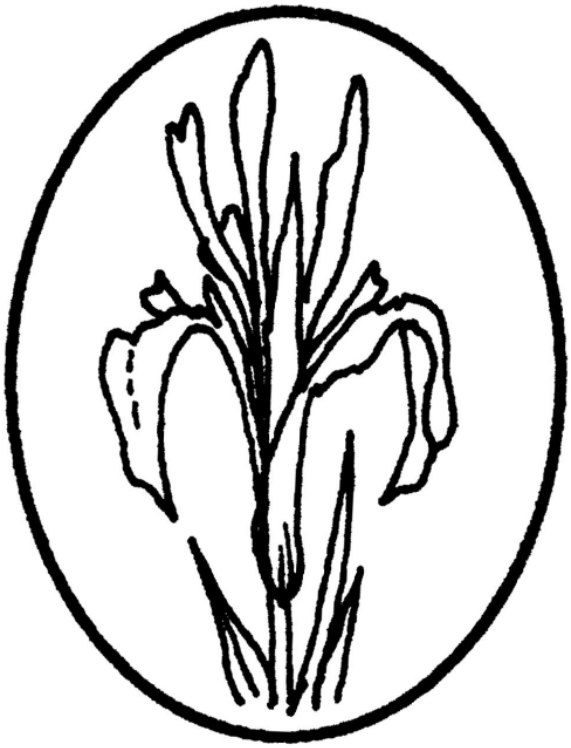
Alberta Native Plant Council (ANPC)

Guidelines for Rare Vascular Plant Surveys in Alberta

2012 UPDATE



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BACKGROUND

The *Alberta Native Plant Council (ANPC) Guidelines for Rare Plant Surveys in Alberta* (Lancaster 2000) was published 12 years ago. The guidelines were prepared as rare plant surveys were becoming more common and a need was identified to standardize the methodology, because it was noted that pre-disturbance surveys were sometimes conducted with inappropriate techniques, timeframes and scopes. Now, twelve years later, a need has been identified to update the guidelines to remain current. In recent years, the Alberta government has recommended rare plant surveys be conducted in the Grassland and Parkland Natural Subregions (Alberta Energy Resources Conservation Board 2002); there has been increased scrutiny of rare plant surveys by regulatory boards such as the Alberta Energy and Resources Conservation Board (ERCB) and the Canadian National Energy Board (NEB); and the Canadian *Species-At-Risk Act* (SARA) has focused critical attention on the requirements for rare plant surveys in Alberta. The updated guidelines draw on the knowledge and experience of many practicing field botanists in Alberta to present appropriate methods for surveying for rare vascular plants.

This document expands on the study design and reporting presented in the original guidelines (Lancaster 2000), and also provides current internet links to useful publications and references. **See Appendix A for Internet Links.**

In addition to updating the guidelines, the ANPC has published a list of recommended resources to assist users in properly defining scope and carrying out botanical surveys, called *Recommended Documents for Botanical Surveys in Areas of Proposed Disturbance* (2010) (Appendix A, Item 9). As new resources or protocols become available, this document will be updated.

These *Guidelines* do not address survey methods for rare ecological communities, rare non-vascular plants (mosses, liverworts and hornworts) or rare lichens. However, ANPC's *Recommended Documents for Botanical Surveys in Areas of Proposed Disturbance* (2010) does provide some guidance for these botanical elements.

The input and review of the following botanists in updating the guidelines is gratefully acknowledged: Lorna Allen, Cheryl Bradley, Dana Bush, Mari Decker, Gina Fryer, Joyce Gould, Laurie Hamilton, Mary Ann Johnson, Todd Kemper, Jane Lancaster, Leslie Monteleone and Jim Posey.

This update is dedicated to Graham Griffiths (1937-2009), for providing feedback at the early stages of the update and for inspiring botanists and mosquito lovers throughout Alberta.

INTRODUCTION

Rare vascular plant surveys are conducted to determine the presence, location and occurrence details of rare species in a given study area. Surveys may be conducted for a variety of purposes, such as, a species inventory of an area for conservation planning, or as a pre-disturbance survey to provide information to assess the impacts of a proposed development.

The objective of this document is to provide a standardized approach to the assessment of lands for the presence of rare vascular plant species to ensure that:

- Appropriate methods are used,
- Reliable information on the presence and status of rare vascular plant species in a study area is produced,
- The potential of locating a rare vascular plant species in a study area is maximized,
- Surveys are conducted in a way that is consistent with ANPC's objectives to conserve native plants and habitats, and
- Survey effort and survey results are appropriately recorded and reported.

Please note that a survey can confirm the presence of rare species, but it can seldom rule out the existence of rare species (Lancaster 2000).

