

**Delineation and Digitization of
WQMA Watershed**

Western Newfoundland Model Forest

And

Department of Environment and Conservation

Prepared by: Jennifer Bonnell and Annette Tobin

October, 2005

9-004-001

Table of Contents

1.0 Background 3

2.0 Methods..... 6

 2.1 Manual Delineation of Watershed Boundaries 6

 2.1 Digitization of Watershed Boundaries in ArcGIS 6

3.0 Results 6

4.0 Conclusions 9

List of Figures

Figure 1: WQMA Stations in Newfoundland Portion of Newfoundland and Labrador

Figure 2: WQMA Stations in Labrador Portion of Newfoundland and Labrador

List of Tables

Table 1: WQMA sites in the Eastern Region, status of delineation and digitization

Table 2: WQMA sites in the Central Region, status of delineation and digitization

Table 3: WQMA sites in the Western Region, status of delineation and digitization

1.0 Background

The decision was made to digitize the boundaries of all watersheds that contained Water Quality Monitoring Agreement (WQMA) sampling sites. This was done so that the watersheds could be entered into a GIS framework for ease of analysis. Once within a GIS setting, the characteristics of the station data can be compared against such physiographic information as slope and area of the watershed. By dropping these digital watershed boundaries over other layers currently in the WRMD GIS application, analysis becomes much more efficient and accessible to water resource specialists. In addition, it eliminates the need to work exclusively with paper maps which can be cumbersome. The long term goal of the WRMD is to develop an integrated GIS framework for all data and information pertaining to water resources in Newfoundland and Labrador.

The WQMA have water quality monitoring throughout Newfoundland and Labrador which are divided into three regions. The regions are classified as Eastern, Central and Western (including Labrador) regions. The stations in this report will be referred to in relation to their respective regions. The WQMA stations that require delineation and digitization in Newfoundland and Labrador are shown in Figure 1 and 2 respectively.

