

5- YEAR LONG-TERM MONITORING OR OPERATIONAL ACTIVITY WORK PLAN

Changes to this Work Plan are only accepted via an Approved Addendum.

| General Information | | |
|---|--|-----------------------------|
| Monitoring Category: <i>(From OSM long-term plan; choose from drop-down menu)</i> | Biotic Response Monitoring | |
| Strategic Monitoring Objective: <i>(From OSM long-term plan; choose from drop-down menu)</i> | Objective: Detect and report biotic response in relation to Oil Sands Developments | |
| Work Plan Unique Identifier: | B-LTM-S-4-1718 | |
| Monitoring Activity Title: | Focal Plants Monitoring | |
| Geographic Location <i>(choose from drop-down menu, if Project Location is in more than one area choose from second drop-down)</i> | Athabasca Oil Sands Region | Cold Lake Oil Sands Deposit |
| Monitoring Site(s) Coordinates <i>(latitude and longitude)</i> | Throughout the JOSM region | |
| Monitoring Organization and Responsible Manager: | Alberta Environment and Parks | Dan Farr |
| Date Monitoring initiated: | 2013 | |
| Specific Monitoring Objective: <i>(State the monitoring objective addressed through this monitoring)</i> | <ol style="list-style-type: none"> 1. Complete surveys on persistence of historic rare plant populations over time in the oil sands region 2. Finalize work on assessment of the mitigation effectiveness of plant translocations and rare plant detectability 3. Synthesize existing information on rare plants into an online plant atlas | |
| Deliverables (Annual): <i>What Data Reports will be produced and when?</i> | Reports ¹ : 1) Persistence of rare plant species over time, 2) Mitigation effectiveness of translocations, 3) Rare plant survey detectability Outreach : 1) Digital rare plant atlas | |

Monitoring Plan Summary: *Please summarize the monitoring including relevant information such as background, objectives, monitoring area, methods/monitoring design, assumptions, outcomes, and references. These should align with the information provided in Appendix 1: Annual Monitoring Schedule.*

¹ Will be published where feasible.

Rare vascular plants are impacted by anthropogenic activities including vegetation disturbance and removal for oil sands developments. They are also influenced by natural processes such as wildfire and climate change. Field data are required to distinguish between anthropogenic vs natural drivers, to support empirical studies of impacts and mitigation, to increase the accuracy of rare plant status assessments, and to improve survey protocols.

Oil sands operators are currently required to conduct surveys for specified rare plants following Alberta Native Plant Council (2012) prior to development (pre-disturbance assessment), providing detailed information for small areas such as well pads. The goals and methodology for these surveys differ from provincial vascular plant monitoring conducted by the Alberta Biodiversity Monitoring Institute. This project has been designed to provide a "bridge" between the province-wide rare plant monitoring done by the Alberta Biodiversity Monitoring Institute, and the on-lease rare plant surveys completed by individual companies as part of their pre-disturbance assessments (PDAs).

This project was initiated by the Ecological Monitoring Committee for the Lower Athabasca to design and to test an iterative, adaptive sampling approach that uses spatially explicit statistical models to determine where field samples should be collected (Nielsen et al. 2011). Pilot fieldwork resulted in the successful collection of hundreds of new rare plant occurrences and further refinement of the adaptive sampling models. The project has generated maps predicting the probability of encountering 25 individual rare plant species in northeastern Alberta, along with estimates of the accuracy and precision of each predictive map throughout the Lower Athabasca region. Field methods are summarized in Alberta Biodiversity Monitoring Institute (2014) and compared to the Institute's protocols in Zhang et al. (2014). The successful testing of this protocol makes it possible to implement the project as a long term monitoring program for rare plants throughout the oil sands region of Alberta.

Information from this project contributes towards addressing multiple objectives relating to rare plants, including improved understanding of status, distribution, and habitat requirements for these species and locations within oil sands leases. Rare species are often a monitoring priority for regulators and developers, as they may be more sensitive to changes as a result of human activity. This project is nearing completion and is focused on finalizing existing work and analyzing and presenting monitoring outcomes and results.

Objectives

1. **Persistence:** Crews will be provided with historical rare plant locations and will re-survey these sites to assess how these populations have changed over time (since oil sands development). Historical plant locations are housed by Alberta Conservation Information Management System (ACIMS); ACIMS records have been collated for the JOSM region and re-surveys were initiated in 2016, with approximately half of the ground-access records remaining to be surveyed. By re-surveying sites, we will document how rare plants have persisted over time, and explore factors, including oil sands activities, that have contributed to changes in rare plants.
2. **Success of translocation:** We are assessing the effectiveness of translocation as a mitigation option for rare plants. We are focusing on two rare species: *Carex oligosperma* and *Sarracenia purpurea*. We have translocated 210 individuals of each species and are monitoring their success. This involves several checks of survival throughout the season, monitoring of habitat variables such as water chemistry, and

assessing reproductive effort/success. Translocation is one of the few mitigation options available to oil sands operators for minimizing impacts on rare plant species yet the effectiveness of this mitigation technique is not well known. This represents effectiveness monitoring of this mitigative tool.