In general, the term 'rare' refers to species that exist in low numbers, have a restricted range, or are of conservation concern due to population trends or threats (Kemper 2009). The rarity or conservation status of all vascular plants occurring in Alberta is ranked by the Alberta Conservation Information Management System (ACIMS, formerly the Alberta Natural Heritage Information Centre, ANHIC). ACIMS is part of the North American NatureServe system (see Appendix A). Specifically, conservation status ranks (ranging from S1 – critically imperiled, to S5 – secure) are based on rarity (population size, range extent, area of occupancy, number of occurrences), population trends (long-term and short-term trend in population size, or range), and threats (scope, severity, intrinsic vulnerability of species in question) (Kemper 2009).

Some species may have additional designations of rarity, some of which confer legal protection. For the purposes of this document, 'rare plant species' include vascular plant species, subspecies or varieties that meet one or more of the following:

- Are included on the current ACIMS list of All Tracked and Watched Elements,
- Are provincially listed as 'At Risk' or 'May Be at Risk' by Alberta's General Status ranks,
- Are provincially regulated as 'Endangered', 'Threatened', or 'Special Concern' under the Alberta *Wildlife Act*, or
- Are listed as 'Endangered', 'Threatened', or 'Special Concern' on Schedule 1 of Canada's *Species at Risk Act* (SARA).

For more information on all of the above, please see Appendix A.

This document is divided into sections based on the main components of conducting a rare vascular plant survey in Alberta as outlined below:

- Study Design
- Survey Methods
- Documentation
- Analysis & Conclusions
- Reporting

Deviation from these guidelines should be supported with biologically relevant arguments in the survey report.

STUDY DESIGN

State the overall goals and specific objectives of the survey and then use those to guide the design of the study. For a discussion on writing accurate study objectives, see Henderson and Neudorf (2007). Considerations for developing an appropriate study design include:

- Type of Survey,
- Study Area,
- Number of Surveys,
- Survey Effort, and
- Qualifications of Surveyors.

TYPE OF SURVEY

Common types of vegetation surveys in Alberta are summarized below. Recommended methods in these guidelines pertain to conducting a 'detailed rare plant survey' as described below, although some of the recommended methods should be applied to all types of surveys.

Ideally for any type of survey, all sites where rare plants have been previously recorded in the study area (as identified in the ACIMS database search, see Pre-Survey Investigations below) should be revisited to confirm the ongoing presence of the population.

Detailed Rare Plant Surveys

The guidelines in this document refer primarily to detailed surveys conducted to identify and document all occurrences of any rare vascular plant species within a given study area. Detailed occurrence information for each located rare plant population is usually collected as this information may be useful for many reasons, including, planning conservation initiatives, assessing proposed impacts from a disturbance, and contributing to the knowledge of a species that allows accurate rankings to be made. Detailed rare plant surveys are usually conducted on foot.

Reconnaissance Surveys

Reconnaissance surveys may be conducted prior to a detailed rare plant survey to gather information for planning the subsequent survey. They may allow a surveyor to get an overview of the area of interest and its habitat types, to estimate the potential of various habitats or locations that support rare plant species and/or to prioritize habitats or locations for surveying. These surveys may be conducted in the year previous to conducting a detailed rare plant survey, or outside of the growing season if need be, but usually, they should be conducted in snow-free conditions. They may be conducted by helicopter, motorized ground travel or on foot.

Targeted Surveys

Targeted surveys focus effort on pre-determined species of interest. These are usually intensive surveys in areas where species have been previously documented, or might be expected to occur. Targeted surveys should focus on the habitat(s) most likely to support the targeted species (*e.g.*, obligate wetland species are not likely to occur on dry ridges); however, the remaining habitat must be systematically or randomly surveyed to generate statistically unbiased information about presence or absence (Henderson and Neudorf 2007). For more information on targeted surveys and for methodology regarding *SARA*-listed species, refer to Environment Canada's recommended survey methods (Henderson and Neudorf 2007, Henderson 2009).

Baseline Surveys

Baseline surveys may be conducted to record the vegetation (dominant and non-native plant species and cover) that are present in an area prior to a disturbance. The baseline information may then be compared to the vegetation present following the disturbance, or may be used as a standard to evaluate revegetation success. These surveys may not be specifically aiming to locate rare species, but if some are found, they should be fully documented as future actions may be needed in order to protect the populations.

Inventory Surveys

Inventory surveys are conducted to identify every species growing in an area so that a complete plant list for an area may be produced. These surveys may not be specifically aiming to locate rare species, but if some are found, they should be fully documented as future actions may be needed in order to protect the populations.

Plant Community / Ecological Land Classification (ELC) Surveys

Plant community or ecological land classification (ELC) surveys are generally conducted in order to acquire more information about the relative abundance of community types in an area. These surveys may not be specifically aiming to locate rare species, but if some are found, they should be fully documented as future actions may be needed in order to protect the populations.

