</i>
Common Name:	Rampion bellflower
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Campanula rapunculoides has pleasant looking purple flowers that droop downward. The flowers are trumpet shaped and take up the top fourth of the stems. The leaves have rough edges and deeply veined. The stem is reddish and gets thinner towards the top.

Campanula rapunculoides grows by roadsides and rural lawns.

Key Characteristic:

Height 1-2ft

Bloom Color: purple

Visual Identification:

Scientific Nomenclature:	<i>Centaurea repens</i>
Common Name:	Russian knapweed
Lifeform Code:	Forb
Desirability Code:	Noxious

Description

Russian knapweed is a noxious weed that can aggressively take over in dry areas. The stems are covered in resin pockets with small leaves growing along the entire branched stems. Each stem ends in a rough cone looking flower with a purple tuft. This purple tuft matures into a white cobweb that stays on the plant throughout the season.

Key Characteristic:

Height (.15-1m) 6in to 3ft

Bloom Color: purple

Visual Identification:



Scientific Nomenclature:	<i>Centaurea stoebe</i>
Common Name:	Spotted knapweed
Lifeform Code:	Forb
Desirability Code:	Noxious

Description

Centaurea stoebe is a noxious weed that can aggressively take over open hillsides and meadows. Its flowering heads are smaller than those of Russian knapweed. The scales of Spotted knapweed have purple tops and sharp points on the ends. It has 2-10 cm long leaves with two distinct lobes. The stems are heavily branched and rough to the touch.

Key Characteristic

Height: 6in to 2ft

Bloom Color: purple

Visual Identification:



May be confused for *Cirsium undulatum* (Wavy leaf thistle) or *Cirsium vulgare* (Bull Thistle)



Canada thistle flower (left) and basal leaves (right)

Scientific Nomenclature:	<i>Cirsium arvense</i>
Common Name:	Canada thistle
Lifeform Code:	Forb
Desirability Code:	Noxious

Description

Not all thistles are undesirable. (See *Cirsium undulatum*) This variety can be identified by its dandelion like tufts formed in late summer. Canada thistle also has spikes at the intersection of the main branch and sub-branches. The flowering heads are also much smaller (14-18 mm) and lighter purple.

Cirsium arvense is relatively common across Montana, growing best along streams and wetlands.

Key Characteristic:

Height 1ft-3ft

Bloom Color: purple

Visual Identification:



May be confused for *Cirsium undulatum* (Wavy leaf thistle) or *Cirsium arvense* (Canada thistle)

Bull Thistle leaves (left) and flower (right)

Scientific Nomenclature:	<i>Cirsium vulgare</i>
Common Name:	Bull thistle
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Cirsium vulgare has large flowers with dark purple buds that mature into white, webby puffs. This thistle has much larger flowers than Canada thistle, roughly an inch and a half wide. This variety also has barbed spikes circling the entire spherical flower base. The stems are not resinous but thickly veined with spikes and small hairs. The leaves are deeply lobed and narrow with obvious white veins.

It can be commonly found in disturbed sites across Montana.

Key Characteristic:

Height 2ft-4ft

Bloom Color: purple

Visual Identification:

Scientific Nomenclature:	<i>Cynoglossum officinale</i>
Common Name:	Peking cotoneaster
Lifeform Code:	Forb
Desirability Code:	Noxious

Description

Cynoglossum officinale has long, fuzzy leaves that frame dark red flowers with deeply divided and folded petals. The flowers have small yellow centers with fuzzy support leaves. The fruits are flat nutlets, usually fading from a light green to tan. This noxious forb grows in a variety of meadows and grasslands and other disturbed areas.

Key Characteristic

Height .3-1m (1-3ft)

Bloom Color: purple/red

Visual Identification:

May be confused for *Solanum dulcamara* (bittersweet)



Scientific Nomenclature:	<i>Lycium barbarum</i>
Common Name:	Matrimony vine
Lifeform Code:	Forb
Desirability Code:	Noxious

Description .

Lycium balimisolium is known as *Lycium barbarum*. It can be identified by its smooth and tan twigs with short leaves coming off the stem. The flowers have 4-5 thick purple petals wrapped around a yellow funnel center. The fruit is a red to orange oblong berry that is usually only a cm long. This forb can appear shrub like or can climb up nearby larger trees or rocks. It grows in vacant lots, by road sides or valleys.

Key Characteristic

Height .3-1m (1-3ft)

Bloom Color: purple

Visual Identification:



Scientific Nomenclature:	Plantago major
Common Name:	Common plantain
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Commonly found near roadsides, lawns or other disturbed areas, *Plantago major* is most known for its broad leaves. Each leaf is a few in long with 5-9 obvious green veins following the rounded contours of the leaf edges. The flowers are green cylinders with brown/purple stamens perched on top a stem roughly 3-6 in tall.

Key Characteristic

Height 2-6 in

Bloom Color: green

Acceptable

Visual Identification:



Scientific Nomenclature:	<i>Ipomopsis aggregate</i>
Common Name:	Scarlet gilia
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Ipomopsis aggregate has red to pink trumpet shaped flowers extending from a medium branched and woody stem. It can be found in sagebush steppes and pine forests in sandy or clay soils. It has narrow spear shaped leaves with edges that curl upward. When not in bloom it forms 2-4mm long capsules with 2-4 seeds inside.

Key Characteristic:

Height .15-.3m (6in- 1ft)

Bloom Color: red to pink

Visual Identification:



Scientific Nomenclature:	Penstemon eatonii
Common Name:	Firecracker penstemon
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Also known as Bear tongue, *Penstemon eatonii* blooms in early spring and has bright red trumpet shaped flowers. It does very well in dry, sandy areas and prefers full sun. The leaves are tapered and waxy feeling.

In late summer small bean shaped pods form as the petals wither away.

Key Characteristic:

Height 1-2ft

Bloom Color: orange/red

Visual Identification:



Scientific Nomenclature:	<i>Sphaeralcea coccinea</i>
Common Name:	Scarlet globemallow
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description

Sphaeralcea coccinea has spade shaped leaves about 5cm (2in) long with multiple lobed divisions. The flowers are rusty orange with delicate round petals, surrounding a yellow center.

It grows in grasslands and valleys and is common near roadsides.

Key Characteristic:

Height 7.6-20cm (3-8 in)

Bloom Color: red/orange

Visual Identification:



Scientific Nomenclature:	<i>Thalictrum occidentale</i>
Common Name:	Western meadow-rue
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description

Thalictrum occidentale has leathery, 3 lobed leaflets with hairy undersides. The top third of the plant is leafless and has a reddish orb flower on top. When in bloom, the flowers are in bloom, a firework of purple with green centers forms. When not in bloom the fireworks wilt to yellow heads that droop toward the ground.

Thalictrum occidentale grows in thickets and wet meadows and is relatively common across Montana.

Key Characteristic:

Height 1ft to 5ft

Bloom Color: red

Undesireable

Visual Identification:

Scientific Nomenclature:	Papaver rhoeas
Common Name:	Common poppy
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Papaver rhoeas is not commonly found outside of gardens in Montana. The common poppy has bright orange and silky petals that are round and overlapping. Purple pollen can smudge the center of the petals. The stems are rough and hairy with leaves about 30 cm long on the bottom fourth of the stem. The petals fall off and leave behind a green and black capsule.

Key Characteristic

Height 1-2ft

Bloom Color: orange

Acceptable

Visual Identification:

Scientific Nomenclature:	<i>Artemisia cana</i>
Common Name:	Silver sagebrush
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

This sagebrush grows at a variety of heights, upwards of 1.5m (5ft). The leaves are less than a cm wide and are covered in fine hairs that give them a silver hue. The stems are thick and woody towards the base and become thinner and more flexible towards the top. This species of sage brush is very common across Montana, especially in semi-arid grasslands.

Key Characteristic:

Height .3-1.5m (1-5ft)

Bloom Color: light green

Visual Identification:



Scientific Nomenclature:	<i>Artemisia frigida</i>
Common Name:	Fringed sage
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Artemisia frigida grows lower to the ground than the other species of sage. The leaves are fan shaped and less than inch long. When in bloom, the flowers are small and golden. Fringed Sage forms mats in dry plains and foothills. It is very common in woodland areas and grasslands.

Key Characteristic:

Height 7cm -.5m (3in to 1.5 ft)

Bloom Color: gold, white

Visual Identification:



Scientific Nomenclature:	<i>Artemisia ludoviciana</i>
Common Name:	Silver wormwood
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Artemisia ludoviciana is a medium sized sage brush with leaves about 4 in long. The stems are covered in a woolly white or gray hair. When in bloom, the flowers are hairy, yellowish cups that nod towards the ground. This sage grows in dense colonies in dry sandy soils.

Key Characteristic:

Height .3-1m(1ft – 3ft)

Bloom Color: yellow, white

Visual Identification:



Scientific Nomenclature:	<i>Artemisia tridentata</i>
Common Name:	Big sage
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Artemisia tridentata keeps its leaves year around. The leaves are wedged shaped and covered in fine silvery hairs. The flowers are yellow and loosely surrounding the stem. Big sage has woody stems and can grow in fine/clay soils. Big sage is common and can often dominate prairies.

Key Characteristic:

Height .6-2m (2ft-6ft)

Bloom Color: pale yellow, silver

Acceptable

Visual Identification:



Mountain mahogany tail like flowers

Scientific Nomenclature:	Cercocarpus ledifolius
Common Name:	Mountain mahogany
Lifeform Code:	Shrub
Desirability Code:	Acceptable

Description:

Cercocarpus ledifolius has red new growth stems and gray older growth. The leaves are about 2 cm long and covered in small hairs. The seeds of the flowers appear to have tails that are brown and fuzzy. Some shrubs grow to be tall with thick woody stems. It grows best in rock slopes of limestone sandstones.

Key Characteristic:

Height 1-3.5ft

Bloom Color: brown

Visual Identification:



Green rabbitbrush flowers (left) and bush (right)

Scientific Nomenclature:	Chrysothamnus viscidiflorus
Common Name:	Green rabbitbrush
Lifeform Code:	Shrub
Desirability Code:	Acceptable

Description:

Green rabbitbrush is also known as yellow rabbitbrush. Although similar to Rubber Rabbit Brush, Rubber rabbit brush looks much more like a sage plant. Green rabbitbrush also has stiffer stems compared to the whiteish-flexible stems of Rubber rabbitbrush. The flower heads are about 5 cm long and usually bright yellow to gold.

Green rabbitbrush does usually does not exhibit dominance when in the presence of other rabbitbrush species. It grows in arid climates in well drained/sandy soils.

Key Characteristic:

Height 1-3ft

Bloom Color: bright yellow to gold

Visual Identification:

Scientific Nomenclature:	<i>Cornus sericea</i>
Common Name:	Redosier dogwood
Lifeform Code:	Shrub
Desirability Code:	Acceptable

Description:

This shrub has reddish branches and can grow up to 3 m (9 ft) tall. The flexible stems may have white dots along the entire length

It grows near river banks or swampy areas. Its leaves, 8cm (3in) long, are smooth and oblong with red woody centers extending from the stem.

Flowers are white and small and later form white berries mid fall.

Key Characteristic:

Height 6m (9ft)

Bloom Color: white

Visual Identification:



Scientific Nomenclature:	<i>Dasiphora fruticosa</i>
Common Name:	Shrubby cinquefoil
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

This highly branched shrub can grow up to 3ft tall. It has dark red and woody stems with short thick leaves extending the entire length of each stem. The flowers bloom yellow and form dry small seed pods (similar to a dandy lion) in late summer.

This shrub grows in a variety of areas including meadows, forest and near rivers.

Key Characteristic:

Height 1-3ft

Bloom Color: yellow

Visual Identification:

May be confused for *Stenotus acaulis*
(Stemless mock goldenweed)



Scientific Nomenclature:	Gutierrezia sarothrae
Common Name:	Broom snakeweed
Lifeform Code:	Shrub
Desirability Code:	Acceptable

Description:

This small shrub grows to be about 2ft tall with green to brown stems coming from a woody base. The yellow flowers form dense clusters on top of the shrub and can be sticky to the touch.

When in bloom, *Gutierrezia sarothrae*, looks dome like. While not in bloom appears to look more like a broom. The fruits are small scales that can be covered in coarse hairs. *Gutierrezia sarothrae* grows in rocky plains and mountain slopes in a variety of soil types.

Key Characteristic:

Height 6 in to 2ft

Bloom Color yellow

Visual Identification:



Scientific Nomenclature:	<i>Juniperus communis</i>
Common Name:	Common juniper
Lifeform Code:	Shrub/Tree
Desirability Code:	Acceptable

Description:

Juniperus communis is very common in forested areas across Montana. It forms dark blue berries nestled in short, stiff needles. The stems are woody and can either grow upright to look more like a bush or flat to the ground in mat formation.

The needles have a whitefish lower surface and are roughly 10mm (.4 in) long.

Key Characteristic:

Height .3-1m (1-3ft)

Bloom Color: green

Visual Identification:



Scientific Nomenclature:	Juniperus communis
Common Name:	Creeping juniper
Lifeform Code:	Shrub/Tree
Desirability Code:	Acceptable

Description:

This species of juniper has very similar needles as the Common Juniper, however, it forms much lighter green berries. It is always found low to the ground and the bark is often obscured by the thick mat of needles.

Juniperus communis is also much more common in plains and valleys and is rarely found in forested areas.

Key Characteristic:

Height 1ft

Bloom Color: green

Visual Identification:



Scientific Nomenclature:	<i>Juniperus scopulorum</i>
Common Name:	Rocky Mountain juniper
Lifeform Code:	Shrub/Tree
Desirability Code:	Acceptable

Description:

Out of the three juniper species commonly found in Montana, rocky mountain juniper is by far the largest and most tree like. Its reddish bark is stringy and peels easy from the trunk.

Juniperus scopulorum also forms blue berries and softer/flatter needles compared to *Juniperus communis*.

It is commonly found in forested areas as well as moist meadows.

Key Characteristic:

Height 10m (30ft)

Bloom Color: green

Visual Identification:



Scientific Nomenclature:	<i>Philadelphus lewisii</i>
Common Name:	Mockorange
Lifeform Code:	Shrub
Desirability Code:	Acceptable

Description:

Philadelphus lewisii is a shrub with reddish bark that peels on the woodier sections of the plant. It is highly branched with 2 inch long and stiff leaves growing from the entire length of each twig. The flowers grow throughout the shrub and do not remain on the plant for long. They are sweet smelling, delicate and usually white.

Common in western Montana, *Philadelphus lewisii* grows well in rocky grasslands.

Key Characteristic:

Height 10-15cm (4-6in)

Bloom Color: white

Visual Identification:



Chokecherry flowers (left) and early season berries (right) Ψ

Scientific Nomenclature:	<i>Prunus virginiana</i>
Common Name:	Chokecherry
Lifeform Code:	Shrub
Desirability Code:	Acceptable

Description

Prunus virginiana has reddish brown twigs with a woody trunk. The leaves are slightly toothed, about 7cm (3in) long. It has fragrant flowers that bloom around June in cup shaped bunches. The fruit forms red to black tart cherries in late summer.

Choke cherries grow in rocky slopes, woodland areas and in mostly stony soil.

