

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-E-6-1718
Monitoring Activity Title:	Biotic Response of Ungulates to Oil Sands Activity
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 Peace River Oil Sands Region
Monitoring Site(s) Coordinates <i>(latitude and longitude)</i>	The study area is outlined by Wildlife Management Units (WMU) with >50% coverage within the oil sands region. This includes 28 WMUs covering an area of 183,098km ² .
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>	<p>The objective of this Oil Sands Monitoring (OSM) program is to monitor ungulate (moose and deer) population trends within the oil sands region. Wildlife Management Units (WMU) within the OSM region will be sampled at a five-year interval, resulting in a better understanding of how population size and density of moose and deer are changing over time in relation to habitat disturbance (both natural and anthropogenic) and other factors (including hunting).</p> <p>This program is part of a larger provincial program that monitors and models ungulate populations in Alberta. The newly formed AEP Moose Analytical Task Team (MATT) is bringing together experts from Policy, Environmental Monitoring and Science and Operations Divisions to build a consistent base population model that can be tailored suit specific area needs. For example, OPS (allocation), EMSD (long-term trend) and Policy (frameworks/strategies).</p>
Deliverables (Annual): <i>What Data Reports will be produced and when?</i>	<p>A. 2017-2018 WMU Reports. Completed June 30, 2018.</p> <ol style="list-style-type: none"> 1. Braid, A., B. Sarchuk, S. Slater, A. Sztaba et al. 2018. Aerial Ungulate Survey (2017-18), Moose and Deer in WMU 256. Alberta Environment and Parks, Government of Alberta, Bonnyville, Alberta, Canada. 2. Braid, A., B. Sarchuk, S. Slater, A. Sztaba et al. 2018. Aerial Ungulate Survey (2017-18), Moose and Deer in WMU 501. Alberta Environment and Parks, Government of Alberta, Bonnyville, Alberta, Canada.

	<ol style="list-style-type: none"> 3. Braid, A., B. Sarchuk, S. Slater, A. Sztaba et al. 2018. Aerial Ungulate Survey (2017-18), Moose and Deer in WMU 520. Alberta Environment and Parks, Government of Alberta, Peace River, Alberta, Canada. 4. Braid, A., B. Sarchuk, S. Slater, A. Sztaba et al. 2018. Aerial Ungulate Survey (2017-18), Moose and Deer in WMU 523. Alberta Environment and Parks, Government of Alberta, Peace River, Alberta, Canada. 5. Braid, A., B. Sarchuk, S. Slater, A. Sztaba et al. 2018. Aerial Ungulate Survey (2017-18), Moose in WMU 530. Alberta Environment and Parks, Government of Alberta, Fort McMurray, Alberta, Canada. <p>B. 2018 Peer-reviewed journal articles: Manuscripts prepared by December 31, 2018.</p> <ol style="list-style-type: none"> 1. Author TBA. 2018. "Biotic response of ungulates to anthropogenic and natural disturbance in the oil sands region". 2. Author TBA. 2018. Comparison of distance vs strip survey methods to estimate the population size of moose and deer in the oil sands region. <p>C. Survey Standard Operating Procedures and Data Management QA/QC documentation. Documents prepared by September 1, 2017.</p>
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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.*

Background: Aerial surveys provide important information on ungulate populations and are used to assess population size, distribution and trends where oil sands development is occurring. Oil sands development is believed to change ungulate population dynamics, especially in areas of higher disturbance. For example, a recent increase in white-tailed deer populations has been documented in the boreal region of Alberta.

Alberta Environment and Parks (AEP) use this information to examine impacts of harvesting or predation on populations and set hunting allocations for specific areas. The province is divided into a series of Wildlife Management Units (WMU). Wildlife within the boundaries of each WMU is managed by AEP according to the regulations established in Alberta's Wildlife Act (Government of Alberta, 2015). Monitoring ungulate populations on an increased frequency will help examine the impacts of industrial development.

AEP is responsible for reporting on required biodiversity indicators under the land-use framework. An indicator for moose is currently being developed for the Lower Athabasca Region (LAR) Biodiversity Management Framework (BMF). Data collected from the program will support reporting on this indicator.

Objectives:

1. Assess long-term trends of ungulate populations and demographic parameters (age and gender) in the oil sands region.
2. Assess the relationship between ungulate populations and patterns of land use and ungulate mortality via hunting.

3. Compare methods of surveying ungulates from aerial surveys.

Methods:

a. Study Area: The study area for the OSM ungulate monitoring program is outlined by WMUs with >50% coverage within the oil sands region. This includes 28 WMUs covering an area of 183,098 km² through the Athabasca, Cold Lake and Peace River Oil Sands Deposits (Figure 1).