Monitoring Surveys

Monitoring surveys are conducted for known occurrences of rare plant populations to gather more information. These surveys may be conducted over multiple years to identify trends in abundance, areal extent, and vigour to help understand population dynamics. For more information on conducting monitoring surveys, please see Henderson and Neudorf (2007), and Elzinga *et al.* (1998).

STUDY AREA

The study area must be cleared defined and rationale for selecting the boundaries must be provided. Consider land ownership and use; the ecology of the area, including local and regional level biology, geology, hydrology and climate; and, the boundary of the area of interest or the footprint of a proposed disturbance (if applicable). More than one scale may need to be discussed (*e.g.,* footprint, local study area, and regional study area). Beyond the specific boundary of an area or project, a study area may need to include any required setbacks for wetlands and riparian areas and *SARA*-listed species.

NUMBER OF SURVEYS

The area should be surveyed during those times of the growing season when potentially occurring rare species are most likely visible (*i.e.*, when diagnostic features are most identifiable). The study area should be surveyed a sufficient number of times during a growing season to observe ephemeral habitats (*e.g.*, snow beds, ephemeral wetlands, spring seeps), and early and late season perennials and annuals.

For detailed rare plant surveys, the ANPC recommends surveying the area at least twice during the growing season. More than two visits may be required in areas with a longer growing season (*e.g.*, dry grasslands) or with known early or late-blooming rare species. One visit may be sufficient in areas with a shorter growing season (*e.g.*, alpine areas or areas at high latitude).

For details on the length and timing of the growing season in each Natural Subregion in Alberta, please refer to *Natural Regions and Subregions of Alberta* (Natural Regions Committee 2006). The specific climatic conditions during the year of the survey may also need to be considered.

One site visit or a survey at a marginal time of year (*i.e.*, outside the growing season) is better than not conducting a rare plant survey before a disturbance. However, it is important to indicate confidence levels in the results and whether the survey meets the minimum standard (*i.e.*, two surveys per growing season) that has become accepted in the development industry as defensible in a regulatory hearing.

Ideally, the study area should be surveyed over a number of growing seasons and moisture conditions to account for the following:

- Climatic fluctuations (*e.g.*, in dry years annuals may not germinate);
- Perennials that may not produce flowers yearly, making it difficult to confirm identity;
- The fact that in a number of plant families with subterranean perennial organs, above-ground growth can be absent for one or more years; and,
- Other factors that may affect the vigour and visibility of plants on a site (*e.g.*, grazing, insects, fire and disease).

For prairie species listed under Canada's *Species at Risk Act* (*SARA*), refer to the methods prescribed by Environment Canada (Henderson and Neudorf 2007, Henderson 2009).

SURVEY EFFORT

Whenever possible, an entire project or study area should be surveyed. If this is not possible, and sub-sampling is necessary, consider how best to stratify or distribute the sampling effort to maximize the number of appropriate sites surveyed.

Factors to consider include:

- Objectives of the survey,
- Size of the study area,
- Diversity of habitats in the survey area (*e.g.*, ecosites, plant community types),
- Number of rare plant species potentially occurring in the area,
- Number of rare species listed provincially (Alberta *Wildlife Act*) or federally (*SARA*) whose range overlaps the survey area, and
- The number of ACIMS occurrences that require a revisit.

When identifying your sampling sites, ensure that they represent the spatial extent of your study area and that the following are sampled:

- Each representative habitat,
- Areas deemed to be more sensitive to disturbance,
- Uncommon plant communities and/or habitats, and
- Small-scale features and microhabitats.

The growing conditions or preferences of most rare species are not well understood, and it is important to bear this in mind when determining how to conduct a survey. Some rare plant species may consistently prefer a certain substrate, water pattern, landscape feature or plant association, while others may occur in a number of different situations, or could be found outside documented habitats (Gould 2007). Henderson (2009) states: "part of the reason for rarity may be a specialized habitat that is limited in space and time, or random long-distance dispersal events that create uncommon patchy distributions in a larger matrix of potentially suitable habitat". Many rare plant species seem to prefer uncommon locations such as

microhabitats, ephemeral habitats, uncommon soil conditions, unusual landscape features, and transition zones between habitats, however, some rare species occur in fairly common habitats, and some even prefer disturbed areas. Some habitats, especially those that occur less frequently, may be thought to have a higher probability of supporting rare plants (*e.g.*, calcareous areas, seepage areas, old growth forests, areas with fluctuating water levels). If search effort is purposely skewed to sample uncommon or 'high probability' habitats or to avoid habitats that are thought to be more common or homogeneous, the rationale for this should be documented.

It may or may not be appropriate to conduct rare plant surveys in conjunction with plant community classification. The objectives of these components may seem at odds, as the former may focus on small-scale features, and the latter on large-scale features. However, the one may supplement the other. Plant communities can give context and clues for rare plant occurrences, and may be useful for determining whether or not a rare species is linked to a specific habitat or plant community type.