Key Characteristic:

Height 1-4m (3-12ft)

Bloom Color: white

Visual Identification:

Scientific Nomenclature:	<i>Purshia tridentata</i>
Common Name:	Antelope bitterbrush
Lifeform Code:	Shrub
Desirability Code:	Acceptable

Description

Purshia tridentata is commonly associated with Ponderosa pines. It grows in a bush like fashion with interact branches layered with dusty yellow flowers. It has small, fan shaped leaves that grow directly from the stem.

Blooming mostly occurs in June, the flowers about an inch wide with clawed petals. Later in the summer, the petals fall and leave behind fruits with furry horns extending from the center.

Key Characteristic:

Height 1-2m (3-6ft)

Bloom Color: yellow

Visual Identification:



Scientific Nomenclature:	<i>Ribes aureum</i>
Common Name:	Golden currant
Lifeform Code:	Shrub
Desirability Code:	Acceptable

Description

Also known as Goose berries, this shrub can grow up to 1.8 (6ft) tall with dark brown twigs that age to grey. The leaves are about .8m (32in) wide with multiple finger like lobes. The flowers are thick and yellow with tube shaped centers. In late summer a nearly black berry grows in place of the flowers.

It grows in similar climates as chokecherries, however it is less common.

Key Characteristic:

Height 1-2m (3-6ft)

Bloom Color: yellow

Visual Identification:



Wax currant flowers and leaves (left) and berries (right)

Scientific Nomenclature:	Ribes cereum
Common Name:	Wax currant
Lifeform Code:	Shrub
Desirability Code:	Acceptable

Description

Ribes cereum has fan shaped leaves with gentle hairs on the underside. It has 5 petaled flowers surrounding a tube center. The twigs start brown and mature to grey. Midsummer the petals fall to form red berries with a mm long stem at the end.

Ribes cereum prefers stony soils of open forest and plains.

Key Characteristic:

Height 3-6ft

Bloom Color: pink

Visual Identification:



Whitestem gooseberry flower (left) and berry (right)

Scientific Nomenclature:	Ribes inerme
Common Name:	Whitestem gooseberry
Lifefrom Code:	Shrub
Desirability Code:	Acceptable

Description

Ribes inerme has waxy fan shaped leaves extending from tan to grey stems. The leaves and flowers grow directly from the stem. The flowers are white to light green, about a half in long with long stamens coming from tightly packed petals. In mid summer dark red and grapelike berries form.

This gooseberry grows best in open forests and is not very commonly distributed across Montana.

Key Characteristic:

Height 3-5ft

Bloom Color: white

Visual Identification:

Scientific Nomenclature:	<i>Rosa woodsii</i>
Common Name:	Wood's rose
Lifeform Code:	Shrub
Desirability Code:	Acceptable

Description

Like other roses, *Rosa woodsia*, has spikes covering the stems. Its leaves are round and gently toothed, growing from the stem in numerous leaflets. Its flowers are about 5cm (2in) wide with bright yellow and fluffy stamens. The petals are gently tapered at the ends and are usually pink. In late summer red hips (fruits) form with long finger like fronds extending from the tips.

Rosa woodsia is found in riparian thickets and plains across Montana.

Key Characteristic:

Height .3-2m (1-6ft)

Bloom Color: pink

Visual Identification:

Scientific Nomenclature:	Rubus idaeus
Common Name:	American red raspberry
Lifeform Code:	Shrub
Desirability Code:	Acceptable

Description

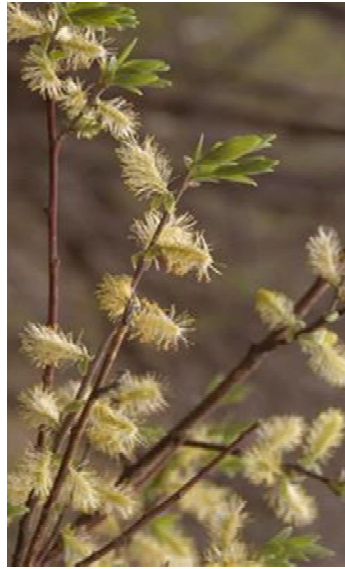
The American red raspberry has very bristly and prickly branches with yellow to brown bark. The leaves are saw-toothed with hair on the upper surface. In June/July it forms white flowers that fall to form red and juicy raspberries. About 1 cm across, the berries can be fuzzy on each individual drupelet.

Key Characteristic:

Height 1-6ft

Bloom Color: white

Visual Identification:



Scientific Nomenclature:	Salix boothii
Common Name:	Blueberry willow
Lifeform Code:	Shrub
Desirability Code:	Acceptable

Description

Salix boothii is a moisture loving shrub commonly found in wetlands. It has green to purple branches with thick leaves about 3 inches long growing directly from the stem. When flowering, long hairy capsules form. They are about 2 cm long and look like fuzzy caterpillars.

Salix boothii can be a dominant willow species, or can be codominant with other species of willows.

Key Characteristic:

Height 5-15ft

Bloom Color: white

Visual Identification:

Scientific Nomenclature:	<i>Salix exigua</i>
Common Name:	Narrowleaf willow
Lifform Code:	Shrub
Desirability Code:	Acceptable

Description

Like other willows, *Salix exigua* is found near bodies of water. This species of willow, however, is known for its narrow leaves. The leaf blades are 2.5cm (1in) with a dark green center vein. Fluffy capsules grow from the leaves in June/July. These capsules may be covered in pollen in late summer.

It has dark brown or dark green bark and very flexible twigs.

Key Characteristic:

Height 1.5-6m (5-20ft)

Bloom Color: yellow

Visual Identification:



Scientific Nomenclature:	Salix geyeriana
Common Name:	Geyer willow
Lifeform Code:	Shrub
Desirability Code:	Acceptable

Description

Salix geyeriana grows in wet meadows and along streams. From a distance this shrub looks silver. It has leaves roughly 3 inch long and about an inch wide. The leaves are oblong with lanceolate edges.

The stems are flexible and grow from a woody trunk. Like other willows, Geyer willow produces hairy capsules.

Key Characteristic:

Height 5-20ft

Bloom Color: yellow

Visual Identification:

May be confused for *Cicuta douglasii* (Water Hemlock)



Red Elderberry flowers and late season berries

Scientific Nomenclature:	<i>Sambucus racemosa</i>
Common Name:	Red Elderberry
Lifeform Code:	Shrub
Desirability Code:	Acceptable

Description

Sambucus racemosa often grows along streams or open forests. It has blooms with tiny white flowers that form a thick blanket on top of oblong/saw-toothed leaves. Around August dark black berries form and the stem begins to turn bright red. This is not to be mistaken with the poisonous water hemlock, which does not produce fleshy berries.

Key Characteristic:

Height 2-5ft

Bloom Color: white

Visual Identification:

Scientific Nomenclature:	Sarcobatus vermiculatus
Common Name:	Greasewood
Lifeform Code:	Shrub
Desirability Code:	Acceptable

Description

This deciduous shrub has rigid stems with whiteish bark and thorns. It has smooth highly branched stems and leaves. The leaves are about an inch long and fleshy. Flowers form midsummer and are cone like. Female flowers are cup like and light green. It has winged fruits that are also a similar fleshy texture as the leaves .

Sarcobatus vermiculatus can be found in the badlands or plains.

Key Characteristic:

Height 3-6ft

Bloom Color: green to yellow

Visual Identification:



Ψ

Scientific Nomenclature:	<i>Sedum stenopetalum</i>
Common Name:	Wormleaf stonecrop
Lifeform Code:	Shrub
Desirability Code:	Acceptable

Description

Sedum stenopetalum grows in many climates including rocky soils and very arid plains. It has succulent like and waxy leaves. The leaves are often keeled with a sharp point at the end. The flowers are also fleshy and when in bloom form yellow or red stars with delicate stamens.

Key Characteristic:

Height 7.6 cm to .3m (3in to 1ft)

Bloom Color: red to yellow

Visual Identification:

Scientific Nomenclature:	Shepherdia canadensis
Common Name:	Buffaloberry
Lifeform Code:	Shrub
Desirability Code:	Acceptable

Description

This is a small bush plant that usually looks globe like. Buffaloberry gets its name from its leathery leaves. The leaves are a few inches long and gray/green. When in bloom tiny yellow flowers form at the base of the leaves and give way to yellow/red oval shaped fruits. The old branches look rusty while the new growth is brown and peeling. It is usually found in forest meadows.

Key Characteristic:

Height 3-6ft

Bloom Color: yellow

Visual Identification:



Scientific Nomenclature:	Sorbus scopulina
Common Name:	Greene's mountain ash
Lifeform Code:	Shrub
Desirability Code:	Acceptable

Description

Sorbus scopulina grows in avalanche slopes and by lake shores in moist soils. It can look tree or bush like and is common in Northwest Montana. In early June white flowers bloom from highly branched leaflets. In the fall small red berries form that are popular with multiple bird species. The leaves are thin, fleshy and roughly 2 inch long.

The stems are grey and mature to brown.

Key Characteristic:

Height 3ft to 9ft

Bloom Color: white

Visual Identification:

May be confused for *Gutierrezia sarothrae* (Broom Snakeweed)



Scientific Nomenclature:	<i>Stenotus acaulis</i>
Common Name:	Stemless mock goldenweed
Lifeform Code:	Shrub
Desirability Code:	Acceptable

Description

Stenotus acaulis looks like many other golden flowered species found in the plains of Montana. *Stenotus acaulis*, however, forms mats on the understory. The leaves are mostly basal with gently and numerous hairs. The flowers form at the top of the stem with 5 to 13 rays. The centers of the flowers are yellow with 2-5mm long achenes (dry seeds) forming when the petals fall.

Key Characteristic:

Height 2-4in

Bloom Color: gold

Visual Identification:

Ψ

Scientific Nomenclature:	<i>Symphoricarpos albus</i>
Common Name:	White snowberry
Lifefrom Code:	Shrub
Desirability Code:	Acceptable

Description

Symphoricarpos albus has smooth leaves and stems. The leaves are oval and about 7.6cm (3in) long. The flowers are tiny, thick and pink. The flowers in mid summer form into white dense berries, roughly 2cm wide. The berries form within the base of the leaves throughout the plant.

Symphoricarpos albus is very common across the lower subalpine of Montana as well as dry forests.

Key Characteristic:

Height .6-1.5m (2-5ft)

Bloom Color: white to pink

Visual Identification:



Spineless horsebrush in fall (left) and mid summer (right)

Scientific Nomenclature:	Tetradymia canescens
Common Name:	Spineless horsebrush
Lifefrom Code:	Shrub
Desirability Code:	Acceptable

Description

Tetradymia canescens grows in conjunction with sage bush and rabbitbrush, in dry grasslands. It is a highly branched shrub with a globe appearance. The leaves are white and woolly giving the whole plant a silvery appearance. Its leaves are about a cm long. The flowers have petals curving back from a yellow center. The yellow petals are small, less than a mm long, and grow in groups of 5-7.

Key Characteristic:

Height 8-30in

Bloom Color: yellow

Undesireable

Visual Identification:

Scientific Nomenclature:	Cotoneaster acutifolius
Common Name:	Peking cotoneaster
Lifefrom Code:	Shrub
Desirability Code:	Undesirable

Description

Cotoneaster acutifolius is native to northwest Asia that forms a dense shrub about 6-10 ft tall and wide. The leaves are about an inch wide and long with a waxy feeling and a dull green color. The leaves turn a yellow red color in the fall.

In early June small pink flowers form and give way to a black fruit in September. Its bark is tan with a fishbone pattern.

Key Characteristic

Height 6ft-10ft

Bloom Color: white

Acceptable

Visual Identification:

Scientific Nomenclature:	<i>Agropyron cristatum</i>
Common Name:	Crested wheatgrass
Life-form Code:	Graminoid
Desirability Code:	Acceptable

Description

Agropyron cristatum grows best in fine textured soils in disturbed areas. It can aggressively take over dry areas. The leaves are 2-6mm with smooth undersides and rough top sides. The leaves are flat in the spring, however, roll inward in the late summer. The seeds form a bristle top and have short and sharp points at the end. The inflorescence is about 5 cm (2 inch) long.

Key Characteristic

Height: .3-.7m (1-2.5 ft)

Bloom Color: green

Visual Identification:

May be confused for *Agropyron smithii*
(Western Wheatgrass)



Slender wheatgrass in spring (left) and fall (right)

Scientific Nomenclature:	<i>Agropyron trachycaulum</i>
Common Name:	Slender Wheatgrass
Lifeform Code:	Graminoid
Desirability Code:	Acceptable

Description:

Agropyron trachycaulum is a native bunch grass with flat, narrow leaves. Stems can have a reddish or purple tint near the base with hairless stems and sheaths.

Its inflorescences are tightly packed and are usually shorter than those of western wheatgrass (1-3in). *Agropyron trachycaulum* is found mostly in sandy soil but can handle a variety of growing conditions. Widely used on reclamation sites, especially along rivers.

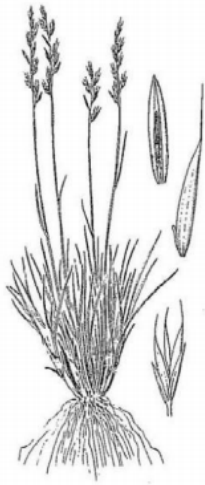
Key Characteristics

Height .3-1m (1-3 feet)

Bloom Color: white or yellow

Visual Identification:

*May be confused for Festuca idahoensis
(Idaho Fescue)*



ΨΨ



Ψ

Scientific Nomenclature:	Festuca ovina
Common Name:	Sheep fescue
Life-form Code:	Graminoid
Desirability Code:	Acceptable

Description

The best way to differentiate this grass from Idaho fescue is by the flowers that grow from a branched inflorescence rather than directly from the stem. The stems are very narrow (only about a mm long) with hairy leaf sheaths. The leaves are rough to the touch and usually in rolled.

Festuca ovina grows best in dry gravelly soils and is not commonly found in Montana

Key Characteristic

Height: 1-4ft

Bloom Color: yellow

Visual Identification:



Ψ



Scientific Nomenclature:	<i>Medicago sativa</i>
Common Name:	Alfalfa
Life-form Code:	Forb
Desirability Code:	Acceptable

Description

Medicago sativa is a hardy plant that can succeed in a variety of soil types and climates. The leaves are about 3 cm (1 in) long, oblong and soft. It grows in bunches with purple to white flowers nestled within the branches. The flower petals grow around a tube center. In fall curly seeds form that mature from green to brown.

Key Characteristic

Height: (.3-1m) 1-3ft

Bloom Color: purple to white

Visual Identification:



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Ψ



© MTNHP - Scott Mincemoyer

Scientific Nomenclature:	<i>Melilotus officinalis</i>
Common Name:	Yellow sweet clover
Life-form Code:	Forb
Desirability Code:	Acceptable

Description

Melilotus officinalis is commonly distributed in open areas across Montana. It has the classic clover leaf, usually in groups of three with gently serrated edges. The flowers are a few mm long and open towards the ground. The top third of the stems are covered in these small yellow flowers. It can look like white sweet clover. This species, however, has yellow flowers and wider leaves

Key Characteristic

Height: .2-1m(1-3ft)

Bloom Color: yellow

Undesireable

Visual Identification:



Ψ

Scientific Nomenclature:	<i>Bassia scoparia</i>
Common Name:	Burningbush (kochia)
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Bassia scoparia has long hairs on its stem and leaves. It has compact flowers that bud from the intersection of the red stem and small leaves. Ray shaped leaves circle the bottom of the plant with narrowing leaves growing smaller toward the top. The fruit grows horizontal wings that extend from the green capsule. It grows well in saline soil of plains across Montana.