3. **Detectability:** Experiments have been completed to assess detection rates for different rare plant species, including in experiments where abundance and distribution was manipulated, and in observational surveys where detectability varies across sites.
4. **Online plant atlas:** As part of efforts to synthesize information, we will bring together data and information from multiple sources, including maps, data, analyses, and images on rare plants in the oil sands region. Information will be presented in an online platform to improve communication and access of information.

Appendix 1 – Annual Monitoring Schedule

(Please provide detailed information on the specifics of your monitoring schedule including – **locations, schedule, methods, SOPs, QA/QC data release, references**)

| <u>Sampling Locations/Sites</u> | <u>Sampling Schedule (timing/frequency)</u> | <u>Compounds to be Analyzed</u> | <u>SOPs to be Consulted</u> <i>(hyperlinks accepted)</i> | <u>QA/QC Complete & Date Data to be Released</u> |
|--|--|--|---|---|
| Throughout the Lower Athabasca | Sites are visited multiple times over the growing season | NA | http://www.abmi.ca/home/publications/101-150/112.html?mode=detail&keyword=rare+plants | Spring annually |

References:

Alberta Biodiversity Monitoring Institute. 2014. Terrestrial rare vascular plant field data collection protocol for the Lower Athabasca Region. Version 2014 05 07. abmi.ca

ANPC. 2012. Alberta Native Plant Council Guidelines for Rare Vascular Plant Surveys in Alberta – 2012 Update. Alberta Native Plant Council, Edmonton, AB.

Boutin C, Carpenter D, De Silva NDG, Kohler M & Nielsen SE. In final prep. Plant species diversity and effects of metal and PAH contamination in sites near Fort McMurray oil sands. Environmental Monitoring & Assessment.

Nielsen SE. 2011. A model-based adaptive rare plant sampling and monitoring design for the Lower Athabasca Region of Alberta. Ecological Monitoring Committee for the Lower Athabasca. 92 pages.

Zhang J, Nielsen SE, Grainger TN, Kohler M, Chipchar T & Farr D. 2014. Sampling plant diversity and rarity at landscape scales: Importance of sampling time in species detectability. PLoS ONE 9(4): e95334.

[Rare Plants Project website](#)

[Applied Conservation Ecology Lab](#)

Appendix 2 – Detailed Multi-Year Financial Breakdown: if changes are to be made then an Addendum must be Complete and Approved.

(Complete the following detailed financial breakdown; add or delete categories as required)



| Budget requirements | Year 1 (201X- 201Y) | | Year 2 (201X- 201Y) | | Year 3 (201X- 201Y) | | Year 4 (201X- 201Y) | | Year 5 (201X- 201Y) | |
|---|---------------------|------------------|---------------------|------------------|---------------------|------------------|---------------------|------------------|---------------------|------------------|
| | OSM Funding | External Funding | OSM Funding | External Funding | OSM Funding | External Funding | OSM Funding | External Funding | OSM Funding | External Funding |
| 1) Salaries and benefits | | | | | | | | | | |
| a) Appendix 3 - Totals | 112,000 | | | | | | | | | |
| 2) Operations and Maintenance | | | | | | | | | | |
| a) Vehicles and Transportation | 15,000 | | | | | | | | | |
| b) Field work | 10,000 | | | | | | | | | |
| c) Web atlas design and hosting | 15,000 | | | | | | | | | |
| 3) Travel | | | | | | | | | | |
| a) Conferences and meetings <i>(project workshops)</i> | 3,000 | | | | | | | | | |
| Grand Total | 155,000 | | | | | | | | | |

Appendix 3 – Staffing Plan

(Complete the following detailed staffing plan; add or delete categories as required)

| Responsible Role | Year 1 – Budget Allocation | | Year 2 – Budget Allocation | | Year 3 – Budget Allocation | | Year 4 – Budget Allocation | | Year 5 – Budget Allocation | |
|---|----------------------------|------------------|----------------------------|------------------|----------------------------|------------------|----------------------------|------------------|----------------------------|------------------|
| | OSM Funding | External Funding | OSM Funding | External Funding | OSM Funding | External Funding | OSM Funding | External Funding | OSM Funding | External Funding |
| PhD Student | 25,000 | | | | | | | | | |
| Research Assistant | 52,000 | | | | | | | | | |
| Project Coordinator | 5,000 | | | | | | | | | |
| Field Technicians (1 crew of 2) | 30,000 | | | | | | | | | |
| Grand Total <i>(inserted into Appendix 2)</i> | 112,000 | | | | | | | | | |

Appendix 4 - Approvals

| | | |
|---|------------|--|
| Project Submitted by: | | |
| Name: | | |
| Organization: | Signature: | Date: |
| | | |
| Project Approved by: | | |
| Dr. Monique Dubé (AEP) | | Dr. Kevin Cash (ECCC) |
| Signature | | Signature |
|  | |  |
| Date | | Date |