Plot-based surveys, such as nested quadrats used to sample ecosite polygons where areas are pre-selected to reflect a homogeneous stand, may not be the most effective method to locate rare plants.

A note about logistics:
Survey effort should be determined based on the objectives and scope of the survey, prior to considering the logistics of carrying out the survey. Logistics might modify the time or cost required to meet the objectives, but the survey effort should reflect the diversity in the study area and not logistical constraints.

In order to determine the logistics of carrying out the survey, estimate the area that can be safely and thoroughly surveyed per day. Consider:

- Access to the area (*e.g.,* by vehicle, boat, helicopter, on foot),
- Traversability of the habitat (*e.g.*, wetland versus dense forest versus open grassland),
- Vegetation (*e.g.*, diversity of communities and structure),
- Detectability of potential rare plant species (*e.g.,* height and ease of identification),
- Commute time, and
- Number of rare species/populations likely to be found (and subsequent additional time needed to document and prepare records and specimens).

QUALIFICATIONS OF SURVEYORS

The following are recommended qualifications for all rare plant field surveyors:

- Training in plant taxonomy, resulting in ability to use technical floras [*e.g.*, Flora of Alberta (Moss 1983), Flora of North America (Flora of North America Editorial Committee 1993+)] and competency with botanical terminology,
- Knowledge of the local flora and the potential rare species in the study area to be surveyed,
- Familiarity with plant community classification guides where they exist,
- Taxonomic experience to identify most species in the field (including difficult taxa such as willows, sedges and grasses), and the remainder through taxonomic determination in a herbarium, and
- 120 days of taxonomic field experience.

The following additional qualifications of a rare plant field survey team are recommended:

- Knowledge of relevant standards and policies,
- Experience with GPS and maps,
- Navigational skills, and
- Data collection skills.

The ANPC acknowledges that the amount of time needed for a practicing field botanist to become competent will vary, and a botanist may be competent in one geographical area and not in another. However, as a guideline, the ANPC suggests all rare plant surveyors have at least 120 days of plant taxonomy field work experience. For reference, note that Henderson (2009) recommends that at least one observer have a decade or more experience in the taxonomy of the local flora.

SURVEY METHODS

Survey methods are divided into: Pre-survey Investigations, Survey Techniques, and Field Resources.

PRE-SURVEY INVESTIGATIONS

Pre-survey investigations enable the surveyors to become familiar with previously documented rare plant occurrences and rare species potentially occurring in an area, and to determine the most appropriate dates for fieldwork. Descriptive and spatial information specific to the study area, should be compiled prior to the field survey.

The following steps are recommended for pre-survey investigations:

1. Compile list of potentially occurring rare species (Appendix A, Items 18 to 20):
    - Check with ACIMS (Appendix A, Item 1) for known rare plant occurrences:

    - within and surrounding the study area,
    - in similar habitats to those within the study area, and
    - elsewhere within the Natural Subregion(s).
  - Liaise with appropriate knowledgeable agencies, scientists and others (Conservation Data Centres may recommend local botanists).

2. Compile information on potentially occurring rare plant species (Appendix A, Items 16 to 20):
   - Review descriptions, illustrations and photographs of each species (where possible),
   - Examine herbarium specimens to become familiar with the species of interest,
   - Check appropriate flora(s) for key characteristics used in differentiating the potentially occurring rare species from similar common species, and
   - Consult appropriate flora(s) and herbarium specimens to determine important life history information (*i.e.*, annual, perennial, saprophytic); typical habitats (*e.g.*, range site/ecosite), substrates (*i.e.*, soil type, drainage), and associated species (*e.g.*, plant community); and phenology (including typical timing of development of key characteristics for identification),
   - Use phenological information of the potential rare species to determine appropriate field survey dates, and to determine the life stage most easily identified (*e.g.*, flowers, seeds, fall foliage). If no information is available on a particular species, use flowering dates of common species in the area.
3. Compile information on the biophysical characteristics of the study area and if needed, map the study area. Mapping is useful for large study areas that require stratification or site selection for surveying, but may not be needed for smaller study areas, or visiting previously documented occurrences. Mapping plant habitats or variables relevant to the distribution of rare plant species (*e.g.*, soils, parent materials, ground and surface hydrology) may assist in survey stratification.
   - Obtain maps or spatial datasets (*e.g.,* Grassland Vegetation Inventory) aerial photographs or satellite imagery at an appropriate scale or resolution (≤ 1:30,000 scale or 20 metre resolution, preferably full-spectrum colour or infrared),
   - Delineate polygons that represent plant habitats (including open water or non-vegetated areas) using aerial photographs or satellite imagery in hard copy (*e.g.*, contact print air photos) or soft copy (*e.g.*, GIS software) format,
   - Review any available biophysical land classification systems or plant community guides for the Natural Region, Natural Subregion or specific area (*e.g.*, field guides to ecosites, range plant community type guides) to provide valuable sources of background info and help to provide consistency in describing habitat (*e.g.*, physical site characteristics and vegetation) in which rare plants are found,
   - Map and gather information on any designated areas that may have ecological significance (*e.g.*, Environmentally Significant Areas (ESAs), Special Areas, National or Provincial Parks, Protected Areas),
   - Identify any potentially uncommon habitats (*e.g.*, slopes, waterbodies, sensitive soils, saline areas),
   - Map known rare plant occurrences in the study area,