Key Characteristic:

Height .5-1m (1-3ft)

Bloom Color: yellow/white

Visual Identification:



Ψ

Scientific Nomenclature:	<i>Bromus tectorum</i>
Common Name:	Cheat grass
Life-form Code:	Forb
Desirability Code:	Undesirable

Description

Cheat grass is a nonnative forb that is most known for its ability to dislodge from the main plant and stick to humans and animals. The blades are 3mm (.03in) wide that surround multiple nodding seed pods.

Bromus tectorum grows in open and dry areas and can aggressively dominate areas.

Key Characteristic:

Height (.1-.3m) 6in-1ft

Bloom Color: green

Visual Identification:



Ψ



Scientific Nomenclature:	<i>Centaurea stoebe</i>
Common Name:	Spotted knapweed
Life-form Code:	Forb
Desirability Code:	Noxious

Description

Centaurea stoebe is a noxious weed that can aggressively take over open hillsides and meadows. Its flowering heads are smaller than those of Russian knapweed. The scales of Spotted knapweed have purple tops and sharp points on the ends. It has 2-10 cm (.7-4in) long leaves with two distinct lobes. The stems are heavily branched and rough to the touch.

Key Characteristic

Height: .1-6m (6in to 2ft)

Bloom Color: purple

Visual Identification:



May be confused for *Cirsium undulatum* (wavy leaf thistle) or *Cirsium vulgare* (bull thistle)



Scientific Nomenclature:	<i>Cirsium arvense</i>
Common Name:	Canada thistle
Life-form Code:	Forb
Desirability Code:	Noxious

Description

Not all thistles are undesirable. (See *Cirsium undulatum*) This variety can be identified by its dandelion like tufts formed in late summer. Canada thistle also has spikes at the intersection of the main branch and sub-branches. The flowering heads are also much smaller, 14-18mm (.5-1in), and lighter purple.

Cirsium arvense is relatively common across Montana, growing best along streams and wetlands.

Key Characteristic:

Height .5-1m (1ft-3ft)

Bloom Color: purple

Visual Identification:

May be confused for *Cirsium undulatum* (wavy leaf thistle) or *Cirsium arvense* (canada thistle)



Ψ

Scientific Nomenclature:	<i>Cirsium vulgare</i>
Common Name:	Bull thistle
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Cirsium vulgare has large flowers with dark purple buds that mature into white, webby puffs. This thistle has much larger flowers than canada thistle, roughly 4 cm (1.5in). This variety also has barbed spikes circling the entire spherical flower base. The stems are not resinous but thickly veined with spikes and small hairs. The leaves are deeply lobed and narrow with obvious white veins.

It can be commonly found in disturbed sites across Montana.

Key Characteristic:

Height .6-1.5m (2ft-4ft)

Bloom Color:purple

Visual Identification:



Scientific Nomenclature:	<i>Gypsophila paniculata</i>
Common Name:	Baby's breath
Life-form Code:	Forb
Desirability Code:	Noxious

Description

Gypsophila paniculate is a noxious weed common in western Montana grasslands. Its tiny blue to white flowers form a cloud like formation above highly branched and woody stems. The seed capsules are also white and often fluffy. The leaves are about inch long and have a light green vein through the center.

Key Characteristic

Height .3-.8m (1-2ft)

Bloom Color: white to light blue

Visual Identification:



Scientific Nomenclature:	<i>Linaria dalmatica</i>
Common Name:	Dalmatian toadflax
Life-form Code:	Forb
Desirability Code:	Noxious

Description .

Linaria dalmatica is an invasive species that is known for its snap dragon like flowers. Part of its successful establishment is due to its ability to flower in early spring into late fall. It has flowers that range from yellow to orange that grow on the top third of the stem. The stem also has arrow shaped leaves that alternate up the stem. Both the stem and leaves are fleshy and hairless.

Linaria dalmatica is often found in stony soils in open terrain.

Key Characteristic

Height .3-.8m (1-2.5ft)

Bloom Color: yellow

Visual Identification:



Ψ

Field sowthistle flowers (left) and wrapped leaves (right)

Scientific Nomenclature:	<i>Sonchus arvensis</i>
Common Name:	Field sowthistle
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Sonchus arvensis is not commonly found in Montana, however, it can do well in meadows and other disturbed plains. The leaves are lobed with sharp points on the end. The leaves are unique and appear to fold around the stem. The stems are branched and end in yellow, dandelion like flower. The flowers are made up of yellow rays about 5 mm (2 in) long. The fruits are also dandelion like puffs with obvious bumps on the ribs.

Key Characteristic

Height: .5-1m (1-3ft)

Bloom Color: yellow

Acceptable

Visual Identification:



Ψ

Scientific Nomenclature:	<i>Juniperus scopulorum</i>
Common Name:	Rocky mountain juniper
Lifeform Code:	Shrub/Tree
Desirability Code:	Acceptable

Description:

Out of the three juniper species commonly found in Montana, Rocky Mountain juniper is by far the largest and most tree like. Its reddish bark is stringy and peels easy from the trunk. *Juniperus scopulorum* also forms blue berries and softer/flatter needles compared to *Juniperus communis*.

It is commonly found in forested areas as well as moist meadows.

Key Characteristic:

Height 9m (30ft)

Bloom Color: green

Visual Identification:



Scientific Nomenclature:	<i>Pinus contorta</i>
Common Name:	Lodgepole pine
Lifeform Code:	Tree
Desirability Code:	Acceptable

Description:

Lodgepole pines are slender trees with branches forming on the top third of the trunk. The bark is thin, scaly and varying shades of brown. It has needles that are roughly two inches long (shorter than ponderosa and longer than douglas fir).

It is very common in forested areas of western Montana, especially in areas that have recently burned.

Key Characteristic:

Height 35m (115ft)

Bloom Color: green

Visual Identification:



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Ψ



Scientific Nomenclature:	<i>Pinus flexilis</i>
Common Name:	Limber pine
Lifeform Code:	Tree
Desirability Code:	Acceptable

Description:

Pinus flexilis is a medium Montana elevation pine that grows well in western Montana (excluding northwest). It is shorter than most pines with needles about an inch long. It has oblong cones that fall off the tree soon after opening.

Its branches grow upwards from the trunk that is covered in dark grey and heavy creased bark.

Key Characteristic:

Height 15m (50ft)

Bloom Color: green

Visual Identification:



Ψ



Scientific Nomenclature:	<i>Pinus ponderosa</i>
Common Name:	Ponderosa pine
Lifeform Code:	Tree
Desirability Code:	Acceptable

Description:

Ponderosa pines are one of the largest of the low elevation trees of Montana. It has branches that spread straight out from the trunk which has furrowed and puzzle piece like bark. The creases of the bark can smell like vanilla in late summer.

The cones are very prickly and can grow bigger than a softball. Its needles are about 15cm (6in) long. Ponderosa pines grow well in dry areas but occasionally show up near watery areas.

Key Characteristic:

Height 65m (215ft)

Bloom Color: green

Visual Identification:



Scientific Nomenclature:	<i>Pseudotsuga menziesii</i>
Common Name:	Douglas-fir
Lifeform Code:	Tree
Desirability Code:	Acceptable

Description

This evergreen tree can grow up to 60m (200ft) tall in dry subalpine forests or along the plains near the Missouri River. Its bark is gray with reddish furrows. Its needles are about an inch long with pine cones about 2 inches long and falling from the tree all season. Douglas firs have spreading branches forming a broad crown.

Key Characteristic:

Height 15-60m (50-200ft)

Bloom Color: green

Acceptable

Visual Identification:



Scientific Nomenclature:	<i>Fraxinus pennsylvanica</i>
Common Name:	Green ash
Lifeform Code:	Tree
Desirability Code:	Acceptable

Description:

This Montana tree species has dark gray bark and can grow up to 12m (40ft) tall. The flowers grow on the woody branches, are cupped shaped and unisexual. The leaves are oblong and grow into waxy leaflets, 5-7 on a branch. The leaves are the best way to identify this tree, regardless of its growth stage. It grows along rivers and drainages and is more common in eastern Montana.

Key Characteristic:

Height 3-12m (10-40ft)

Bloom Color: green to red

Visual Identification:



Ψ Ψ

Scientific Nomenclature:	<i>Malus domestica</i>
Common Name:	Apple
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description

Malus domestica is not commonly found outside of yards or other cultivated areas. In spring it has fragrant white flowers that mature to apples. The bark is dark brown and slightly furrowed. The branching section starts low on the tree, giving this species a round appearance.

Key Characteristic

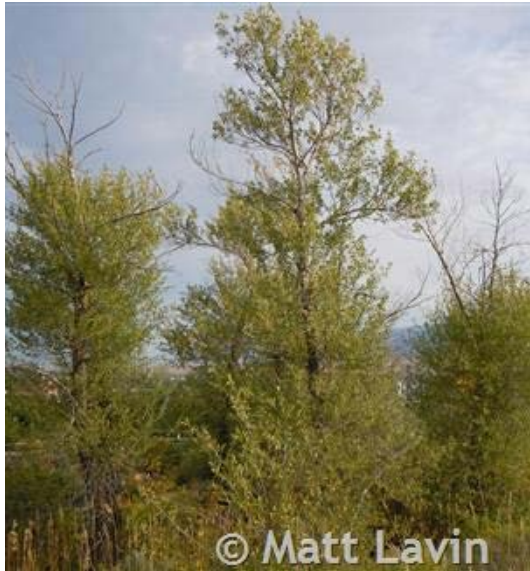
Height: 3-9m(10-30ft)

Bloom Color: white

Visual Identification:



Ψ



Scientific Nomenclature:	<i>Populus angustifolia</i>
Common Name:	Narrowleaf cottonwood
Lifeform Code:	Tree
Desirability Code:	Acceptable

Description:

Populus angustifolia has light yellow, smooth bark on new growth and dark grey furrows on the older/lower sections. Its leaves are gently rough on the edges and usually grow to be 10 cm (4in) long. This variety of cottonwood grows near river and streams.

Populus angustifolia is one of the taller cottonwoods with branches that curl upward from the trunk.

Key Characteristic:

Height 20m (65ft)

Bloom Color: green

Visual Identification:



Scientific Nomenclature:	<i>Populus balsamifera</i>
Common Name:	Balsam poplar
Lifeform Code:	Tree
Desirability Code:	Acceptable

Description:

Balsam poplar is also known as black cottonwood, even though it has white to grey furrowed bark. The leaves are lance shaped and waxy feeling when touched. Its branches ascend upwards and it can grow to about 18m (60ft) tall. It has about half inch long capsules that are slightly sticky.

It grows near water bodies, lower alpine avalanche slopes and roadsides.

Key Characteristic:

Height 18m (60ft)

Bloom Color: green

Visual Identification:



Ψ

Scientific Nomenclature:	<i>Populus deltoides</i>
Common Name:	Eastern cottonwood
Lifeform Code:	Tree
Desirability Code:	Acceptable

Description:

Populus deltoides grows along rivers and lakes up to heights above 30m (100ft). It has dark tan and deeply furrowed bark. Its leaves are saw-toothed leaves about 7.6cm (3in) long. The leaves are the same color above and beneath and turn yellow in the fall. It forms spreading branches in a massive crown above the trunk.

Key Characteristic:

Height 30m (100ft)

Bloom Color: green

Visual Identification:



Scientific Nomenclature:	<i>Populus tremuloides</i>
Common Name:	Quaking aspen
Lifeform Code:	Tree
Desirability Code:	Acceptable

Description

Populus tremuloides is named for its rustling sounds the leaves make when wind travels across them. It grows at a variety of heights depending on soil conditions. It prefers moist soils but can be found in low sub alpine and cool slopes.

Populus tremuloides can most easily be distinguished by its smooth white bark with dark scars where the tree has self-pruned younger branches. The leaves turn a vibrant orange in fall.

Key Characteristic:

Height 3-30m (10-100ft)

Bloom Color: green

Visual Identification:

Scientific Nomenclature:	<i>Populus x acuminata</i> = <i>P. deltoides</i> + <i>P. angustifolia</i>
Common Name:	Lanceleaf cottonwood
Lifeform Code:	Tree
Desirability Code:	Acceptable

Description:

Populus x acuminata = *P. deltoides* + *P. angustifolia* is a hybrid of *Populus angustifolia* and *Populus deltoides*, both of which are common tree species in Montana. It has oblong jagged leaves that can be waxy feeling. With gray bark that is only lightly furrowed, this hybrid can grow by water-bodies as well as semi-deserts. The branches are highly forked and pointing upwards.

Key Characteristic:

Height 40m (130ft)

Bloom Color: green

Visual Identification:

Scientific Nomenclature:	<i>Salix exigua</i>
Common Name:	Narrowleaf willow
Lifeform Code:	Shrub
Desirability Code:	Acceptable

Description

Like other willows, *Salix exigua* is found near bodies of water. This species of willow, however, is known for its narrow leaves. The leaf blades are 2.5cm (1in) with a dark green center vein. Fluffy capsules grow from the leaves in June/July. These capsules may be covered in pollen in late summer.

It has dark brown or dark green bark and very flexible twigs.

Key Characteristic:

Height 1.5-6m (5-20ft)

Bloom Color: yellow

Undesireable

Visual Identification:



Scientific Nomenclature:	<i>Salix alba</i>
Common Name:	White willow
Lifeform Code:	Tree
Desirability Code:	Undesirable

Description

Salix alba has 7.6cm (3in) long leaves with white undersides and obvious white center veins. The new growth has orange bark while the old growth is grey and deeply furrowed. The new growth is often brittle and can leave large amounts of litter beneath the tree. *Salix alba* grows best in wet areas or as an ornamental tree.

Key Characteristic

Height 9-15m (30-50ft)

Bloom Color: green

Acceptable

Visual Identification:



Western virgin's bower blooming and in fruit

Scientific Nomenclature:	<i>Clematis ligusticifolia</i>
Common Name:	Western virgin's bower
Lifeform Code:	Vine
Desirability Code:	Acceptable

Description:

Clematis ligusticifolia is a vine that grows on shrubs or small trees found in creek bottoms and mountain meadows. The flowering heads are made up of white flowers that are 2-6 cm long. The stems can be up to 18 ft long with alternating leaves along the whole stem. The fruits look silky, like old man's beard.

Key Characteristic:

Height 18ft

Bloom Color: White

Undesireable

Visual Identification:

May be confused for *Solanum dulcamara* (bittersweet)



Scientific Nomenclature:	<i>Lycium barbarum</i>
Common Name:	Matrimony vine
Lifeform Code:	Forb
Desirability Code:	Noxious

Description .

Lycium balimisolium is known as *Lycium barbarum*. It can be identified by its smooth and tan twigs with short leaves coming off the stem. The flowers have 4-5 thick purple petals wrapped around a yellow funnel center. The fruit is a red to orange oblong berry that is usually only a cm long. This forb can appear shrub like or can climb up nearby larger trees or rocks. It grows in vacant lots, by road sides or valleys.