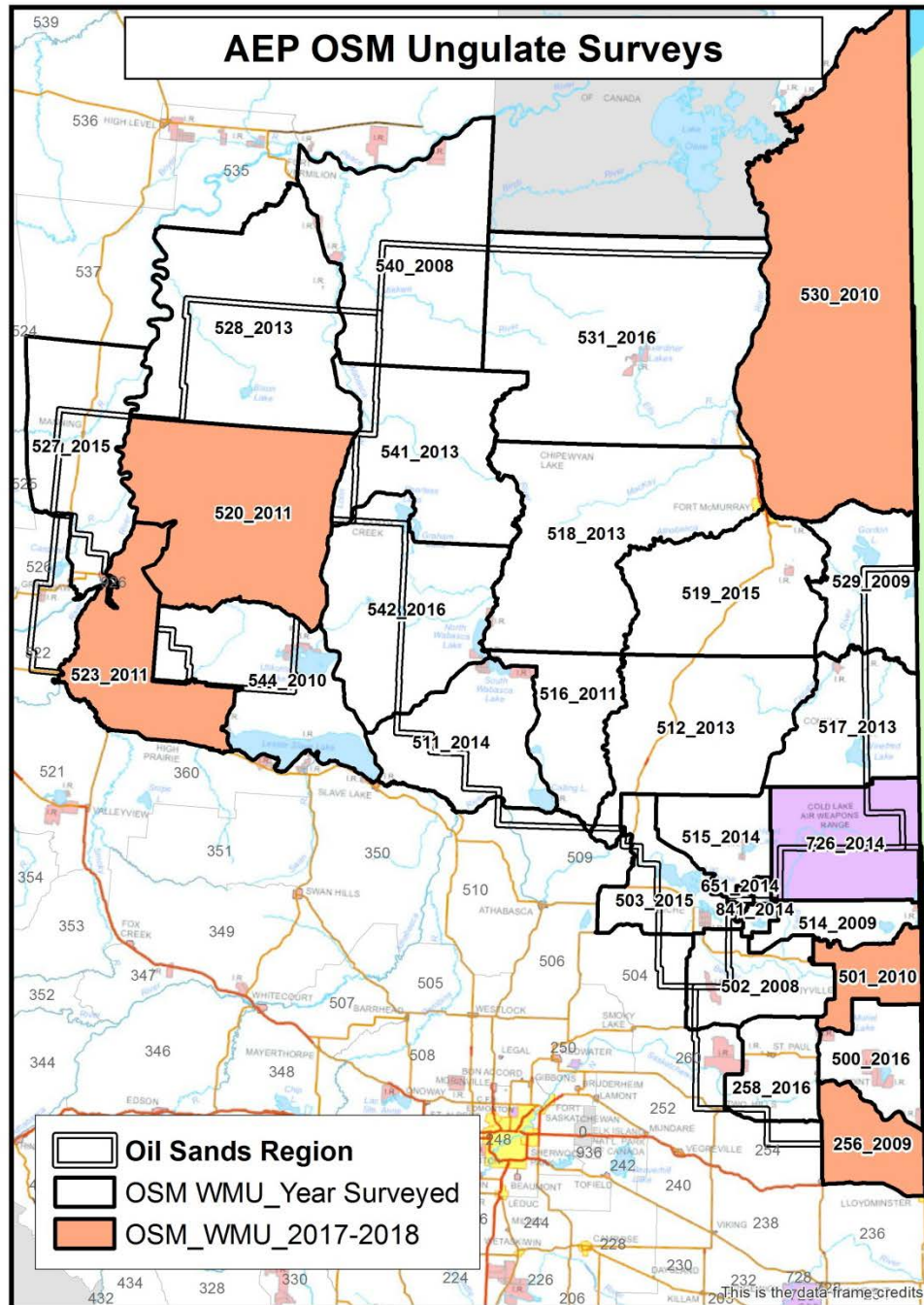


Figure 1. Alberta Environment and Parks OSM ungulate survey map. OSM WMUs are listed with WMU name and the year it was last sampled (WMU_YEAR). Survey units for the 2017-2018 planning year are highlighted in

orange.

b. Survey Methods: Surveys are conducted using distance sampling methods (Buckland et al. 2001; Peters et al. 2014). Using ArcMap (ESRI ArcMap 10.1) 10 km transects, spaced 1.2 km apart are generated throughout the entire WMU. Transects <2 km are not sampled. A random seed order determines what order the transects are to be flown. Transects are flown with a crew of 3 observers and one pilot at approximately 300 ft AGL at 80 knots with a Jet Ranger helicopter equipped with bubble windows. When a moose or deer are detected, two waypoints are recorded: the first one on the transect line when perpendicular to the ungulate and the second where the ungulate was first observed. Survey crews GPS mark locations on the transect and the location where animal was observed. Animals are classified by sex, age class and antler class if antlers were present. Additional covariates are collected including crown closure, activity, snow cover, light intensity and terrain slope.

c. Analysis Methods: Data are analyzed using Distance 6.0 (Thomas et al. 2010). Preliminary analyses include an examination of histograms of all observations by distance and data are truncated and/or binned to improve model fit (Buckland et al. 2001). Five candidate models are fit to the data and model selection is determined using QQ-plots, Chi-square goodness of fit tests and Akaike's Information Criterion (AIC; Buckland et al. 2001).