Figure 1: WQMA Stations in Newfoundland Portion of Newfoundland and Labrador

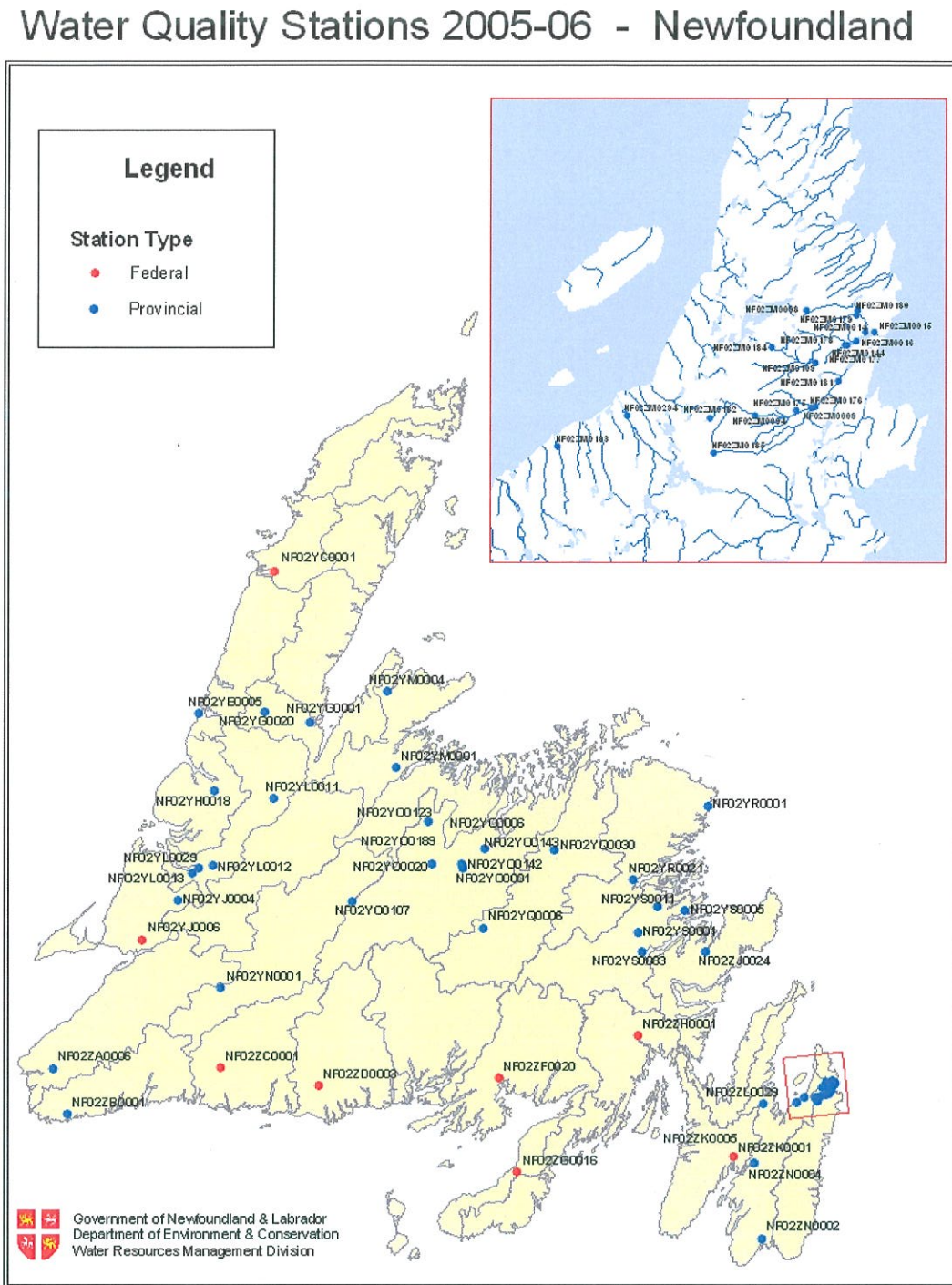
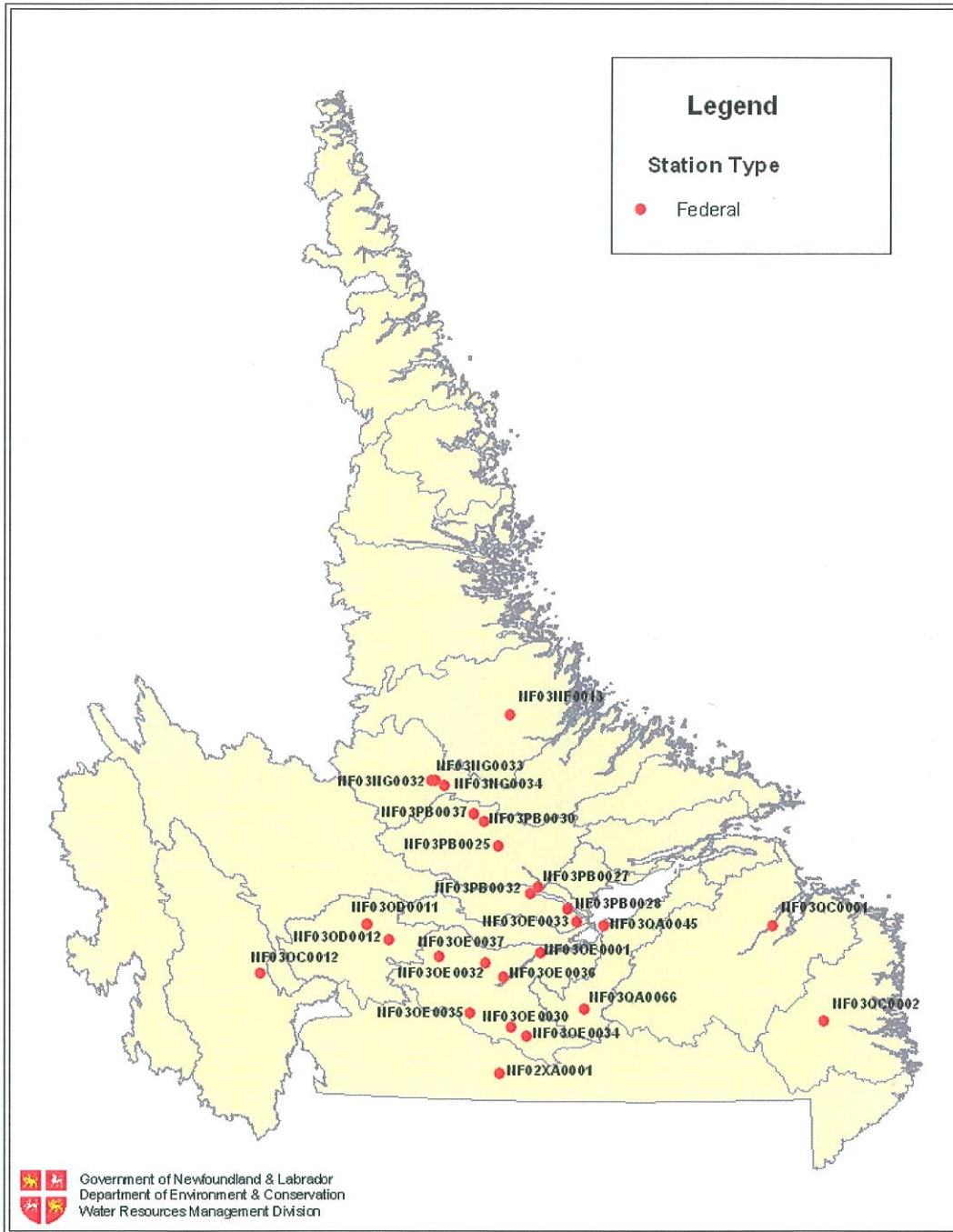