Key Characteristic

Height .3-1m (1-3ft)

Bloom Color: purple

Visual Identification:

May be confused for *Lycium barbarum*
(Common Matrimony vine)



Climbing nightshade flowers/berries (left) and leaves (right)

Scientific Nomenclature:	Solanum dulcamara
Common Name:	Climbing nightshade
Lifeform Code:	Vine
Desirability Code:	Undesirable

Description

This climbing vine has oblong leaves with 1-2 deep lobes and sharp saw tooth edges. These lobed and wide leaves are the best way to tell *Solanum dulcamara* from similar species. The leaves and stem are generally hairless and attached to woody stems. The flowers are five petaled stars centered around a yellow tube center. The petals usually have a yellow spot at the base. In late summer these flowers form red oblong berries. This non-native vine grows best near riparian areas along streams.

Key Characteristic

Height 3-6ft

Bloom Color: purple

Acceptable

Visual Identification:

May be confused for Equisetum laevigatum



Ψ

Field horsetail in early spring (left) and late summer (right)

Scientific Nomenclature:	<i>Equisetum arvense</i>
Common Name:	Field horsetail
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Equisetum arvense stems are green, hollow and sheathed with dark gold teeth. The leaves are smooth, narrow and flat. The leaves encircle the stem, growing larger towards the middle of the stem and then tapering off again in size towards the top.

In the spring Field horsetail has tan short stems only a few inches off the ground. It grows well in wet soils in western Montana forest, meadows and stream banks and varying elevations.

Key Characteristic:

Height 5cm-.6m (2 in-2ft)

Bloom Color: gold/brown

Visual Identification:

Scientific Nomenclature:	<i>Lemna minor</i>
Common Name:	Common duckweed
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Lemna minor grows in permanent freshwater ponds and slow-moving streams. It is most known for its small green leaves that are only a few mm long.

The root system is occasionally exposed. *Lemna minor* grows in clusters or by itself. This forb looks like green dots on a pond surface.

Key Characteristic:

Height water surface

Bloom Color: green

Visual Identification:



Scientific Nomenclature:	Potamogeton pectinatus
Common Name:	Fennel-leaved pondweed
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description

Also known as Sago pondweed, *Potamogeton pectinatus* is a submerged plant that grows in saline or brackish water. Underwater stands look like underwater grassy meadows formed of many narrow highly branched stems. The stems and leaves are only about an 8th of an inch thick. The flowers are green, tiny and grow in spikes at the tip of the stems.

Key Characteristic:

Height 6in

Bloom Color: green

Undesireable

Visual Identification:



Spiked water milfoil leaflets in water (left) and above the surface (right)

Scientific Nomenclature:	Myriophyllum spicatum
Common Name:	Spiked water milfoil
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Myriophyllum spicatum is an aquatic plant with leaves in groups of four intersecting at obvious stem nodes. The stems are smooth and hairless and can grow up to 20 ft long, often up to the water surface. Flower spikes grow above the water surface and don't have obvious petals. The fruits are less than a cm long spherical, black globes.

This species can be confused with other aquatic species. *Myriophyllum spicatum* is most known for forming dense mats on the surface of the water.

Key Characteristic

Height 1-20ft

Bloom Color: yellow

Acceptable

Visual Identification:

Scientific Nomenclature:	<i>Achillea millefolium</i>
Common Name:	Common yarrow
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Yarrow grows to 1m (3 ft) tall and has no branches except near the top. The leaves are alternate, 7-12 cm (3-5 in) long, with many leaflets on each side of the midrib. These leaves are divided into smaller leaflets, giving them a delicate, fernlike, lacy appearance. Flower heads are arranged in large, compact clusters at the top of the stem, each cluster consisting of 1 or more flowerheads. The flower head has 20-25 yellowish-white (rarely pink) ray flowers and similarly colored disk flowers. *Achillea millefolium* is highly variable and abundant in grasslands across most of Montana.

Key Characteristics

Height .3-1m (1-3 feet)

Bloom Color: white or pink

Visual Identification:

Scientific Nomenclature:	<i>Androcace occidentalis</i>
Common Name:	Western rock jasmine
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Apart of the primrose family, *Androcace occidentalis*, has small white flowers (less than a cm wide). Its basal leaves are about 2 cm wide and smooth. The stems are narrow, sometimes take on a reddish hue and feel rough to the touch. The flowers before blooming can appear purplish. Western rock jasmine grows in a variety of soils (mostly rocky) in partial sunlight.

Key Characteristic:

Height 2-7cm (1-3 in)

Bloom Color: white

Visual Identification:



Scientific Nomenclature:	Antennaria microphylla
Common Name:	Littleleaf pussytoes
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Antennaria microphylla grows low to the ground. Most of its leaves are basal and alternate up to the bulbs. The leaves are light green, point upward and are fuzzy. The flower is made up of 5-7 distinct flowering sections that are usually white with pink bases. True to its name, the flower looks like fuzzy toes. This plant grows in indirect sunlight in meadows, wooded areas and rocky soils.

Key Characteristic:

Height 2.5-7.6cm (1-3 in)

Bloom Color: white, light pink

Visual Identification:



Ψ

Scientific Nomenclature:	<i>Apocynum androsaemifolium</i>
Common Name:	Spreading dogbane
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

The flowers of this plant are small, fragrant and bell shaped with pink stripes on the inside. The stems are thick and woody with 5cm (2in) oblong leaves going up the entire length. This forb is found in sandy or graveling soils and is relatively common across the Montana.

Key Characteristic:

Height .6-1m (2-3ft)

Bloom Color: white, light pink

Visual Identification:

Scientific Nomenclature:	<i>Arabis holbolleii</i>
Common Name:	Holbøll's rockcress
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

This short plant has small stiff leaves covered in tiny hairs. The flowers are small and white/light pink and can either nod downwards or grow erect from the stem. The leaves are about a cm thick and can also point downwards.

Arabis Holbolleii can be found in rocky soils and is relatively uncommon in Montana.

Key Characteristic:

Height 15-30cm (6in-1ft)

Bloom Color: white, pink

Visual Identification:



Ψ

Scientific Nomenclature:	<i>Astragalus atropubescens</i>
Common Name:	Hangingpod milkvetch
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Astragalus atropubescens is uncommon grassland forb. It has linear leaves that grow directly from smooth, branched stems. It has white flowers with darker keels growing from the backside. The flowers look like they are loosely hanging onto the stem and fall to form fuzzy bean pod like seeds.

Key Characteristic:

Height: .3-1m (1ft-2ft)

Bloom Color: white

Visual Identification:

May be confused for *Astragalus canadensis* (canada milkvetch)



Ψ

Scientific Nomenclature:	<i>Astragalus cicer</i>
Common Name:	Cicer milkvetch
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description

Also known as Chickpea milkvetch, *Astragalus cicer* is best known for its white ascending flowers. The flowers are flat with a 10mm long keel extending from the top. The leaves are 5-35mm long, oblong with pointed tips at the end. Fruits form in mid summer into green then black bladders. The fruits are covered in short hairs and may remain on the plant throughout winter. The fruits thin white flowers are the best way to tell this species from Canada milkvetch

Astragalus cicer is not commonly distributed across Montana, however, some groups may be found along streams and roads.

Key Characteristic

Height: .3-1m (1-3ft)

Bloom Color: white

Visual Identification:



Ψ

Scientific Nomenclature:	<i>Chaenactis douglasii</i>
Common Name:	Dusty maiden
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Chaenactis douglasii grows in rocky alpine environments in relatively dry soils. Commonly found in sparsely vegetated areas, its basal leaves spread out in a lacy fan around the stem. The stems range from green to a woody brown and can be covered in small hairs.

The flowering portion can be pink to white and is made up of numerous small, five-petaled flowers. The stamens are usually darker than the rest of the flowering portion and can curl inwards.

Dusty maiden has not been observed in large numbers across Montana.

Key Characteristic:

Height: .15-.3m (6in-1 ft)

Bloom Color: white or pink

Visual Identification:



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Ψ

Scientific Nomenclature:	<i>Comandra umbellata</i>
Common Name:	Bastard toadflax
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Its leaves are moderately branched and extend the entire length of the stem. The flowers are small, and star shaped with yellow centers.

The fruits form late in the summer and can range from dark green to blue. The fruits usually droop downwards and are a few cm long. It grows in dry soils and is commonly found in meadows across Montana.

Key Characteristic:

Height 15-60cm (6in -2ft)

Bloom Color: white

Visual Identification:

Scientific Nomenclature:	<i>Cryptantha celosioides</i>
Common Name:	Miner's candle
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Only a few inches high, *Cryptantha celosioides* has tiny white flowers that can coil down the stem. Both the stem and leaves are slightly rough to the touch. The leaves of Miner's candle are narrow and alternating along the stem. When fruit has formed in mid-summer, the pods are dark green/brown and are covered in spiky hairs

There are other variations to this plant that look similar, however, *Cryptantha celosioides* can be distinguished by the barbed spikes on the podlets/fruits.

Miner's candle grows in a variety of climates and soil types and is not commonly distributed in Montana.

Key Characteristic:

Height 15cm (6in)

Bloom Color: white

Visual Identification:

Scientific Nomenclature:	<i>Epilobium ciliatum</i>
Common Name:	Fringed willowherb
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Epilobium ciliatum has wide (about an inch) leaves with saw-toothed edges that do not branch off into leaflets. Its flowers usually have 4 delicate, 2 lobed, petals and can range from white to pink. The leaves are veined and slightly waxy.

It grows in a variety of climates and prefers moist soils.

Key Characteristic:

Height .3-.6m (1-2ft)

Bloom Color: white/pink

Visual Identification:



Scientific Nomenclature:	<i>Erigeron compositus</i>
Common Name:	Cutleaf daisy
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Also known as Cutleaf Fleabane, *Erigeron compositus* grows about 25.4cm (10 in) tall. Most of the leaves are basal and jagged. The stems are stiff, dark green to brown and sometimes covered in short hairs.

The flowers are solitary with white and sometimes purple tipped petals. The petals are separated into crowded lobes of 2-3 groups. The centers of the flowers are bright yellow. When not in bloom this flower has spherical bulbs that are also covered in small hairs.

Key Characteristic:

Height 2.4-25.4cm (1-10in)

Bloom Color: White

Visual Identification:



Ψ



Scientific Nomenclature:	<i>Eriogonum ovalifolium</i>
Common Name:	Cushion buckwheat
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

The leaves of *Eriogonum ovalifolium*, usually a sage green color, form tightly woven cushions on the ground. Multiple smooth leaves grow from the cushion of leaves and end in a spherical group of cupped shaped flowers. The stems can appear grey or dark red. The flowers are about an inch long with upright delicate petals. It grows in stony or sandy soils in grasslands of western Montana and is relatively uncommon.

Key Characteristic:

Height 15-20cm (6in-1ft)

Bloom Color: white, yellow or pink

Visual Identification:



Scientific Nomenclature:	<i>Eriogonum umbellatum</i>
Common Name:	Sulphur buckwheat
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Eriogonum umbellatum has basal leaves that form loose mats around the base of this forb. The flowering portion is made up of 6-12, 4-8mm lobes. The lobes are bell shaped and can vary in color. The stems are smooth and green.

Eriogonum umbellatum grows in southwest Montana in a variety of climates and soils

Key Characteristic:

Height 15-30cm (6-12in)

Bloom Color: white, yellow or red

Visual Identification:



Northern bedstraw flower bunches

Scientific Nomenclature:	Galium boreale
Common Name:	Northern bedstraw
Lifform Code:	Forb
Desirability Code:	Acceptable

Description:

Galium boreale has spear-like and soft leaves going along the entire length of the stem. The flowers are 3-5mm across and form oblong bunches a few inches wide. The flowers are made up 4-5 tiny petals that close to form small white fruits in mid-summer. Northern bedstraw is well distributed across Montana in meadows and open forests.

Key Characteristic:

Height 6in -2ft

Bloom Color: white

Visual Identification:



Scientific Nomenclature:	<i>Heuchera cylindrica</i>
Common Name:	Roundleaf alumroot
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Heuchera cylindrica has gently lobed and flat leaves that usually grow in a mat around the stems. The stems are thin and delicate and end in a tiny white flowers that grow directly from the stem. The petals are very small or nearly absent and fall off to form capsules mid summer.

Heuchera cylindrica prefers stony soil in the lower alpine of western Montana.

Key Characteristic:

Height .3-.6m (1-2ft)

Bloom Color: white

Visual Identification:



Scientific Nomenclature:	<i>Lappula occidentalis</i>
Common Name:	Western stickweed
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Lappula occidentalis has long fuzzy leaves with light blue or white flowers clusters growing from the base of the leaves. The flowers are small, less than a cm wide, and usually consist of 5 round petals. Fruits form in late summer and have dark brown prickles covering the nutlets.

Western stickweed is commonly found in dry central Montana soils.

Key Characteristic:

Height .1-.6m (1-2ft)

Bloom Color: blue or white (fruit may be yellow)

Visual Identification:



Scientific Nomenclature:	<i>Maianthemum stellatum</i>
Common Name:	Starry false lily of the valley
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Maianthemum stellatum has 7.6 cm (3in) long lily like leaves that alternate up the flexible stem. White flowers shoot up from the center of the leaf formations. The flowers usually have 5 small white petals. In mid summer these petals fall off to leave behind a green/blue fruit that has longitudinal red stripes that ripen to red.

This forb grows best in moist meadows and grasslands in western Montana.

Key Characteristic:

Height 10-15cm (4-6in)

Bloom Color: white

Visual Identification:

Scientific Nomenclature:	<i>Mentha arvensis</i>
Common Name:	Wild mint
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Wild mint is most known for its leaves. They are saw-toothed, about 2 in long and most noticeably minty in their aroma. Light purple flowers form compact clusters at the base of the leaves. The fruits are small light-colored spheres.

Wild mint prefers wet soils and grows along lake or stream shores.

Key Characteristic:

Height .3-.6m (1ft-2ft)

Bloom Color: purple or white

Visual Identification:



Scientific Nomenclature:	<i>Phlox hoodii</i>
Common Name:	Spiny phlox
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Phlox hoodii forms loose to dense mats in areas that have been overgrazed or subalpine exposed slopes. The mat is formed by numerous small branches with tiny leaves tangling together. From this tangle small white or pink flowers grow in dense clusters. The flowers usually have five petals and yellow centers.

Phlox hoodia is found across Montana and can be differentiated from other similar mat like plants (*Douglasia montana*) by its flat and larger, five petaled flowers.

Key Characteristic:

Height ground level

Bloom Color: purple or white

Visual Identification:

Scientific Nomenclature:	<i>Plantago patagonica</i>
Common Name:	Woolly plantain
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Plantago patagonica is a plains plant that is recognizable by its woolly green/brown flowers. The flowering portion makes up about half of the plant and its covered in small, nearly translucent flowers. The stem can be reddish and has narrow leaves, 7cm (3in) long, alternating the length of the stem.