Outcomes: Technical reports are produced for each survey unit. 2017-18 represents the completion on the first round of sampling in each of the OSM WMUs we will take this opportunity to examine the current status of ungulate populations in the oil sands region and provide a foundation for continued monitoring. Another priority that will be addressed in the 2017-18 planning year will be documentation of survey standard operating procedures (SOP) and data management quality assurance and quality control (QA/QC) related to this monitoring work.

References:

1. Buckland, S. T., D. R. Anderson, K. P. Burnham, J. L. Laake, D. L. Borchers, and L. Thomas. 2001. Introduction to Distance Sampling: Estimating Abundance of Biological Populations. Oxford University Press, Oxford.
2. Government of Alberta. 2015. Environment and Parks Wildlife Management Units. <http://aep.alberta.ca/fish-wildlife/fishing-hunting-trapping/hunting-alberta/wildlife-management-units.aspx>
3. Peters, W., M. Hebblewhite, K. G. Smith, S. M. Webb, N. Webb, M. Russell, C. Stambaugh, and R. B. Anderson. 2014. Contrasting aerial moose population estimation methods and evaluating sightability in west-central Alberta, Canada. Wildlife Society Bulletin 38:639-649.
4. Thomas, L., S. T. Buckland, E. A. Rexstad, J. L. Laake, S. Strindberg, S. L. Hedley, J. R. B. Bishop, T. A. Marques, and K. P. Burnham. 2010. Distance software: design and analysis of distance sampling surveys for estimating population size. Journal of Applied Ecology 47:5-14.

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>
WMUs: 256, 501, 520, 523, 530	2017/2018	None	Aerial Ungulate Surveys Using Distance Sampling Techniques – Protocol Manual.	June 30, 2018
WMUs: 512, 517, 518, 528, 541	2018/2019	None	Same as above	June 30, 2019
WMUs: 511, 515/651/841, 726	2019/2020	None	Same as above	June 30, 2020
WMUs: 503, 519, 527	2020/2021	None	Same as above	June 30, 2021
WMUs: 258, 500, 531, 542	2021/2022	None	Same as above	June 30, 2022

References:

Aerial Ungulate Surveys Using Distance Sampling Techniques – Protocol Manual (Draft). 2016. Alberta Environment and Parks, Environmental Monitoring and Science Division. 30 pp.

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

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



Budget requirements	Year 1 (2017- 2018)		Year 2 (2018- 2019)		Year 3 (2019- 2020)		Year 4 (2020- 2021)	
	OSM Funding	External Funding	OSM Funding	External Funding	OSM Funding	External Funding	OSM Funding	External Funding
1) Salaries and benefits								
a) Appendix 3 - Totals	\$90,000	\$0	\$90,000	\$0	\$90,000	\$0	\$90,000	\$0
b) In-Kind Support (AEP Operations)		(\$50,000)		(\$50,000)		(\$50,000)		(\$50,000)
2) Operations and Maintenance								
a) Vehicles and Transportation	\$8,000		\$8,000		\$8,000		\$8,000	
b) Aircraft and Fuel	\$225,000		\$225,000		\$225,000		\$225,000	
c) Data management	\$0		\$0		\$0		\$0	
d) Field work – Supplies	\$2,000		\$2,000		\$2,000		\$2,000	
3) Consumable Materials and supplies								
a) None	\$0		\$0		\$0		\$0	
4) Travel								
a) Conferences and meetings (<i>Moose conference/ OSM meetings</i>)	\$5,000		\$5,000		\$5,000		\$5,000	
b) Field work – accommodations and meals	\$50,000		\$50,000		\$50,000		\$50,000	
5) External Contracts								
a) None	\$0		\$0		\$0		\$0	
Grand Total	\$380,000	(\$50,000)	\$380,000	(\$50,000)	\$380,000	(\$50,000)	\$380,000	(\$50,000)

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	
	OSM Funding	External Funding	OSM Funding	External Funding	OSM Funding	External Funding	OSM Funding	External Funding
Science Expertise – A. Braid, B. Sarchuk, S. Slater, A. Sztaba	\$40,000		\$40,000		\$40,000		\$40,000	
Science Expertise – AEP Operations Biologists (in-kind support)		(\$10,000)		(\$10,000)		(\$10,000)		(\$10,000)
Field Staff Overtime – A. Braid, B. Sarchuk, A. Sztaba	\$50,000		\$50,000		\$50,000		\$50,000	
Field Staff Overtime – AEP Operations Staff (in-kind support)		(\$40,000)		(\$40,000)		(\$40,000)		(\$40,000)
Administrative and Program Coordination								
Grand Total <i>(inserted into Appendix 2)</i>	\$90,000	(\$50,000)	\$90,000	(\$50,000)	\$90,000	(\$50,000)	\$90,000	(\$50,000)

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