- If available, review other mapped information (*e.g.*, topography, surface geology, soils and hydrology) to help locate potential habitats and plant communities, and
- Review relevant reports (Appendix A, Item 21) and relevant grey literature (Appendix A, Item 24).

SURVEY TECHNIQUES

Rare plant surveys should be floristic as this allows for greater spatial coverage of a study area than quantitative methods (Lancaster 2000). Floristic surveys involve traversing the variety of habitats in the study area noting species that are encountered. Lancaster (2000) identified that "[a] floristic survey in this context is not to develop a full list of the plant species in the study area but rather to ensure that all species encountered are sufficiently evaluated to confirm or to rule out the possibility that they are a rare species. Search effort is focused [on] inspecting as many [of] the fine scale biotic patterns, unusual plant associations and landscape features as possible while still checking some portions of each dominant habitat or plant association. All sites and features with high probability of supporting rare species should be checked."

Systematic search patterns are recommended to minimize overlap and maximize coverage (Lancaster 2000). As well, systematic patterns will increase detectability of rare species and the repeatability of the survey (Henderson 2009). Search patterns will depend on the topography and vegetation cover. A combination of the two methods, described below, is often useful. Meander searches help locate vegetation patterns and their boundaries, which can then be searched using transect searches to maximize the coverage of the area of interest. Search patterns and intensity are discussed in Nelson (1986, 1987).

Types of search patterns, include the meander search and the transect search (Government of Saskatchewan 2012) and are described below (Lancaster 2000).

- Meander searches focus on a particular habitat and the range of variation within (Cropper 1993, Goff *et al.* 1982), and:
    - Involve walking purposefully through a sample site or plant association and noting each new species until no more new species are observed (often this search pattern is referred to as 'random', however there is no random element in the design or execution),
    - If a rare plant is observed during a meander search, similar habitats in the study area should be searched,
    - Are useful in difficult terrain, irregularly-shaped areas, or large search areas, and
    - May be biased toward areas that are easier walking and may oversample some areas (*i.e.*, sample some areas more than once).
- Transect searches involve walking a series of roughly parallel transects within a sampling site, which:
    - Maximizes coverage of an area and minimizes overlap,
    - Reduces the tendency to avoid difficult search terrain, forcing the surveyor to survey microsites/habitats that might otherwise be overlooked,
    - May be time consuming due to access to difficult terrain, and
    - May miss uncommon microsites depending on the spacing of transects.

FIELD RESOURCES

Field surveyors should ensure that the following field resources are compiled prior to the survey and taken to the field:

- The complete ACIMS list of tracked and watched vascular plant species (Element Code starting with 'P'), as well as the provincial and federal species at risk lists (Appendix A, Items 21 to 23),
- Appropriate flora(s) for the area,
- List of potential rare plants, including phenology and habitat,
- Required permits (*e.g.*, a collecting permit if working in a National or Provincial Park, or if working with provincially-listed or *SARA*-listed species), and
- Maps, air photos and/or survey plans.

DOCUMENTATION

Document search effort including:

- a map and/or description of the specific area surveyed;
- details about the actual area walked (the track function on a GPS is an accurate way to record and document the specific path that was followed), the survey width, and speed (GPS can document average and maximum speed);
- number of days and the specific number of hours/day spent surveying, and
- names of the surveyors who conducted the surveying.

Detailed documenting of surveys and rare plant occurrences is needed to improve the understanding of rare plant species biology, habitat requirements, phenology and abundance.

- Occurrences of all rare plant species encountered should be documented.
- Document all search areas and search effort (number of surveyors and time spent), including those areas and efforts where no rare plant species were observed. Negative data are important to ascertain the actual rarity of a species (*i.e.*, a species may be under-surveyed or under-recorded rather than actually rare) or population trend for known occurrences. Note, it is more accurate to refer to this as 'no detection' data, than as 'absence' data (Henderson 2009).
- In the field, fill in a *Rare Native Plant and Lichen Survey Form* (Appendix A, Items 4 & 5), for each rare plant population observed. Fill in *as many* fields as possible. An electronic spreadsheet template is available from ACIMS for surveys resulting in multiple observations (Appendix A, Item 5).
- ACIMS's report form asks for information on extent and number of individuals. The objectives of the survey will help determine what method for measuring a population's size is appropriate. A useful publication on measurement techniques is *Measuring and Monitoring Plant Populations* by Elzinga *et al.* (1998):

  - If the population is small in extent and the number of counting units is few, a complete population count or census may be feasible.
  - For larger, more extensive populations, it may be more practical to map the extent/boundary of the population and estimate the overall population size with a range (*e.g.*, 0-10, 11-100, 101-1000, 1001-5000 plants) by counting smaller areas spaced regularly or randomly and extrapolating.