Key Characteristic:

Height .15-.3m (6in to 1ft)

Bloom Color: white

Visual Identification:

May be confused for *Stellaria media*
(Common chickweed)



Scientific Nomenclature:	<i>Stellaria longifolia</i>
Common Name:	Longleaf starwort
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description

Stellaria longifolia can sometimes remain green into the wintertime. It has reddish stems and very narrow leaves that are hairless and pointed at the tip. These narrow leaves are the best way to differentiate this plant from *Stellaria media* (Common chickweed). The stems also grow low to the ground and can form mats on the forest floor. The flowers are white with 3-5mm long petals with a distinct vein going down the center. The fruit is a 1/4in long capsule with tiny brown seeds inside.

Stellaria longifolia grows in gardens lawns and plains.

Key Characteristic:

Height 2in to 4in

Bloom Color: white

Visual Identification:



Scientific Nomenclature:	Trifolium repens
Common Name:	White clover
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description

Trifolium repens grows low to the ground with white flowers spread throughout a mat of leaves. The leaves are made of three lobes with “u” shaped white marks. The white flowers form dry balloon like fruits in late summer. It is commonly found across Montana in moist meadows.

Key Characteristic

Height: 6in to 1ft

Bloom Color: white

Visual Identification:

Scientific Nomenclature:	<i>Zigadenus elegans</i>
Common Name:	Mountain death camas
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description

Zigadenus elegans has a silvery blue stem with small white flowers at the top fourth of the stem. The flowers a few mm wide with green centers and stamens as long as the petals. Its leaves are basal and blade like. When the petals fall many green and brown capsules are left behind.

Zigadenus elegans grows in moist meadows with mostly shaded areas It is mostly found in western Montana.

Key Characteristic:

Height .15-.6m (6in -2ft)

Bloom Color: white

Undesireable

Visual Identification:

May be confused for *Alyssum desertorum* (Desert madwort)

Pale madwort flowers and seeds

Scientific Nomenclature:	<i>Alyssum alyssoides</i>
Common Name:	Pale madwort
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Alyssum alyssoides is an exotic undesirable forb that is commonly found in grasslands along roadsides and streambanks. It has short leaves (1-2cm) that are usually folded and fuzzy. Its flowers are trumpet shape and usually white. These fruits form curricular pods that grow the entire length of the stem. Sometimes these seed pods look like they are covered in soapy film (transparent in the middle).

Key Characteristic:

Height 3-6in

Bloom Color: white

Visual Identification:

May be confused for *Alyssum alyssoides* (pale madwort)



Scientific Nomenclature:	<i>Alyssum desertorum</i>
Common Name:	Desert madwort
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Alyssum desertorum is generally shorter than *Alyssum alyssoides*. The dried seed pods also do not have the same transparent film when dried. Its leaves are about 2cm and not as folded. It also grows in areas of disturbed soils such as roadsides and fields.

Key Characteristic:

Height 5-10cm (2-4in)

Bloom Color: white

Visual Identification:

Scientific Nomenclature:	<i>Amaranthus albus</i>
Common Name:	Prostrate pigweed
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Amaranthus albus is also known as White amaranth. In late summers this forb becomes a dry tumbleweed. Before drying in the late summer, it has green leaves that fold inward. They are roughly and inch long and oblong. Flowers are tiny and white, growing at the base of the leaves.

It grows in disturbed soils, mostly in disturbed pastured and cultivated fields.

Key Characteristic:

Height .15-.7m (6in to 2.5 ft)

Bloom Color: white

Visual Identification:

Scientific Nomenclature:	<i>Amaranthus retroflexus</i>
Common Name:	Pigweed
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Amaranthus retroflexus grows low to the ground and branches out in multiple directions. It can be found in rocky soils near stream sides and cultivated fields. Its leaves are gently toothed about 7.6cm (3in) long and slightly waxy. The stems have a purple tinge that end in a cone like flower. The flowering portion is made up of short, pointed petals roughly 3mm long. These sepals are usually green with reddish tips.

Key Characteristic:

Height .15-1m (6in-3ft) (long, however not very tall)

Bloom Color: white/green

Visual Identification:



Scientific Nomenclature:	Arenaria serpyllifolia
Common Name:	Thymeleaf sandwort
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Arenaria serpyllifolia is a short hairy plant with branched leaves. It has thick tear drop shaped leaves with sharp points. The flowers are 3mm long with 5 petals circling around the yellow tube center. These petals fall off leaving behind the yellow center. This exotic species grows in rock outcrops and other disturbed areas.

Key Characteristic:

Height 3in to 6in

Bloom Color: white

Visual Identification:



Scientific Nomenclature:	<i>Berteroa incana</i>
Common Name:	Whitetop (hoary alyssum)
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Berteroa incana has small, fern like basal leaves. The stem leaves are much smaller and grow upward along the length of the stem. The top of the stem ends in a white flower with pink stamens growing from a tube center. Its fruits are oblong disks covered in rough fuzz. The fruits are about 1 cm long with light pink undersides.

Berteroa incana grows by roadsides and in fields.

Key Characteristic:

Height .3-.6m (1-2ft)

Bloom Color: white

Visual Identification:

May be confused for mustard species

Scientific Nomenclature:	<i>Camelina microcarpa</i>
Common Name:	Littlepod false flax
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Camelina microcarpa looks similar to a mustard plant with yellow flowers. *Camelina microcarpa*, however, forms green to pink disk fruits that later fade to a thin membrane.

The seed pods have a beak about an mm long.

This undesirable forb is reasonably common in western Montana and grows by roadsides and grasslands.

Key Characteristic:

Height .3-.6m (1-2ft)

Bloom Color: white to pink

Visual Identification:

Scientific Nomenclature:	<i>Capsella bursa-pastoris</i>
Common Name:	Sheperd's purse
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Capsella bursa-pastoris is most known for its upright heart shaped leaves that take up roughly half of the smooth stem. Before seeds form, small white 4 lobed flowers bloom from the top of the plant. The stems can occasionally be purple.

Capsella bursa-pastoris grows in disturbed low elevation areas.

Key Characteristic:

Height .3-.6m (1-2ft)

Bloom Color: white

Visual Identification:

Scientific Nomenclature:	<i>Cardaria draba</i>
Common Name:	Whitetop
Lifeform Code:	Forb
Desirability Code:	Noxious

Description

Cardaria draba is also known as *Lepidium draba*. It is a common noxious weed across Montana, most abundant in irrigated fields with saline soils. It grows in large groups with thick stems with upward saw-toothed leaves thickly growing up the entire stem. The top of the flower is a bouquet made up of tiny white flowers with yellow centers. The flowers give way to heart shaped fruits in mid-summer.

Key Characteristic:

Height .15-.3m (6in-1ft)

Bloom Color: white

Visual Identification:



Scientific Nomenclature:	<i>Conium maculatum</i>
Common Name:	Poison hemlock
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Conium maculatum is a highly poisonous branched forb with purple-spotted stems. The leaves are oblong with sharply toothed edges. Each branch ends in a gentle puffed white cluster of flowers. The flowers have small white petals with white centers.

Conium maculatum prefers moist soils along streams and ditches.

Key Characteristic:

Height .6-3m (2ft-10ft)

Bloom Color: white

Visual Identification:

May be confused for *Phacelia linearis* (threadleaf)



Scientific Nomenclature:	<i>Convolvulus arvensis</i>
Common Name:	Field Bindweed
Lifeform Code:	Forb
Desirability Code:	Noxious

Description

Convolvulus arvensis may be mistaken for *Phacelia linearis*. This species can be identified by its arrow shaped leaves as opposed to narrow/oblong leaves. It grows low to the ground with tangled stems extending to about 1m (3ft). The leaves are arrow shaped with rounded edges. Dispersed throughout the stems are white or pink flowers with smudged yellow centers and white stamens. The petals are connected with two large leaves at the base of the flowers. It can also be identified by its small green flowers growing on the upper side of the leaves.

Convolvulus arvensis grows in fields and vacant lots across Montana.

Key Characteristic:

Height 5-15cm (2in to 6in)

Bloom Color: white to pink

Visual Identification:

Scientific Nomenclature:	<i>Filago arvensis</i>
Common Name:	Field filago
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Apart of the daisy family, *Filago arvensis* grows in one linear stem with thick leaves growing throughout the entire length. The leaves taper to a fine point. The flowers grow from the top of the stem. They look like a very fuzzy stars with thick sage green petals. It flowers July through September in disturbed soils and matures to white puffs in fall.

Key Characteristic

Height 25-50cm (10-20in)

Bloom Color: green

Visual Identification:



Scientific Nomenclature:	<i>Galium aparine</i>
Common Name:	Stickywilly
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Galium aparine is a sticky climbing plant with hooked hairs growing on its shiny stem and leaves. It has flowers in clusters made up of two to three small four lobes white flowers. The fruits are also hairy and are effective at sticking to humans and animals. It prefers rocky soils.

Key Characteristic

Height 2m (6ft)

Bloom Color: white

Visual Identification:



Baby's breath flowers (left) and leaves (right)

Scientific Nomenclature:	<i>Gypsophila paniculata</i>
Common Name:	Baby's breath
Lifeform Code:	Forb
Desirability Code:	Noxious

Description

Gypsophila paniculate is a noxious weed common in western Montana grasslands. Its tiny blue to white flowers form a cloud like formation above highly branched and woody stems. The seed capsules are also white and often fluffy. The leaves are about inch long and have a light green vein through the center.

Key Characteristic

Height 1-2ft

Bloom Color: white to light blue

Visual Identification:

Scientific Nomenclature:	<i>Lepidium densiflorum</i>
Common Name:	Common pepperweed
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description .

Lepidium densiflorum has white/green petals blooming at the end of small dark purple stems. These flowers give way to scoop shaped seed pods. The seeds are about 1-2mm in diameter and flat. The stems are slightly rough and moderately branched. Oblong leaves 8cm (3in) long grow on the bottom third of the stem.

Lepidium densiflorum grows best in open and disturbed sites with well-drained soils.

Key Characteristic

Height .3-1m (1-3ft)

Bloom Color: white

Visual Identification:



Scientific Nomenclature:	Lepidium latifolium
Common Name:	Common pepperweed
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description .

Lepidium latifolium can grow in large numbers in pastures. The basal leaves are smooth, gently serrated and usually wither by the time the plant flowers. The stems are also smooth, branched and end in a white cluster of flowers. The flowers have about 5 white petals surrounding a tan center. The fruit is dry and splits open, like a peppercorn.

Key Characteristic

Height 6in -1.5ft

Bloom Color: white

Visual Identification:



Scientific Nomenclature:	<i>Leucanthemum vulgare</i>
Common Name:	Oxeye daisy
Lifeform Code:	Forb
Desirability Code:	Noxious

Description .

Leucanthemum vulgare is also known as dog daisy, bull daisy or moon flower. It is an invasive weed and can become aggressive in pastures across western Montana. It is easy to mistake this for other daisies such as *Anthemis arvensis*. This daisy has 2 inch wide flowers with a yellow center. 20-30 white petals, with slight notches on the end, radiate from the yellow center. It has dark green and smooth leaves that get smaller as they grow up the stem. The plant smells bad when crushed. The basal leaves have saw toothed edges.

Key Characteristic

Height .3-1m (1-3ft)

Bloom Color: white

Visual Identification:



Scientific Nomenclature:	Melilotus alba
Common Name:	White sweetclover
Lifform Code:	Forb
Desirability Code:	Undesirable

Description .

Melilotus alba has fragrant white flowers about 1-2in long. The flowers grow from most of the stem and mature to form grey pods with a single veined seed. The leaves are narrow, slightly saw-toothed and have a sharp point on the end. This species is the tallest clover variety found in Montana.

Key Characteristic

Height 2-4ft

Bloom Color: white

Visual Identification:



Scientific Nomenclature:	Plantago lanceolata
Common Name:	Narrowleaf plantain
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Plantago lanceolata can have a brown/wooly base with large leaf blades growing from it. The leaves have deep lateral veins and are 2-5 in long. Stems are smooth and end in cylinder shaped flower. The flowers are tan and mature to white dandelion like seeds in mid fall. *Plantago lanceolata* can be found near streams, valleys or other disturbed areas.

Key Characteristic

Height 2-4ft-

Bloom Color: tan

Visual Identification:

May be confused for other species of *Potentilla*



Scientific Nomenclature:	Potentilla recta
Common Name:	Sulfur cinquefoil
Lifeform Code:	Forb
Desirability Code:	Noxious

Description

Potentilla recta has similar characteristics to other native species of *Potentilla*. *Potentilla recta* can be identified by its numerous hairy leaves. The leaves are longer than they are wide, roughly an inch long and form 5-7 fingers. The stems are moderately branched and rough. The flowers have 5-7 heart shaped leaves growing around a yellow center. The green support leaves behind the flowering heads are also very hairy. The hairs all over the plant, unlike native species, grow at 90 degree angles from the plant, rather than flat to the stem.

Potentilla recta grows well at subalpine climates of western Montana. This is a similar range to other species of *Potentilla*.

Key Characteristic

Height 1-2ft

Bloom Color: white to yellow

Visual Identification:



Scientific Nomenclature:	Rumex acetosella
Common Name:	Common sheep sorrel
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Rumex acetosella has smooth stems with mostly basal leaves and the occasional smaller leaf towards the top of the stem. The leaves are about 3 in long, smooth and have wavy leaf margins. The top third of the plant branches out to multiple flowering clusters. The flowers are small, yellow and form about a mm long dark yellow spherical fruit.

Rumex acetosella is relatively common across Montana wetlands and other moist areas.

Key Characteristic

Height 1-3ft

Bloom Color: white

Visual Identification:



White campion flowers (left) and leaves (right)

Scientific Nomenclature:	<i>Silene latifolia</i> ssp. <i>alba</i>
Common Name:	White campion
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Silene latifolia ssp. *Alba* has small white flowers that form from a hairy leaved base. The petals are usually white and heart shaped. The leaves are about a half inch long and tear drop shaped. They have hairy and veined undersides. The white petals yield to a spherical fruit that splits open when dried. Relatively uncommon in Montana, *Silene latifolia* ssp. *Alba* grows in disturbed meadows in clusters

Key Characteristic

Height 6in -1ft

Bloom Color: white

Visual Identification:

Scientific Nomenclature:	<i>Thlaspi arvense</i>
Common Name:	Field pennycress
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Thlaspi arvense has hairless stems and leaves. The stems can be stained red with leaves that have gently saw-toothed margins. Each branch is topped with a cluster of tiny trumpet shaped flowers. The flowers are about 10mm (.4in) long and give way to flattened fruits that are deeply notched at the tip. It is commonly found across Montana in disturbed soils of grasslands and roadsides.

Key Characteristic

Height: 15-46cm (6-18in)

Bloom Color: white

Acceptable

Visual Identification:



Mountain dandelion in bloom

Scientific Nomenclature:	<i>Agoseris glauca</i>
Common Name:	Mountain dandelion
Lifform Code:	Forb
Desirability Code:	Acceptable

Description:

Several leafless stalks, each with a yellow flower head at the top, grown from a basal cluster of leaves. Leaves are linear and lance shaped. The plant contains milky sap.

Several other yellow-flowered species of *Agoseris*, called false dandelion or mountain dandelion, are distinguished from this one by technical features of the fruit. The true dandelion (*Taraxacum*) is also similar but has minute pegs all over the top of the fruit and usually has bracts curved toward the rear of the fruit.

