

ALMS Watershed Delineation Maps – Additional Information

This document is to be used as an additional resource to the watershed maps published on the ALMS website in December 2016. It provides details on where the data came from, how the watershed boundaries were delineated, and any additional information regarding the use or limitations of these maps. ***Please read through this document before using these maps for any purpose.***

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Where did the data for these maps come from?

The data on these maps primarily came from GIS base features for the province of Alberta or Alberta Environment and Parks. Where necessary, all data was projected into a specific coordinate system¹ to ensure datasets matched up spatially with one another.

Some of the completed delineations used in these maps were delineated by Alberta Environment and Parks for the Alberta Water Council, and some were delineated by ALMS using the same process and base data. The table below describes some base data originally created and provided to ALMS by Alberta Environment and Parks, which was needed in order to perform the delineation steps in ArcGIS.

Data needed for the delineation

Name	Source	Description
Flow direction	Alberta Environment and Parks	Raster layer developed from a digital elevation model that shows flow direction across a landscape
Streams		Raster layer that shows the stream network across a landscape (threshold = approx. 5 km ²)
Adjoint catchment		Vector polygon layer that shows the upstream watershed of each catchment (created to speed up watershed delineation)
Catchment		Vector polygon layer that shows the area that contributes surface flow to stream segments
Drainage Line		Vector line layer of the stream network across a landscape (a vectorized version of the stream raster)
Drainage Point		Vector point layer that displays the outflow of a catchment

¹ Projected Coordinate System in ArcGIS: NAD_1983_10TM_AEP_Forest

In order to provide some context and give a general idea of the lake’s surroundings, some additional GIS data was added to the watershed maps. All of this data is publicly available to download online and use for free. For more information about downloading the AltaLIS 20K Base Features for Alberta, visit http://www.altalis.com/products/base/20k_base_features.html.

Data displayed on the map

Name	Source	Description	AltaLIS Base Feature Path
Background image	Esri World Imagery Basemap or Google Earth	Satellite image of the region. See map PDF caption for region-specific sources.	N/A
First Nations	AltaLIS 20K Base Features	Vector polygon data of First Nation reserve land in Alberta	Admin/GEOADMIN/ BF_INDIAN_RES_POLYGON
Métis Settlements	AltaLIS 20K Base Features	Vector polygon data of Métis Settlements in Alberta	Admin/GEOADMIN/ BF_METIS_STLMNT_POLYGON
Parks & Protected Areas	Shapefile created by ALMS, but polygons were combined from AltaLIS 20K Base Feature data	Vector polygon data of provincial parks, national parks, natural areas and provincial recreation areas in Alberta	Admin/GEOADMIN/ BF_NATIONAL_PARK_POLYGON
			Admin/GEOADMIN/ BF_NATURAL_AREA_POLYGON
			Admin/GEOADMIN/ BF_PRA_POLYGON
			Admin/GEOADMIN/ BF_PROVINCIAL_PARK_POLYGON
Summer Villages	AltaLIS 20K Base Features	Vector polygon data of summer villages in Alberta	Admin/GEOADMIN/ BF_SUMMER_VILLAGE_POLYGON
LakeWatch Lakes	Shapefile created by ALMS, but specific lake polygons were extracted from AltaLIS 20K Base Features hydrography polygon data	Vector polygon data displayed on some of the maps where lake boundaries may not be clear on the satellite image.	Hydrography/ BF_HYDRO_POLYGON

How were the watershed boundaries delineated?

Watershed boundaries for these maps were created in ArcGIS with the ArchHydro tool extension. The Point Delineation tool in ArchHydro uses flow direction raster data, stream raster data, catchment vector data, and adjoint catchment vector data to delineate a watershed from a selected point.

In order to first estimate where the point for the point delineation should be, the Flow Path Tracing tool from the ArchHydro toolset was used along with the stream grid to determine the flow direction from a

selected point. The LakeWatch Lakes vector layer was used atop the stream grid in order to better estimate how the stream network relates to the lake, and where potential outflow or inflow points may be. Once a point was discovered near the lake that had a flow path leading back to a major river (e.g. North Saskatchewan River, Red Deer River, etc.), that point was selected as a start (“pour point”) for the point delineation.

Once the likely “pour point” was discovered using the Flow Path Tracing tool, the Point Delineation tool from the ArcHydro toolset was used in order to delineate the watershed from the selected point using the flow direction raster data, catchments, and streams.

Once a watershed was delineated using the Point Delineation tool, it was then exported to a feature class, projected, and if necessary, edited, before being including in the watershed map.