- It may be acceptable to submit less detailed information for watched species, especially if they are locally common (*i.e.*, frequently encountered). A summary table documenting locations and population sizes may be more appropriate than an ACIMS form for each occurrence.
- Where the population size permits, collect a voucher specimen. Voucher specimens are critical to verify the identification, and are essential where there are taxonomic difficulties. Specimens should only be collected following ANPC's Collection Guidelines (see Appendix A, Item 8). Specimens (*e.g.*, plant material or diagnostic photographs) should be submitted to a publically accessible herbarium, typically a university or museum herbarium. For information on proper mounting and labeling of herbarium specimens see Brayshaw (1996). Note, some institutions may prefer to do their own mounting and labeling.
- If the identification of a species cannot be confirmed by the botanists conducting the survey, a voucher specimen (*e.g.*, plant material or diagnostic photographs), should be submitted to an expert for confirmation (CDC's may be able to suggest personnel).
- Diagnostic photographs are useful in all cases and are particularly important for occurrences in which the population size, legal protection status, or terms of access (*e.g.*, private landowner restrictions, federal or provincial protected areas permits) do not permit collections of plants or plant parts. Photographs should also be taken of the small- and large-scale habitat of the population including any landmarks as these provide useful information for documenting an occurrence and for relocating a population.
- For rare plant populations that are threatened by a proposed disturbance, a detailed site sketch showing the relationship to the proposed disturbance will be necessary in order to determine what mitigation actions should be taken. As well, it is useful to estimate the proportion of the population that is threatened by the disturbance.

ANALYSES & CONCLUSIONS

The level of analyses and conclusions required will depend on the objective(s) of the survey. For the purposes of a detailed rare plant survey where no disturbance to the landscape is expected, documenting the results as described above, reporting the results to the client (as described further below under Reporting), and submitting the rare plant information to ACIMS and specimens to a herbarium, may be all that is needed.

For rare plant populations that will potentially be affected by a proposed disturbance, recommendations should represent what actions may be taken and why. Both potential direct effects (*e.g.*, rare plant population is under development footprint) and indirect effects (*e.g.*, changes in moisture or light regimes) should be considered. Details on how to determine appropriate mitigation actions are not within the scope of these guidelines.

REPORTING

A rare plant survey report must allow a reviewer to assess the quality and rigour of the survey. A sample table of contents for a rare plant survey report is located in Appendix B. The following are minimum reporting requirements for a rare plant survey:

- Provide details and methods of the study design and survey methods, including rationale,
- Describe the survey effort in terms of percentage of the area covered, time spent, dates of survey and names of surveyors,
- Summarize the number and location of rare plant species observed (including voucher specimens collected) and describe the populations and habitats,
- State whether the information will be supplied to ACIMS, if not, state the reasons,
- Depending on the purpose of the report, it is advisable to include a professional sign-off sheet with signature(s) of the author(s) to indicate that all have seen the final report and approve of the data and recommendations, additionally the sign-off sheet indicates that the senior author acknowledges that all relevant information is included, and that they accept responsibility for the accuracy of the report,
- Include the credentials of field botanist(s) and author(s)
- Discuss limitations of the survey (*e.g.,* times of year, number of site visits, effort),
- Describe any required follow-up or recommended further surveys, and
- Describe the level of survey confidence and where it is low, consider rescheduling the survey or surveying during the following year.

Data Sharing

If you use a Conservation Data Centre you have a responsibility to contribute to it. Unless surveyors are contracted to maintain the privacy of the information, all rare plant observations should be reported to ACIMS as well as information on areas and search effort where no rare plants were detected. A *Rare Native Plant and Lichen Survey Form* should be filled out and e-mailed to ACIMS for every observed rare plant population. It is very helpful to ACIMS, if a map (preferably digital and in a GIS environment) is submitted along with the forms showing the areas surveyed, and the locations of all rare populations.

For any withheld information, permission should be sought to release the information to ACIMS as soon as it becomes possible to do so (*i.e.*, when a decision on a proposed development project has been made), and the ACIMS submission should then indicate whether impacts to rare plant species have or will occur.