Key Characteristics

Height: .1-.3m (.5-1ft)

Bloom Color: Yellow

Visual Identification:



Tarweed fiddleneck in bloom (right) and beginning fruit formation (left)

Scientific Nomenclature:	<i>Amsinckia lycopoides</i>
Common Name:	Tarweed fiddleneck
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

This common native forb has sticky spikes on the leaves and flowers. The petals are round and a couple cm wide. *Amsinckia lycopoides* grows in disturbed soil or in dry slopes in direct sunlight. When not in bloom the bulbs have the same sticky spikes as the stem.

Key Characteristic:

Height .3-.6m (1-2ft)

Bloom Color: yellow, orange

Visual Identification:



Ψ

Scientific Nomenclature:	<i>Artemisia drancunculus</i>
Common Name:	Tarragon
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Artemisia drancunculus grow up to .6m (2ft) tall in dry and sandy soils. When in bloom it has small bell-shaped white/yellow flowers. The leaves go the total length of the stem and are roughly 3-5 cm long. Tarragon stems are flexible but feel woody towards the base of the stem. It has an herby aroma and is relatively uncommon in most parts of Montana.

Key Characteristic:

Height (.15-.6m) 6in-2 ft

Bloom Color: light green, white

Visual Identification:

May be confused for *Astragalus cicer* (chickpea milkvetch)



Ψ

Scientific Nomenclature:	<i>Astragalus canadensis</i>
Common Name:	Canadian milkvetch
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Astragalus canadensis grows in a variety of climates and soils including prairies and streambanks. Tubular flowers about an inch long surround the top third of the stem. When not in full bloom the flowers can look bean shaped. The stem is smooth with oblong leaflets about 10cm (4in) long attached. The best way to tell this forb from chickpea milkvetch is that *Astragalus canadensis* has many more flowers that are thicker compared to chickpea. This forb also has much longer seed pods.

Key Characteristic:

Height 1ft-3ft

Bloom Color: light green/yellow

Visual Identification:



Arrowleaf blooming in late summer with basal leaves present

Scientific Nomenclature:	<i>Balsamorhiza sagittata</i>
Common Name:	Arrowleaf balsamroot
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Balsamorhiza sagittata is very common across Montana. The basal leaves are wide, at least 2 in wide and 4 in long, and are arrow shaped. The stems and leaves are rough to the touch and can be covered in tiny coarse hairs. The flowers stand erect from the stem and have numerous narrow, yellow arrow shaped petals extending from a golden/fuzzy center. *Balsamorhiza sagittata* grows best in sagebrush valleys and grasslands

Key Characteristic:

Height .15-1m (6in to 3ft)

Bloom Color: yellow

Visual Identification:



American yellow rock blooming in summer

Scientific Nomenclature:	<i>Barbarea orthoceras</i>
Common Name:	American yellow rocket
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Barbarea Orthoceras is commonly found across Montana, usually in wetlands or moist areas. It has tiny yellow flowers in 2-inch globes on top of the stem. The stem has small hairs and has small oblong leaves extending upwards from the stem. Extensive amounts of yellow pollen can be found coming off American yellow rocket in the early summer.

Key Characteristic:

Height .3-.6m (1ft -2 ft)

Bloom Color: yellow

Visual Identification:



Oregon grape in bloom (right) and fruiting in fall (left)

Scientific Nomenclature:	<i>Berberis repens</i>
Common Name:	Oregon grape
Lifform Code:	Forb
Desirability Code:	Acceptable

Description:

Oregon Grape grows low to the ground. Its leaves are waxy and have sharp pointed edges. In late fall the small yellow bell shaped flowers transition into dark blue berries. *Berberis repens* grows in the shady, wooded areas.

Key Characteristic:

Height 7-14cm(3-6 in)

Bloom Color: yellow flowers, blue berries

Visual Identification:

Yellow paintbrush in bloom (June-July)

Scientific Nomenclature:	<i>Castilleja lutescens</i>
Common Name:	Yellow paintbrush
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Castilleja lutescens grows in moderately drained soils in both full sun and part shade. Like other paint brushes, this variety has small hairs covering the stems and leaves. The leaves are narrow and flexible and usually point upward along the length of the stem. The flower petals look similar to the leaves except for the bright yellow color. The center of the petals can be dark yellow to orange. It is a semi-parasitic plant species.

Other varieties of paint brush are orange to pink, however, *Castilleja lutescens* is known for its bright yellow color.

Key Characteristic:

Height .3-.6m (1ft-2ft)

Bloom Color: yellow to orange-yellow

Visual Identification:



Scientific Nomenclature:	<i>Chrisothamnus nauseosus</i>
Common Name:	Rubber rabbitbrush
Lifeform Code:	Shrub
Desirability Code:	Acceptable

Description:

Chrisothamnus nauseosus is now commonly known as *Ericameria nauseosa*. Its leaves are oblong and narrow, 1- 6cm (.4-2.3in) long. The flowering portion is light yellow/green to yellow and appear to be hairy when drying out in late summer. The stems are woody and moderately branched.

Rubber rabbitbrush grows in arid climates and is relatively common across Montana.

Key Characteristic:

Height 1-2m (3-6ft)

Bloom Color: green/yellow

Visual Identification:

May be confused for Equisetum laevigatum



Ψ

Field horsetail in early spring (left) and late summer (right)

Scientific Nomenclature:	<i>Equisetum arvense</i>
Common Name:	Field horsetail
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Equisetum arvense stems are green, hollow and sheathed with dark gold teeth. The leaves are smooth, narrow and flat. The leaves encircle the stem, growing larger towards the middle of the stem and then tapering off again in size towards the top.

In the spring Field horsetail has tan short stems only a few inches off the ground. It grows well in wet soils in western Montana forest, meadows and stream banks and varying elevations.

Key Characteristic:

Height 5cm-.6m (2 in-2ft)

Bloom Color: gold/brown

Visual Identification:

May be confused for Equisetum arvense



Scientific Nomenclature:	<i>Equisetum laevigatum</i>
Common Name:	Smooth horsetail
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Equisetum laevigatum looks similar to *Equisetum arvense* and can be distinguished by its black (as opposed to brown) teeth that make up the stem sheath. The sheaths fade to gray in late summer.

Equisetum laevigatum is also hollowed stemmed but can grow in more gravely/sandy soils than *Equisetum arvense*. The top of the plant is a rounded cone-shaped strobangia that can be reddish brown to black.

Key Characteristic:

Height .15-1m (6in-3ft)

Bloom Color: gold/brown

Visual Identification:

Scientific Nomenclature:	<i>Erythronium grandiflorum</i>
Common Name:	Yellow avalanche-lily
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Erythronium grandiflorum grows commonly in late spring in the alpine or sub-alpine of western Montana. It is also called Glacier Lily. In the full sun the bright yellow flowers open to a star shape. In the shade it closes to an oblong-ovoid. Its anthers are yellow or red and grow in groups of 5.

The leaves are basal, about 10cm (4 in) long and smooth.

Key Characteristic:

Height 10-25cm (4-10in)

Bloom Color: yellow

Visual Identification:



Scientific Nomenclature:	<i>Fritillaria pudica</i>
Common Name:	Yellow fritillary
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Also known as Yellowbells, *Fritillaria pudica*, is known for its small (1-2 cm long) flowers that are bright yellow and usually nod towards the ground. The stems are smooth with 2-4 leaves clustered mid stem. When not in bloom a rounded, smooth top forms in midsummer. They grow in open forests, valleys and grasslands.

Key Characteristic:

Height 15cm (6in)

Bloom Color: yellow

Visual Identification:



Ψ

Largeleaf avens leaves and yellow flowers (left) and fruit (right)

Scientific Nomenclature:	<i>Geum macrophyllum</i>
Common Name:	Largeleaf avens
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Geum macrophyllum usually grows along streams or a variety of other waterways. As the common name describes, its leaves are large, oblong and often saw toothed with 5-7 lobes. Stems are usually hairy.

Geum macrophyllum has five petaled flowers that are usually rounded and yellow. It has small dry fruit that form mid-summer. These fruits are often covered in pink spikes.

Key Characteristic:

Height .6-1m (2-3ft)

Bloom Color: yellow

Visual Identification:



Scientific Nomenclature:	<i>Grindelia squarrosa</i>
Common Name:	Curlycup gumweed
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Grindelia squarrosa is known for its bright yellow flowering heads with 25-40 flat and overlapping rays. The leaves are oblong, gently toothed and occasionally covered in sticky resin.

The fruits are spherical, bristly and do not remain on the plant long after forming.

Key Characteristic:

Height .15-.3m (6in to 1ft)

Bloom Color: yellow

Visual Identification:



Scientific Nomenclature:	<i>Helianthus annuus</i>
Common Name:	Common sunflower
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Helianthus annuus is easy to pick out due to its bright yellow rayed flowers. Its center is a deep red with 4-5 mm long seeds. *Helianthus annuus* has rough feeling stems that can be dark green to brown. It has spade shaped leaves with lighter veins and hairy undersides. It grows best in disturbed soils of grasslands road sides and streambanks.

Key Characteristic:

Height .3-1m (1-3ft)

Bloom Color: yellow

Visual Identification:



Scientific Nomenclature:	<i>Heterotheca villosa</i>
Common Name:	Golden aster
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Golden asters have golden ray shaped petals surrounding a yellow center. Its stems are woody at the base with radiating flowers and fuzzy short/folded leaves.

Heterotheca villosa grows mostly in grasslands across Montana but can also be found along stream banks, roadsides and forests.

Although its flowers can appear like Arrowleaf balsamroot, *Heterotheca villosa* has comparably rounder petals and much shorter and smoother leaves.

Key Characteristic:

Height .3-1m (1-3ft)

Bloom Color: gold

Visual Identification:

Scientific Nomenclature:	<i>Lithospermum ruderale</i>
Common Name:	Western groomwell
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Western groomwell is similar in appearance to *Lappula occidentalis*. However, western groomwell has longer and stiffer leaves. This forb also only has yellow flowers. Western groomwell can appear bushlike and grows to be .6m (2ft) tall. It grows well in open forest meadows and valleys.

Key Characteristic:

Height .3-.6m (1-2ft)

Bloom Color: light yellow

Visual Identification:



Ψ *Nineleaf biscuitroot in bloom (left) and seed (right)*

Scientific Nomenclature:	<i>Lomatium triternatum</i>
Common Name:	Nineleaf biscuitroot
Lifform Code:	Forb
Desirability Code:	Acceptable

Description:

Lomatium triternatum has upward pointing leaves that are covered in very short hairs. The stems end in clusters of yellow flowers. Each cluster is made up of numerous cup shaped yellow flowers, sometimes with stamens extending from their center. In mid summer small white and green seed pods form and usually fall to ground quickly after forming.

Lomatium triternatu grows in most Montana soils, especially in meadows and forested areas.

Key Characteristic:

Height 15-45cm (6in-1.5ft)

Bloom Color: yellow

Visual Identification:



Ψ

Birds foot Trefoil flowers and leaves

Scientific Nomenclature:	<i>Lotus corniculatus</i>
Common Name:	Bird's-foot trefoil
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description

Lotus corniculatus can be identified by its yellow crown of flowers. The petals are bright yellow with narrow red veins and surround a darker yellow keel. The leaves look like sharper clover leaves. Most of the leaves are basal and are roughly 10 mm long. It can be found in pastures and road sides in a variety of soil types.

Key Characteristic

Height: .3-1m (1-2ft)

Bloom Color: yellow

Visual Identification:



Ψ



Scientific Nomenclature:	<i>Melilotus officinalis</i>
Common Name:	Yellow sweet clover
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description

Melilotus officinalis is commonly distributed in open areas across Montana. It has the classic clover leaf, usually in groups of three with gently serrated edges. The flowers are a few mm long and open towards the ground. The top third of the stems are covered in these small yellow flowers. It can look like whitesweet clover. This species, however, has yellow flowers and wider leaves

Key Characteristic

Height: .3-1m (1-3ft)

Bloom Color: yellow

Visual Identification:



Scientific Nomenclature:	<i>Mentzelia laevicaulis</i>
Common Name:	Blazing Star
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Mentzelia laevicaulis is not very common in Montana but can be found in sparsely vegetated valleys. It can grow in high metal containing soils.

This is a biennial forb with light yellow flowers with white firework like centers. Blazing star usually has 5 petals. When those fall, inch long and flat capsule form in their place. Its leaves are about 7.6cm (3in) long and gently lobed. They usually are tapered and narrow towards the tip.

Key Characteristic:

Height .3-1m (1-3ft)

Bloom Color: yellow

Visual Identification:

Scientific Nomenclature:	<i>Oenothera biennis</i>
Common Name:	Common evening primrose
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description:

Oenothera biennis has lemon scented flowers that grow near the top of a leafy stock. The stem is hairy and can be dark purple or green. The petals are heart shaped and bright yellow and usually only open at night or early morning. It prefers sandy soils and is not very commonly found in Montana.

Key Characteristic:

Height .6-2m (2-6ft)

Bloom Color: yellow

Visual Identification:



Ψ

Scientific Nomenclature:	<i>Potentilla anserina</i>
Common Name:	Silverweed cinquefoil
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description

Potentilla anserina has a growth pattern similar to strawberries. It grows low to the ground with light red stems shooting across the understory. It has basal leaves divided into jagged leaflets with white undersides. It has yellow flowers, usually less than a cm long.

Potentilla anserina is found in very wet areas, such as stream and wetlands.

Key Characteristic:

Height surface

Bloom Color: yellow

Visual Identification:



Fanleaf cinquefoil flowers (left) and leaves (right)

Ψ

Scientific Nomenclature:	<i>Potentilla gracilis</i>
Common Name:	Fanleaf cinquefoil
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description

Potentilla gracilis is found in sub-alpine meadows in moderately well drained soils. It blooms between June and July with bright yellow flowers. Its petals are heart shaped and lightly layered on top of each other. It has hand like leaves, with 5-7 finger shaped leaves. The leaves have sharply cut teeth with white and hair undersides. The stems are slender and extending from branched basal leaves.

Key Characteristic:

Height .3-.6m (1-2ft)

Bloom Color: yellow

Visual Identification:



Ψ

Scientific Nomenclature:	<i>Ranunculus glaberrimus</i>
Common Name:	Sagebrush buttercup
Lifefrom Code:	Forb
Desirability Code:	Acceptable

Description

Sagebrush buttercup grows low to the ground in rocky soils. It has basal leaves roughly an inch long with lobed edges. The leaves are about 3mm wide and occasionally have reddish edges.

One of the first flowers to bloom in Montana in the spring time, it has 5 petaled yellow flowers with a yellow center.

Key Characteristic:

Height 7.6-15.2cm (3in to 6in)

Bloom Color: yellow

Visual Identification:



Ψ

Scientific Nomenclature:	<i>Ratibida columnifera</i>
Common Name:	Prairie coneflower
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description

Ratibida columnifera has mostly basal leaves with solitary flowers that radiate from branched stems. The flowers have purple centers with drooping yellow ray shaped petals. Sometimes all the petals fall off leaving a green to dark purple knob behind.

The stem is rough to the touch and not very flexible.