Figure 2: WQMA Stations in Labrador Portion of Newfoundland and Labrador

Water Quality Stations 2005-06 - Labrador



2.0 Methods

2.1 Manual Delineation of Watershed Boundaries

Sampling stations were located on 1:50000 topographic maps by their latitude and longitudes. In the case of larger watershed, such as those found in the Western Region and in Labrador, 1:250000 maps were also consulted. In cases where the 1:50000 did not cover entire watersheds, and 1:250000 maps were consulted, additional maps were printed at the 1:50000 scale, but zoomed out, so that the entire watershed could be viewed on one paper map without losing detail. Once noted on these paper maps, their watersheds were delineated by hand.

Delineation was done by identifying topographic divides, and identifying where runoff drains to a common point or outlet – in this case towards and including the WQMA sampling site. The watershed boundaries were drawn according to the interpretation of these topographical maps (i.e. contour lines of elevation), and the mapped waterbodies illustrated on them. It is possible due to map error, error in judgement of flow, or lack of detail that there are some inaccuracies in these delineations. In addition, the delineations were for surface water only, and did not take into account groundwater flow of any type.

2.1 Digitization of Watershed Boundaries in ArcGIS

Once delineated on paper maps, the boundaries of the watersheds were digitized. In order to digitize the maps, the GTCO CalComp DP5 digitizing tablet was used. The maps were first registered using ArcGIS, using at least four control points. These points were digitized using the digitizer puck, using actual ground coordinates from the paper maps. Enough points were used to reach a desired root mean square (RMS) error of less than <0.008 inches. A RMS error is an average of the distance deviations between the transformation of each input control point and the corresponding point in the map coordinates.

The boundaries of the watersheds were delineated using point to point digitization, with the sketch tool in ArcMap. Point to point digitizing mode was used instead of streamline mode, because the continuous nature of streamline results in a large file with unnecessary detail. It is also more difficult to fix errors in streamline mode. New shape files were created for each of the watersheds, and named by station number.

3.0 Results

Table 1 details the watersheds (named by WQMA sampling station) for which boundaries were delineated, and whether or not they were digitized. Table 2 shows the total number of watershed that were delineated and digitized.