Benefits of Reporting

ANPC promotes data sharing and believes that contributing to the ACIMS database will increase the effective management of rare plant species in Alberta. ANPC has published a letter template (Appendix A, Item 25), which can be used to obtain permission from clients to share survey results with ACIMS. This letter template can be edited to reflect the specific details of the rare plant survey and be submitted to the appropriate individual/organization as soon as possible during the design and implementation of the rare plant survey.

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Appendix A. Internet Links

Item #	Category	Name	Internet Hyperlink	Brief Description
1	Conservation Data Centre	Alberta Conservation Information Management System (ACIMS, formerly ANHIC)	http://tpr.alberta.ca/parks/heritageinfocentre/	The Alberta Conservation Information Management System tracks information at several levels- species, community and landscape. ACIMS is Alberta's conservation data centre.
2	Conservation Data Centre	British Columbia Conservation Data Centre	http://www.env.gov.bc.ca/atrisk/toolintro.html	The BC Species and Ecosystems Explorer is a source for authoritative conservation information on approximately 6000 plants and animals, and almost 600 ecological communities (ecosystems) in British Columbia.
3	Conservation Data Centre	Saskatchewan Conservation Data Centre	http://www.biodiversity.sk.ca/	The Saskatchewan Conservation Data Centre gathers, interprets and distributes standardized information on the ecological status of provincial wild species and communities.
4	Forms	ACIMS Rare Native Plant and Lichen Survey Form - Field form	http://tpr.alberta.ca/parks/heritageinfocentre/docs/rarenative_2011_UPDATE_v1.1.pdf	Field form for recording information on rare plant species for submission to ACIMS.
5	Forms	ACIMS Rare Native Plant and Lichen Survey Form - Electronic form	http://tpr.alberta.ca/parks/heritageinfocentre/plants/vascularbryophytes/default.aspx	Digital form for recording and submitting information on rare plant species to ACIMS.

Item #	Category	Name	Internet Hyperlink	Brief Description
6	Guidelines	California Native Plant Society's Botanical Survey Guidelines (2001)	http://www.cnps.org/cnps/rareplants/inventory/guidelines.php	These recommendations are intended to help those who prepare and review environmental documents determine when a botanical survey is needed, who should be considered qualified to conduct such surveys, how surveys should be conducted, and what information should be contained in the survey report.
7	Guidelines	California Department of Fish and Wildlife - General Rare Plant Survey and Species-specific Survey Guidelines	http://www.fws.gov/sacramento/ES/Survey-Protocols-Guidelines/Documents/rare_plant_protocol.pdf	Standardized guidelines for use when conducting surveys for rare plants.
8	Guidelines	ANPC Plant Collection Guidelines for Researchers, Students and Consultants	http://www.anpc.ab.ca/assets/researchers_students.pdf	ANPC's guidelines to assist researchers, students and consultants in properly collecting, documenting and handling specimens.
9	Guidelines	ANPC Recommended Documents for Botanical Surveys in Areas of Proposed Disturbance	http://www.anpc.ab.ca/assets/ANPC_Recommended_Documents_for_Botanical_Surveys.pdf	This document was designed to assist land managers/planners, industry representatives, regulators and consultants in properly identifying the scope of work required to assess rare elements of botanical biodiversity in areas of proposed disturbance.

Item #	Category	Name	Internet Hyperlink	Brief Description
10	Guidelines	Occupancy Survey Guidelines for Prairie Plant Species at Risk	http://www.ec.gc.ca/Publications/156699D4-DACA-413F-8EE9-80160BD62805%5COccupancySurveyGuidelinesPrairiePlantSpeciesAtRisk.pdf	These guidelines are designed to ensure that SARA-listed rare prairie plant species occupancy data collected during surveys includes the number of occurrences, area of occupancy and extent of occurrence of species, needed to assess or rank the status of rare plants, and monitor the success of recovery actions for species at risk.
11	Guidelines	Standardized Methodology for Surveys of Rare Plants	http://www.biodiversity.sk.ca/Docs/rareplantsurveyguidelines.pdf	Standardized guidelines for use when conducting surveys for rare plants in Saskatchewan.
12	Guidelines	Protocols for Rare Plant Surveys (Red- and Blue-listed Species)	http://www.geog.ubc.ca/biodiversity/eflora/ProtocolsforRarePlantSurveys.html	Standardized guidelines for use when conducting surveys for rare plants in British Columbia.
13	Native Plant Organization	Alberta Native Plant Council (ANPC)	http://www.anpc.ab.ca/	The ANPC promotes knowledge and conservation of the native plants and vegetation of Alberta.
14	Native Plant Organization	California Native Plant Society	http://www.cnps.org/	The mission of the California Native Plant Society is to increase understanding and appreciation of California's native plants and to conserve them and their natural habitats through education, science, advocacy, horticulture and land stewardship.
15	Native Plant Organization	Native Plant Society of British Columbia (NPSBC)	http://www.npsbc.org/	The NPSBC is an organization bringing together people from throughout the province who enjoy, study and work with native plants and habitats.