Ratibida columnifera grows near streambanks and roadsides in a variety of north central Montana soils.

Key Characteristic:

Height .3-1m (1-3ft)

Bloom Color: yellow

Visual Identification:



Scientific Nomenclature:	<i>Ribes aureum</i>
Common Name:	Golden currant
Lifeform Code:	Shrub
Desirability Code:	Acceptable

Description

Also known as Goose berries, this shrub can grow up to 1.8 (6ft) tall with dark brown twigs that age to grey. The leaves are about .8m (32in) wide with multiple finger like lobes. The flowers are thick and yellow with tube shaped centers. In late summer a nearly black berry grows in place of the flowers.

It grows in similar climates as chokecherries, however it is less common.

Key Characteristic:

Height 1-2m (3-6ft)

Bloom Color: yellow

Visual Identification:

Scientific Nomenclature:	<i>Rumex salicifolius</i>
Common Name:	Willow dock
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description

Rumex salicifolius flowers all summer long with brownish clusters forming at the top third of the stem. It grows near lakes, marshes and other areas of wet soils. The leaves are narrow, about 10cm (4in) long and curl inward at the edges.

The stems and leaves are thicker near the bottom, with an almost woody stem at the base.

Key Characteristic:

Height .3-1m (1-3ft)

Bloom Color: yellow

Visual Identification:



Ψ

Scientific Nomenclature:	<i>Sedum stenopetalum</i>
Common Name:	Wormleaf stonecrop
Lifeform Code:	Shrub
Desirability Code:	Acceptable

Description

Sedum stenopetalum grows in many climates including rocky soils and very arid plains. It has succulent like and waxy leaves. The leaves are often keeled with a sharp point at the end. The flowers are also fleshy and when in bloom form yellow or red stars with delicate stamens.

Key Characteristic:

Height 7.6 cm to .3m (3in to 1ft)

Bloom Color: red to yellow

Visual Identification:

May be confused for *Solidago Gigantea* (Giant goldenrod)



Scientific Nomenclature:	<i>Solidago canadensis</i>
Common Name:	Canada goldenrod
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description

Solidago canadensis has tiny golden flowers that form drooping clusters at the top of the stem. The upper third of the stem is hairy. The disk flowers have 10-16 rays with yellow centers. It has leaves that grow the entire length of the stem and get smaller towards the top of the plant. *Solidago canadensis* has narrower and smoother leaves than *Solidago Gigantea*.

It prefers moist soils and grows in open forests and along streambanks.

Key Characteristic:

Height .15-1m (6 in to 3ft)

Bloom Color: yellow

Visual Identification:

May be confused for *Solidago canadensis* (Canada goldenrod)



Scientific Nomenclature:	<i>Solidago gigantea</i>
Common Name:	Giant goldenrod
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description

Solidago gigantea looks similar to *Solidago canadensis*. It can be identified by its leaves. *Solidago gigantea* has serrated leaves and are generally larger than *Solidago canadensis*. *Solidago gigantea* also can also handle more moist conditions and has larger flowers.

Key Characteristic:

Height .15-1m (6 in- 3ft)

Bloom Color: yellow

Visual Identification:

Scientific Nomenclature:	<i>Solidago missouriensis</i>
Common Name:	Missouri goldenrod
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description

Solidago missouriensis usually grows as the smallest of the goldenrods found in Montana. Like the other species of goldenrods the leaves get smaller as they go up the base. The flowers are much more upright than the other goldenrods with rays of 7 to 14 on each flower.

Solidago missouriensis grows in drier climates and can be found in grasslands and open forests.

Key Characteristic:

Height 15-30cm (6in to 2ft)

Bloom Color: yellow

Visual Identification:

May be confused for *Linaria vulgaris* (toadflax)



Ψ

Scientific Nomenclature:	<i>Thermopsis montana</i>
Common Name:	Mountain goldenbanner
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description

Also known as Roundleaf thermopsis, Mountain goldenbanner can be identified by its smooth yellow flower. The petals usually point upwards from a dark green base. When the petals fall a curly bean stock forms. The leaves are oblong and smooth, often curling inward. *Thermopsis montana* is not to be mistaken with invasive species of Toadflax (*Linaria vulgaris*). Toad flax has, narrow, linear leaves rather than Goldenanners clover like leaves.

It grows in a variety of climates including grasslands and riverbanks.

Key Characteristic:

Height 10cm-38cm (4in-15 in)

Bloom Color: yellow

Visual Identification:



Ψ

Scientific Nomenclature:	<i>Viola nuttallii</i>
Common Name:	Nuttall's violet
Lifeform Code:	Forb
Desirability Code:	Acceptable

Description

Viola nuttallii has yellow flowers with brown to black face like centers. The petals also have purple mid stripes that lead to a yellow center. The flower heads can droop downward. The leaf blades are mostly basal and are about 7.6cm (3in) long. When the petals fall a small seed capsule is left behind.

It grows successfully in open habitats across most of the Montana.

Key Characteristic:

Height 7.6-15.2cm (3-6)

Bloom Color: yellow

Undesireable

Visual Identification:



Scientific Nomenclature:	<i>Alyssum murale</i>
Common Name:	Desert madwort
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Alyssum murale grows in mineral rich soils up to 1m (3ft) tall. It has a high tolerance for copper saturated soils. Yellow flowers form clumps on top of reddish stem in early summer. The stems are covered in fine white hairs. Seeds pods form into oval flattened fruits with paper like sheets surrounding a black seed.

Key Characteristic:

Height .3-1m (1-3ft)

Bloom Color: yellow

Visual Identification:



Ψ



Scientific Nomenclature:	<i>Amaranthus albus</i>
Common Name:	Prostrate pigweed
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Amaranthus albus is also known as White amaranth. In late summers this forb becomes a dry tumbleweed. Before drying in the late summer, it has green leaves that fold inward. They are roughly an inch long and oblong. Flowers are tiny and white, growing at the base of the leaves.

It grows in disturbed soils, mostly in disturbed pastured and cultivated fields.

Key Characteristic:

Height 15cm-.6m (6in to 2.5 ft)

Bloom Color: white/yellow

Visual Identification:

Scientific Nomenclature:	<i>Amaranthus hybridus</i>
Common Name:	Slim amaranth
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Amaranthus hybridus can grow up to three feet tall. It has slightly hairy leaves and stems with blade shaped leaves with obvious center and lateral veins. The leaves are about 13cm (5in) long. It has a large cone of intricately grouped flowers. Usually orange in color, the flowering cone can be yellow to pink with a bright red stem. Cylindrical, soft spikes extend from smooth branches that make up the flowering cone.

Amaranthus hybridus can be found in cultivated fields and roadsides.

Key Characteristic:

Height .15-3m (6in to 3ft)

Bloom Color: yellow/orange

Visual Identification:



Ψ



Absinthium in mid summer

Scientific Nomenclature:	<i>Artemisia absinthium</i>
Common Name:	Absinthium
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Artemisia absinthium has large fanned leaves that are a 7.6cm (3in) wide and long. The leaves get smaller as they grow up the stem. The stem is silvery with several bell shaped flowers drooping down the top third. These flowers are yellow and fade into gently white puffballs in late summer.

Artemisia absinthium can be found near stream banks and roadsides.

Key Characteristic:

Height .3-1m (1-3ft)

Bloom Color: green/yellow

Visual Identification:

Scientific Nomenclature:	<i>Asparagus officinalis</i>
Common Name:	Garden asparagus
Lifefrom Code:	Forb
Desirability Code:	Undesirable

Description

Asparagus officinalis stems can grow up to an inch thick. Small leaves are pressed against the stem, usually growing dark purple into maturity. Numerous small stems branch from the parent stem. From these stems small trumpet shaped flowers drop down to the ground and form green berries in their place.

Asparagus officinalis looks like a smaller version of store-bought asparagus. It grows in wooded areas, abandoned fields and grassy roadsides.

Key Characteristic:

Height 5-18cm (2-7in)

Bloom Color: yellow

Visual Identification:



Ψ



Kochia leaves (left) and red stems (right)

Scientific Nomenclature:	<i>Bassia scoparia</i>
Common Name:	Burningbush (kochia)
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Bassia scoparia has long hairs on its stem and leaves. It has compact, flowers that bud from the intersection of the red stem and small leaves. Ray shaped leaves circle the bottom of the plant with narrowing leaves growing smaller toward the top. The fruit grows horizontal wings that extend from the green capsule. It grows well in saline soil of plains across Montana.

Key Characteristic:

Height .3-1m (1-3ft)

Bloom Color: yellow

Visual Identification:

May be confused for mustard species



Ψ

Scientific Nomenclature:	<i>Camelina microcarpa</i>
Common Name:	Littlepod false flax
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Camelina microcarpa looks similar to a mustard plant with yellow flowers. *Camelina microcarpa*, however, forms green to pink disk fruits that later fade to a thin membrane.

The seed pods have a beak about an mm long.

This undesirable forb is reasonably common in western Montana and grows by roadsides and grasslands.

Key Characteristic:

Height .3-.6m (1-2ft)

Bloom Color: white to pink

Visual Identification:



Rush skeletonweed plant (left) and flower (right)

Ψ

Scientific Nomenclature:	<i>Chondrilla juncea</i>
Common Name:	Rush skeletonweed
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Chondrilla juncea has wing shaped basal leaves with irregular toothed lobes. Naked, highly branched stems grow from the basal leaf mat. Small yellow flowers grow from the base of the branches and then form dandelion like dry puffs in late summer.

Chondrilla juncea originated in Asia and can quickly take over disturbed areas.

Key Characteristic:

Height .3-1m (1-3ft)

Bloom Color: yellow

Visual Identification:

Scientific Nomenclature:	<i>Descurainia sophia</i>
Common Name:	Herb Sophia
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Descurainia Sophia is a common undesirable species with stems about .6m (2ft) tall and moderately branched stems. The leaves are 7.6 cm (3in) long and fan shaped. The tops of the stems are yellow mustard like flowers with upright leaves framing them while blooming. The seeds are erect from the top of the stem and are long and skinny. Like most undesirable species, this plant grows in disturbed areas.

Key Characteristic

Height .3-1m (1-3ft)

Bloom Color: yellow

Visual Identification:

Scientific Nomenclature:	<i>Euphorbia esula</i>
Common Name:	Leafy spurge
Lifeform Code:	Forb
Desirability Code:	Noxious

Description

Euphorbia esula is a hairless forb with narrow leaves branching straight out from a narrow stem. The flowers are a yellow-green color with fleshy teardrop shaped petals surrounding a green stamen. Fruits are about 4mm (.15in) long and look like tiny green berries. *Euphorbia esula* is relatively common and is an aggressive noxious weed that can dominate grasslands and riparian forests.

Key Characteristic

Height .3-1m (1-3ft)

Bloom Color: green to yellow

Visual Identification:

Scientific Nomenclature:	<i>Hypericum perforatum</i>
Common Name:	St Johnswort
Lifeform Code:	Forb
Desirability Code:	Noxious

Description .

This noxious weed has oblong leaves with white dots and one single white center vein. The flowers are orange and star shaped. The petals fan back from the yellow stamens and have black dots on their edges. Mostly observed in western Montana, it can found in open forests and along roadsides.

Key Characteristic

Height .3-.6m (1-2ft)

Bloom Color: yellow/orange

Visual Identification:



Ψ

Prickly lettuce in fall (left) and summer (right)

Scientific Nomenclature:	<i>Lactuca serriola</i>
Common Name:	Prickly lettuce
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description .

Lactuca serriola is known for its bristly leaves with sharp points on the underside and edges. The leaves are about 10cm (4in) long and can curl outward. This moderately branched forb blooms yellow flowers that mature into dandelion puff balls in early fall. Like other undesirable species, it shows up in disturbed soils.

Key Characteristic

Height .3-1m (1-3ft)

Bloom Color: yellow

Visual Identification:



Scientific Nomenclature:	<i>Lepidium perfoliatum</i>
Common Name:	Clasp pepperweed
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description .

Lepidium perfoliatum can be differentiated from the other pepperweeds by its round leaves. The leaves are divided into linear lobes that surround the stem on the upper third of the plant. The top third of the plant branches, each branch ending in a cluster of small yellow flowers. The flowers flatten into a diamond shaped fruit mid summer. This forb prefers sparsely vegetated and alkaline soils. It is usually found in association with wetlands.

Key Characteristic

Height .3-.4m (1-1.5ft)

Bloom Color: yellow

Visual Identification:



Scientific Nomenclature:	Linaria dalmatica
Common Name:	Dalmatian toadflax
Lifeform Code:	Forb
Desirability Code:	Noxious

Description .

Linaria dalmatica is an invasion species that is known for its snap dragon like flowers. Part of its successful establishment is due to its ability to flower in early spring into late fall. It has flowers that range from yellow to orange that grow on the top third of the stem. The stem also has arrow shaped leaves that alternate up the stem. Both the stem and leaves are fleshy and hairless.

Linaria dalmatica is often found in stony soils in open terrain.

Key Characteristic

Height 1-2.5ft

Bloom Color: yellow

Visual Identification:

May be confused for
Thermopsis montana (Golden
Banner)

Scientific Nomenclature:	<i>Linaria vulgaris</i>
Common Name:	Butter and eggs
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description .

Linaria vulgaris is not to be confused with *Thermopsis montana* (golden banner). *Linaria vulgaris* has narrow, linear leaves rather than Goldnanner's clover like leaves.

Also known as yellow toadflax, the flowers look like yellow spurs with orange centers.

The upper stems may have hairs, however, most of the plant is smooth.

Linaria vulgaris can aggressively take over sub alpine clear cuts as well as gravel pits and other disturbed areas.

Key Characteristic

Height .6-1m (2-3ft)

Bloom Color: yellow

Visual Identification:



Pineapple weed flower (left) and basal leaves (right)

Scientific Nomenclature:	Matricaria matricarioides
Common Name:	Pineapple weed
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description .

Matricaria matricarioides is most known for its pineapple scented herbage. The leaves (roughly an inch long) are divided into slim lance like sections. The flowering heads are yellow to green orbs with small or non-existent white outer edges. The basal leaves form wheel spokes around the bottom of the plant. *Matricaria matricarioides* grows best in compacted soils in disturbed areas.

Key Characteristic

Height 4in-1ft

Bloom Color: yellow/light green

Visual Identification:

Scientific Nomenclature:	<i>Melilotus officinalis</i>
Common Name:	Yellow Sweetclover
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Melilotus officinalis looks like white clover, however, it is usually shorter and only produces yellow flowers. The leaves have saw-toothed edges and are usually about an inch long. The white flowers are small and can give this forb a furry appearance from a distance. The flowers give way to brown, non-veined seed pods.

Key Characteristic

Height .3-1m (1-3ft)

Bloom Color: yellow

Visual Identification:

May be confused for other species of *Potentilla*



Scientific Nomenclature:	<i>Potentilla recta</i>
Common Name:	Sulfur cinquefoil
Lifeform Code:	Forb
Desirability Code:	Noxious

Description

Potentilla recta has similar characteristics to other native species of *Potentilla*. *Potentilla recta* can be identified by its numerous hairy leaves. The leaves are longer than they are wide, roughly an inch long and form 5-7 fingers. The stems are moderately branched and rough. The flowers have 5-7 heart shaped leaves growing around a yellow center. The green support leaves behind the flowering heads are also very hairy. The hairs all over the plant, unlike native species, grow at 90 degree angles from the plant, rather than flat to the stem.