Table 1: Status of Delineation and Digitization of WQMA Watersheds

WQMA Station #	Region	Delineated	Digitized
NF02ZM0020	Eastern	Y	Y
NF02ZG0016	Eastern	Y	N
NF02ZL0029	Eastern	Y	Y
NF02ZG0026	Eastern	Y	Y
NF02ZL0002	Eastern	Y	Y
NF02ZM0183	Eastern	Y	N
NF02ZM0144	Eastern	Y	N
NF02ZM0178	Eastern	Y	Y
NF02ZM0184	Eastern	Y	Y
NF02ZM0109	Eastern	Y	Y
NF02ZK0005	Eastern	Y	Y
NF02ZN0002	Eastern	Y	Y
NF02ZH0001	Eastern	Y	N
NF02ZM0015	Eastern	Y	Y
NF02ZG0025	Eastern	Y	Y
NF02ZM0017	Eastern	Y	Y
NF02ZM0016	Eastern	Y	Y
NF02ZM0177	Eastern	Y	Y
NF02ZK0001	Eastern	Y	N
NF02ZN0004	Eastern	Y	Y
NF02ZM0019	Eastern	Y	Y
NF02ZM0185	Eastern	Y	Y
NF02ZM0176	Eastern	Y	Y
NF02ZL0001	Eastern	Y	Y
NF02ZG0024	Eastern	Y	Y
NF02ZM0180	Eastern	Y	Y
NF02ZM0179	Eastern	Y	Y
NF02ZM0098	Eastern	Y	Y
NF02ZM0014	Eastern	Y	Y
NF02ZM0181	Eastern	Y	Y
NF02ZM0182	Eastern	Y	Y
NF02ZM0175	Eastern	Y	Y
NF02ZM0004	Eastern	Y	Y
NF02ZM0009	Eastern	Y	Y
NF02ZM0026	Eastern	Y	Y
NF02ZM0294	Eastern	Y	Y
NF02YM0001	Central	Y	Y
NF02YM0004	Central	Y	Y
NF02YN0036	Central	Y	Y
NF02YO0001	Central	Y	Y
NF02YO0143	Central	Y	Y
NF02YO0020	Central	Y	Y

Delineation and Digitization of WQMA Watersheds

WQMA Station #	Region	Delineated	Digitized
NF02YO0021	Central	Y	Y
NF02YO0128	Central	Y	Y
NF02YO0142	Central	Y	Y
NF02YQ0005	Central	Y	Y
NF02YQ0006	Central	Y	Y
NF02YQ0030	Central	Y	Y
NF02YR0001	Central	Y	Y
NF02YS0001	Central	Y	Y
NF02YS0005	Central	Y	Y
NF02YS0010	Central	Y	Y
NF02YS0011	Central	Y	Y
NF02YS0012	Central	Y	Y
NF02YS0083	Central	Y	Y
NF02ZF0020	Central	Y	Y
NF02ZH0024	Central	Y	Y
NF02YO0107	Central	Y	N
NF02ZJ0024	Central	Y	N
NF02YR0021	Central	Y	N
NF02YS0003	Central	Y	N
NF02ZA0006	Western	Y	Y
NF02YG0001	Western	Y	N
NF02YL0011	Western	Y	N
NF02YK0022	Western	Y	N
NF02ZC0001	Western	Y	N
NF02ZC0011	Western	Y	N
NF02ZB0005	Western	Y	N
NF02YC0001	Western	Y	N
NF02YE0004	Western	Y	N
NF02YJ0004	Western	Y	N
NF02YE0005	Western	Y	N
NF02ZA0007	Western	Y	N
NF02ZD0003	Western	Y	N
NF02YJ0006	Western	Y	N
NF02YN0001	Western	Y	N
NF02OE0030	Labrador	Y	Y
NF02OE0034	Labrador	Y	Y
NF02PB0030	Labrador	Y	Y
NF02PB0027	Labrador	Y	N
NF02PB0032	Labrador	Y	N
NF02PB0025	Labrador	Y	N
NF02PB0037	Labrador	Y	N
NF02NG0032	Labrador	Y	N
NF02NG0033	Labrador	Y	N
NF02NG0034	Labrador	Y	N

WQMA Station #	Region	Delineated	Digitized
NF02OE0033	Labrador	Y	N
NF02OC0002	Labrador	Y	N
NF02OD0011	Labrador	Y	N
NF02OA0045	Labrador	Y	N
NF02OA0044	Labrador	Y	N
NF02NF0013	Labrador	Y	N
NF02XA0001	Labrador	Y	N
NF02XA0029	Labrador	Y	N

Table 2: Number of Stations Delineated and Digitized

Region	Delineated	Digitized
Eastern	36	31
Central	25	21
Western	15	1
Labrador	18	3
Total	94	56

There are a total of 94 stations delineated and 56 stations digitized. To date there are 38 stations left for digitization. The majority of these stations are located in the Western and Labrador regions.

4.0 Conclusions

The protocols developed by Department of Environment and Conservation for the delineation and digitization of watersheds have been followed throughout this project. The delineation and digitization of the WQMA watersheds had made good progress over the life of this project. The completion of this project will require the digitization of 38 additional watersheds in the Western and Labrador regions.