Have any validation steps been taken for these delineations?

Results from the ArcHydro point delineation were compared to the Water Survey Regions of Canada, and if necessary, were edited manually in order to match up with the boundaries of the water survey regions. The Water Survey Regions of Canada data is included in the Watersheds of Alberta (GOA) dataset available to the public through GeoDiscover Alberta. For more information or to access this data, visit <https://geodiscover.alberta.ca/geoportal/> and search Watersheds of Alberta (GOA).

How were the areas and ratios calculated?

Lake Surface Area

Lake surface area in squared kilometres was calculated in ArcGIS by using the Calculate Geometry command.

Watershed Area

Like the lake surface area, the watershed area was calculated in ArcGIS by using the Calculate Geometry command. In order to calculate the lake to watershed ratio, the lake’s surface area was subtracted by the watershed area calculated in ArcGIS (which includes the surface area of the lake).

Lake to Watershed Ratios

Lake to watershed ratios are calculated by dividing the watershed area (excluding the lake area) by the surface area of the lake, then rounded to the nearest whole number.

$$\frac{\text{Watershed Area}}{\text{Lake Area}}$$

Please note that the information on these maps may differ from other calculations. Access to lake basins can vary from year to year based on rising and falling water levels. The areas and ratios in these maps are based solely on GIS data that was available, and have not been measured or surveyed in person. We tried to make it as accurate as possible, however the GIS data used may have included basins of lakes into the surface area calculations that are no longer accessible by boat or connected to the main basin. For example, the surface area of Muriel Lake has been rapidly changing over the last decade, therefore the lake to watershed ratio may differ if the lake surface area or watershed region are measured directly.

The only lake polygon that was edited from the base features data was Minnie Lake. The placement of the island and shape of the lake was noticeably different from current satellite imagery, so the boundary for Minnie Lake was altered manually to match current satellite imagery in order to obtain a more accurate surface area calculation.

Why is my lake not listed?

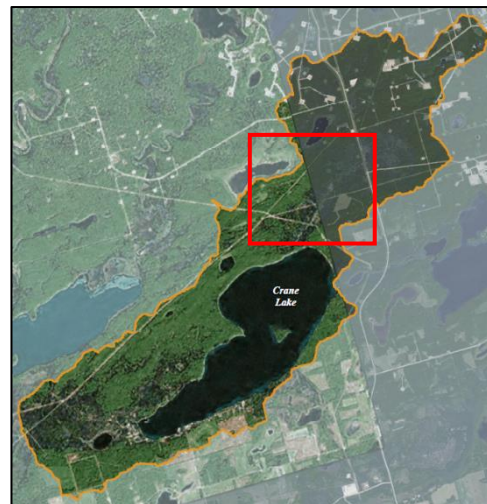
At this time, maps were created for most lakes that have active stewardship groups, or are working to implement best management practices within their watershed. Some maps were created for lakes that have been involved in LakeWatch recently, but do not have active stewardship groups. The following lakes are involved in LakeWatch and we were unable to delineate a watershed because of the size limitations of the data used. The lakes in question were too small to get an accurate delineation using the methods laid out here.

- Chestermere Lake
- Hardisty Lake
- Lessard Lake

Additional notes

- These maps primarily focus on gross drainage areas. For more detailed maps on effective drainage areas, see the Atlas of Alberta Lakes or if possible, consult individual lake’s Watershed Management Plans (e.g. Mayatan Lake).

- You may notice that some areas of the imagery on the watershed maps look different (see example on the right). This just means that the satellite images that cover the region were taken on different dates, so they may differ slightly in terms of contrast or landcover.



- Most of the maps use ArcGIS World Imagery as a basemap, however some have imagery from Google Earth. This is because in some of the lake regions, the ArcGIS basemap imagery was taken over the winter. To maintain consistency between the maps and to make it easier to see features on the landscape, an effort was made to use imagery from ice-off months². Google Earth has options to view and download historical imagery, therefore an image of the region could be selected for months in the summer or fall. Once downloaded, the Google Earth images were georeferenced in ArcGIS to match up with the GIS layers.

² Minnie Lake is an exception – the only suitable imagery available was taken in April 2011, with the ice still on.

- Note that to maintain neatness in some of the maps, polygons representing any of the additional information (First Nations, Summer Villages, Parks, etc.) were edited so that only the polygons within or intersecting the watershed boundary were visible. For example, in the map of Battle Lake, Pigeon Lake is visible in the NE corner, however none of the summer village or park polygons along the west end of Pigeon Lake are visible because they do not lie within the Battle Lake watershed.