Potentilla recta grows well at subalpine climates of western Montana. This is a similar range to other species of *Potentilla*.

Key Characteristic

Height .3-.6m (1-2ft)

Bloom Color: white to yellow

Visual Identification:

Scientific Nomenclature:	<i>Senecio vulgaris</i>
Common Name:	Old-man-in-the-spring
Lifform Code:	Forb
Desirability Code:	Undesirable

Description

Senecio vulgaris has small, coarse hairs spreading across the stems and the leaves. The leaves are sharply lobed and roughly an inch long. The top 3rd of the stem is branched, each stem ending in a group of yellow, trumpet flowers. These flowers are roughly 5 mm long and form dandelion like dried seeds in mid summer. Moderately common in Montana, *Senecio vulgaris* grows best in plains and near roadsides.

Key Characteristic

Height .15-.3m (6in -1.5ft)

Bloom Color: yellow

Visual Identification:

Scientific Nomenclature:	<i>Sisymbrium altissimum</i>
Common Name:	Tall tumbled mustard
Lifefrom Code:	Forb
Desirability Code:	Undesirable

Description

Sisymbrium altissimum is the tallest of its genus. The stems are rough and branched at the top. Yellow flowers top the branched stems. The flowers are small, only a few mm long, and grow in clusters. Late in the season, these flowers fall and leave narrow stems behind. The leaves are saw toothed and grow smaller towards the top of the stem. *Sisymbrium altissimum* can dominate disturbed meadows across Montana.

Key Characteristic

Height .3-1.2m (1-4ft)

Bloom Color: yellow

Visual Identification:

Scientific Nomenclature:	<i>Sisymbrium loeselii</i>
Common Name:	Tall tumbled mustard
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

The best way to tell *Sisymbrium loeselii* from other similar species is the large basal leaves. They grow up to 15 cm (6in) long, are broadly triangular with sharp pointed leaves. The flowers, like other mustards, are stacked in clusters on top of the stem. *Sisymbrium loeselii* stems do not branch. The fruits are about 20 mm (.8in) long and cylindrical. It can be found in forested meadows.

Key Characteristic

Height .3-1m (1-3ft)

Bloom Color: yellow

Visual Identification:



Field sowthistle flowers (left) and wrapped leaves (right)

Scientific Nomenclature:	Sonchus arvensis
Common Name:	Field sowthistle
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Sonchus arvensis is not commonly found in Montana, however, it can do well in meadows and other disturbed plains. The leaves are lobed with sharp points on the end. The leaves are unique and appear to fold around the stem. The stems are branched and end in yellow, dandelion like flower. The flowers are made up of yellow rays about 5 mm long. The fruits are also dandelion like puffs with obvious bumps on the ribs.

Key Characteristic

Height: 1-3ft

Bloom Color: yellow

Visual Identification:

Scientific Nomenclature:	<i>Tanacetum vulgare</i>
Common Name:	Common tansy
Lifeform Code:	Noxious
Desirability Code:	Forb

Description

If pulling *Tanacetum vulgare* gloves should be worn as this plant may have toxins that can be absorbed through raw skin. It is often found near roads and along fence roads. The best way to identify this plant is by its button like yellow flowers. The leaves are sharp and saw-toothed and divided into numerous leaflets. The flowers form fruits covered in soft white hairs.

Key Characteristic

Height: .3-1m (1-3ft)

Bloom Color: yellow

Visual Identification:

Scientific Nomenclature:	<i>Taraxacum officinale</i>
Common Name:	Dandelion
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Taraxacum officinale is common across Montana. It has mostly basal leaves with deeply saw-toothed edges about 4 inches long. The stems, smooth and sometimes stained red, end in a yellow flower. These flowers are made up of many small petals. The flowers give way throughout the summer to white spherical puff balls.

Key Characteristic

Height: 12-30cm (5in-1ft)

Bloom Color: yellow

Visual Identification:



Scientific Nomenclature:	<i>Tragopogon dubius</i>
Common Name:	Yellow salsify
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Tragopogon dubius is also known as Meadow Goats Beard. It grows best in grasslands and open forests. When torn, this plant has a milky sap. It has very tapered leaves, ending in a sharp point. The leaves and stem are smooth and moderately branched. The stems are topped with a yellow flower with a darker orange center. The flowers mature into a white fluff around 2-4 cm wide.

Key Characteristic

Height: .6-1.6m (2-4ft)

Bloom Color: yellow

Visual Identification:



Scientific Nomenclature:	<i>Verbascum thapsus</i>
Common Name:	Common mullein
Lifeform Code:	Forb
Desirability Code:	Undesirable

Description

Verbascum Thapsus has large basal leaves that are covered in small hairs. The edges are slightly serrated. The stems are thick and the top two thirds of the plant is a cylinder covered in small yellow flowers and green fruits. The flowers have yellow centers and round yellow petals. The capsules are 10mm long and hairy. It grows well in stony soils and talus slopes and is common in western Montana.

Key Characteristic

Height: .6-1.5m (2-5ft)

Bloom Color: yellow

Appendix D

Field Evaluation Forms

Appendix D.1

Erosion Condition Class Determination Guideline

BRES EROSION CONDITION CLASS DETERMINATION

SURFACE LITTER	No movement, or if present, <2% of unattached litter has been translocated and redeposited against obstacles. 0 or 3	Between 2 and 10 % of the unattachd litter has been transolcatcd and redeposirtcd against obstacles. 6	Between 10 and 25 % of the unattachd litter has been transolcatcd and redeposirtcd against obstacles. 8	Between 25 and 50 % of the unattachd litter has been transolcatcd and redeposirtcd against obstacles. 11	> 50 % of the unattachd litter has been transolcatcd and redeposirtcd against obstacles. 14
SURFACE ROCK MOVEMENT	No mevement, or if present, < 2% of the surface rock fragments show localized concentration. 0 or 2	Between 2 and 10% of the surface rock fragments show localized concentration. 5	Between 10 and 25% of the surface rock fragments show localized concentration. 8	Between 25 and 50% of the surface rock fragments show localized concentration. 11	>50% of the surface rock fragments show localized concentration. 14
PEDESTALLING	Pedestals are mostly < 0.1 inches (2.5mm) high and or leass frequent than 2 pedestals per 100 ft ² . 0 or 3	Pedestals are mostly between 0.1 to 0.3 inches (2.5 to 8mm) high and/or have a frequency of 2 to 5 pedestals per 100 ft ² . 6	Pedestals are mostly between 0.3 and 0.6 inches (8 to 15mm) high and/or have a frequency of 5 to 7 pedestals per 100 ft ² . 9	Pedestals are mostly between 0.6 to 1 inch (15 to 25mm) high and/or have a frequency of 7 to 10 pedestals per 100 ft ² . 11	Pedestals are mostly greater than 1 inch (25mm) high and/or have a frequency greater than 10 pedestals per 100 ft ² . 14
FLOW PATTERNS	None or if present, < 2% of the surface area shows a flow pattern in which water flows over the ground surface for a distance of at least 10 linear feet. 0 or 3	Between 2 and 10% of the surface area shows a flow pattern in which water flows over the ground surface for a distance of at least 10 linear feet. 6	Between 10 and 25% of the surface area shows a flow pattern in which water flows over the ground surface for a distance of at least 10 linear feet. 9	Between 25 and 50% of the surface area shows a flow pattern in which water flows over the ground surface for a distance of at least 10 linear feet. 12	>50% of the surface area shows a flow pattern in which water flows over the ground surface for a distance of at least 10 linear feet. 15
RILLS (DEPTH)	Rills, if present, are mostly < 0.5 inches (13mm) deep. 0 to 2	Rills are mostly 0.5 to 1 inch (13 to 25 mm) deep. 3	Rills are mostly 1 to 1.5 inches (25 to 38 mm) deep. 4 to 5	Rills are mostly 1.5 to 3 inches (25 to 76 mm) deep. 6	Rills are mostly 3 to 6 inches (76 to 152 mm) deep. 7
RILLS (FREQUENCY)	Rills, if present, are mostly found at intervals over 15 feet. 0 to 2	Rills, if present, are mostly found at intervals over 10 feet. 3	Rills, if present, are mostly found at intervals over 5 feet. 4 to 5	Rills, if present, are mostly found at intervals between 2 to 5 feet. 6	Rills, if present, are mostly found at intervals between 0 to 2 feet. 7
GULLIES (DEPTH)	Gullies, if present, < 2% of the channel bed and walls show active erosion. 0 to 2	Between 2 to 5% of the channel bed and walls show active erosion. 3	Between 5 to 10% of the channel bed and walls show active erosion. 4 to 5	Gullies make up between 10 to 50% of the channel bed and walls show active erosion. 6	> 50% of the of the channel bed and walls show active erosion. 7
GULLIES (FREQUENCY)	Gullies, if present, < 2% of the area. 0 to 2	Gullies make up between 2 to 5% of the area. 3	Gullies make up between 5 to 10% of the area. 4 to 5	Gullies make up between 10 to 50% of the area. 6	Gullies make up > 50% of the total area. 7
SOIL MOVEMENT	Depth of depoits around obstacles is between 0 and 0.1 inches (0 to 2.5 mm). 0 or 3	Depth of depoits around obstacles is between 0.1 and 0.2 inches (2.5 to 5 mm). 5	Depth of depoits around obstacles is between 0.2 and 0.4 inches (5 to 10 mm). 8	Depth of depoits around obstacles is between 0.4 and 0.8inches (10 to 20 mm). 11	Depth of depoits around obstacles is > 0.8inches (20 mm). 14

Appendix D.2
Engineered Cap Evaluation Form

**Butte Reclamation Evaluation System (BRES)
Raw Data Field Form for Engineered Caps**

Date _____ Site Name/Number _____

Field Team Members _____

Area Description _____

Rock Cap

Type of rock (limestone, pit run gravel, etc.) _____ Design thickness _____

Surface staining: None _____ Moderate _____ Excessive _____ Describe stain pattern/color _____

Displaced rock: None _____ Moderate _____ Excessive _____ Pattern of displacement: Localized _____ Universal _____

Describe movement (storm water rills, steep slope instability, vehicular, etc.) _____

Does rock cap have a geotextile liner? Yes _____ No _____ If yes, describe condition of liner (good, exposed, torn, poorly anchored, etc.) _____

Exposed subgrade materials? Yes _____ No _____ Describe exposed subgrade if noted (area, localized, dispersed, etc.) _____

General comments regarding rock cap: _____

Concrete or Shotcrete Cap

Did design specify for sulfate resistant concrete? Yes _____ No _____ Unknown _____ Design thickness _____

Type of reinforcing (fiber, re-bar, welded wire fabric.) _____ Control joints? Yes _____ No _____

Surface staining: None _____ Moderate _____ Excessive _____ Describe stain pattern/color _____

Surface cracking: None _____ Moderate _____ Excessive _____ Describe the approximate frequency, length, and average thickness of the cracks if noted. _____

Surface spalling: None _____ Moderate _____ Excessive _____ Describe the spalling pattern if noted. _____

Exposed subgrade materials? Yes _____ No _____ Describe exposed subgrade if noted (area, localized, dispersed, etc.) _____

Evidence of undercutting at edges of cap? None _____ Moderate _____ Excessive _____ Describe undercutting of subgrade soil at edges of cap if noted _____

General comments regarding concrete/shotcrete cap: _____

Asphalt Cap

Design Thickness _____ Is there a layer of base course under asphalt? Yes _____ No _____ Base course thickness _____

Surface cracking: None _____ Moderate _____ Excessive _____ Describe the frequency, length, and average thickness of the cracks if noted. _____

Holes in asphalt? Yes _____ No _____ Describe number, size, shape of holes in asphalt if noted. _____

Exposed subgrade materials? Yes _____ No _____ Describe exposed subgrade if noted (area, localized, dispersed, etc.) _____

Evidence of undercutting at edges of cap? None _____ Moderate _____ Excessive _____ Describe undercutting of subgrade soil at edges of cap if noted _____

General comments regarding asphalt cap: _____

Appendix D.3

SOP-1 Point Intercept Method



BPSOU BRES FIELD EVALUATION SOP-1

POINT INTERCEPT METHOD

STATUS: Final
 DATE ISSUED: 08/20
 REVISION: 0
 PAGE 1 of 2

PURPOSE	To establish a uniform field procedure to safely and effectively use the point intercept method. This method uses laser pointers and frames to determine the percent groundcover.
SCOPE	Work described in this procedure includes step by step field instructions for selecting the number of frames necessary for a site, the procedure for relocating the frame and moving the laser pointer with a grid of 10 points per frame. It is assumed that field crew members can estimate vegetation cover to within 10% of measured value to complete training.
WORK INSTRUCTIONS	
The following instructions are intended to provide sufficient guidance to perform the task in a safe, accurate, and reliable manner. Should these instructions present information that is inaccurate or unsafe, operations personnel must bring the issue to the attention of the O&M Manager and the appropriate revisions made.	
TASK	INSTRUCTIONS
1. Determine Site Variability	<ul style="list-style-type: none"> a. If site variability is large, more frames are necessary; when the variability is small, fewer frames are needed to adequately characterize the site mean. b. Sites less than 5 acres typically require up to 10 frames and sites greater than 5 acres up to 10 acres may require up to 20 frames. c. Sites greater than 10 acres may require between 30 and 50 frames placed within a site, depending on variability within a site.
2. Placing Frame	<ul style="list-style-type: none"> a. To place frame a random method (an object is blindly tossed) is used that places the frame over an area large enough to represent variability at the site.
3. Moving Laser Across Frame	<ul style="list-style-type: none"> a. The frame is divided into 10 sections of equal length. Each section is marked as a point. b. Place the laser pointing at the ground 90 degrees with respect to the frame. c. Observe and record the interception of the laser and the ground as live plant cover, litter, rocks or bare ground. d. Move the laser to the next point and repeat for all 10 of the points.
4. Determine and Record Percent Groundcover	<ul style="list-style-type: none"> a. Percent groundcover is calculated by the number of “hits” divided by the total number of points (10). b. A “hit” is defined as an area of ground that the laser pointer intercepts as covered in live plant cover, litter or rocks.

DRAWINGS, DOCUMENTS, AND TOOLS/EQUIPMENT	
The following documents should be referenced to assist in completing the associated task.	
DRAWINGS	BRES Quadrant Maps, Aerials
RELATED SOP's / WORK PLANS	
FORMS/CHECKLIST	



BPSOU BRES FIELD EVALUATION SOP-1

POINT INTERCEPT METHOD

STATUS: Final
 DATE ISSUED: 08/20
 REVISION: 0
 PAGE 2 of 2

APPROVALS/CONCURRENCE	
By signing this document, all parties acknowledge the completeness and applicability of this SOP for its intended purpose. Also, by signing this document, it serves as acknowledgement that I have received training on the procedure and associated competency testing.	
MANAGER	DATE
QA OFFICER	DATE
FIELD TEAM LEADER	DATE
OTHER	DATE
OTHER	DATE

Revisions:

Rev.	Description	Date	Approval