Item #	Category	Name	Internet Hyperlink	Brief Description
16	On-line plant resources	ANPC's Rare Vascular Plants of Alberta (Kershaw *et al*. 2001) Errata and Addenda	http://www.anpc.ab.ca/content/resources.php	ANPC provides on-line errata and addenda species to the 2001 Rare Vascular Plants of Alberta publication (order forms for the book are available on-line at www.anpc.ab.ca).
17	On-line plant resources	E-flora BC	http://www.eflora.bc.ca/	The E-Flora BC is an electronic atlas of the plants of BC and provides pages of detailed information on British Columbia's plant species.
18	On-line plant resources	Montana Natural Heritage Program, The Montana Natural Resource Information System	http://mtnhp.org/	The Natural Heritage Program provides information on Montana's species and habitats, emphasizing those of conservation concern.
19	On-line plant resources	NatureServe Explorer	http://www.natureserve.org/explorer/	An authoritative source for information on more than 70,000 plants, animals, and ecosystems of the United States and Canada.
20	On-line plant resources	USDA PLANTS Database	http://www.plants.usda.gov/	The PLANTS Database provides standardized information about the vascular plants, mosses, liverworts, hornworts, and lichens of the U.S. and its territories.
21	Rare Plant Species List	All Tracked and Watch Elements	http://tpr.alberta.ca/parks/heritageinfocentre/datarequests/default.aspx	This list contains the all tracked and watched species in Alberta, including vascular plants, non-vascular plants (mosses, liverworts and hornworts) and lichens, as developed by ACIMS.

Item #	Category	Name	Internet Hyperlink	Brief Description
22	Rare Plant Species List	Alberta Species at Risk Program	http://www.srd.alberta.ca/FishWildlife/SpeciesAtRisk/GeneralStatusOfAlbertaWildSpecies/GeneralStatusOfAlbertaWildSpecies2010/SearchForWildSpeciesStatus.aspx	This Sustainable Resource Development (SRD) program includes information on the current provincial species at risk strategy, general and detailed status reports and designations of rare plant species in Alberta.
23	Rare Plant Species List	Canada's Species at Risk Public Registry	http://www.sararegistry.gc.ca/default_e.cfm	Easy way to look up SARA-listed species and access information and documents about them.
24	Plant-related Reports	ACIMS Reports	http://tpr.alberta.ca/parks/heritageinfocentre/reports/default.aspx	Publications of plant-related studies conducted in Alberta.
25	Templates	Benefits to Reporting Rare Species Information	http://www.anpc.ab.ca/content/resources.php	A letter template, outlining the benefits of reporting rare species observations to ACIMS. This can be modified to be study-specific and sent to the appropriate individual/organization for permission to release information to ACIMS.
26	Legislation	Alberta *Wildlife Act* and *Wildlife Regulation*	Act: http://www.qp.alberta.ca/documents/acts/w10.pdf Regulation: http://www.canlii.org/en/ab/laws/regu/alta-reg-143-1997/latest/alta-reg-143-1997.html	Endangered animals in Alberta are those that are listed in Part 1 of Schedule 6 of the *Wildlife Regulation*.
27	Legislation	Canada's *Species At Risk Act (SARA)*	http://laws.justice.gc.ca/eng/S-15.3/FullText.html	"An Act respecting the protection of wildlife species at risk in Canada". Schedule 1 contains the current list of species with full protection under the Act.

Appendix B. Sample Rare Plant Survey Report Table of Contents

Introduction

State rationale/objectives

Methods

Pre-survey Investigation

- Rare plant species that may be found in the Natural Subregion(s) (may be more appropriate as an Appendix)
- Description of ACIMS database search parameters (what area was requested)
- Rare plant species that have been documented in/near the study area
- Literature review results
- Habitats of potential rare plant species
- Phenology of potential rare plant species
- Mapping (if applicable)

Survey Methods

- Type of survey
- Survey dates
- Survey intensity (# of data points or % area covered)
- Rationale for choosing survey methods
- Identification (*e.g.*, verified at U. of C., verified by *name of botanist*)
- Collection guidelines

Results

Descriptions of Rare Plant Species Observed

- Description
- Location (GPS points)
- Biology of species
- Reasons for rarity
- Population size and extent
- Plant community type
- Habitat
- Associated plant species
- Potential or existing threats to habitat (weeds, changes in hydrology, loss to development etc.)

Mapping Results

Limitations of Survey

Discuss your confidence in the results, including the number of surveys, survey dates, intensity and any situations that reduced the level of confidence in the survey.

Conclusions

- Summarize findings
- Discuss context and implications findings

Follow-up and Monitoring

Signature Sheet and Professional Sign-off

Credentials of field botanist(s) and author(s)