CHAPTER 7

HABITAT ASSESSMENTS: LAKES

The New Brunswick Department of Natural Resources and Energy developed a standard lake survey methodology in the late 1960's. Since that time approximately 400 of the province's largest and most important lakes have been surveyed. Lake surveys are performed in mid-summer and include a complete assessment of the lake. A portion of the survey gathers background information including angling information and stocking data. The following lists the types of information gathered in the field:

- Shoreline Features - topography, forest cover, shoreline use, aquatic vegetation, shoreline vegetation, shoreline substrate composition, debris;
- Human Use - public access, private access, number camps and beaches, shoreline ownership (Crown owned vs. private);
- Hydrographic Parameters - water level, shoreline shape, secchi depth, water color, surface area, shoreline length, volume;
- Temperature, Oxygen and Chemistry Profiles - temperature, dissolved oxygen and chemical analysis using a field kit at regular depth intervals;
- Fish Population Assessments - samples are collected to determine relative abundance and age-growth-maturity relationships;
- Tributary Surveys - average width, substrate types, salmonid nursery and spawning areas, pools and obstructions;
- Depth Measurements - a recording fathometer is used to create depth profiles which are later transferred to depth maps; and
- Water Chemistry - water samples are collected for complete lab analysis.

Water chemistry data for a particular lake can be collected by different agencies, but generally the same basic parameters are analysed. To facilitate convenient access to this information, all lab analyzed water chemistry data is maintained in one data set. Please refer to Chapter 10 **Water Quality: Chemistry** for lab chemistry data associated with lake surveys.

Lake assessments gather information about the lake as it occurred on the date of survey. The physical and chemical data is usually representative of "worst" case conditions (i.e. during summer months) to support game fish populations. In some cases, lakes may be surveyed more than once.

The New Brunswick Department of Natural Resources and Energy developed a computer application (NBLAKES) to input assessment information and to generate summary reports. The Data Warehouse uses the files within this system; however the system does not capture all of the details recorded on the form.

Lake depths for 68 lakes have been digitized by referencing previously drafted maps.

Other lake assessments may be done in the fall of the year to determine locations of shore spawning and upwelling groundwater sources. Spawning areas are identified by boat and appear as obvious

pits or signs of digging and clearing of fines from underlying gravel substrate. Upwelling areas are found during aerial surveys at first freeze-up; the areas that are still open (unfrozen) are receiving upwelling groundwater. These areas can then be digitized in ArcView as polygon themes. Bowater Pulp and Paper Canada Inc. have undertaken these types of surveys and incorporated their results into the Data Warehouse.

DATA SOURCES

Most of the lake survey information is from the New Brunswick Department of Natural Resources and Energy and Bowater Pulp & Paper Canada Inc.

POSITIONAL ACCURACY

The positional accuracy of the hydrographic spatial data is ±1.5m to ±2.5m. Refer to **SNB's Land and Water Standards Manual** for further details.

Points representing depth measurements have been digitized for some lakes. In these cases, the locations of the depth measurements are estimated from previously drafted depth maps, or from field sheets. The depth maps are intended for relative management purposes and are not to be used for navigational purposes.

Spawning and upwelling spring polygons are digitized from field map sketches.

DATA FILES

Tabular Data
There are six data tables associated with lake assessments, four arising from DNRE's standard lake survey. The primary table maintains the bulk of the data describing the physical characteristics of the lake and the surrounding landscape. Three other tables describe lake tributaries, lake temperature/chemistry profiles, and fish species within the lake from the DNRE survey. The remaining two tables contain information on the spawning and upwelling spring areas surveys. The six data tables are summarized below:

- **Lake Assessments** - Maintains a general description of the lake and its surrounding landscape.
- **Lake Measurements** - Contains field data associated with temperature, dissolved oxygen and chemistry at various lake depths.
- **Lake Tributaries** - Describes each of the lake's tributaries in terms of potential spawning and nursery areas. Not all surveyed lakes have tributary information.
- **Lake Fish Species Present** - Indicates the number of each fish species caught by netting.
- **Lake Spawning Areas** - Indicates the location and size of spawning areas of brook trout.
- **Lake Upwelling Areas** - Indicates the location and size of upwelling spring areas.

Spatial Data
Lake assessments are linked to the Route System files through the water body ID.

ArcView point shape files were created for each lake whose depths were digitized.

ArcView polygon shape files were created for spawning and upwelling areas.

> ***Note***
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> Please refer to the following chapters for additional information on New Brunswick's lakes:
>
> ***Management Activities: Fish Stockings***
> ***Water Quality: Chemistry***

TABULAR DATA FILES

LAKE ASSESSMENTS

The ***Lake Assessments*** table (lakeasmt.dbf) maintains the majority of data collected during each lake survey. It describes the general characteristics of the lake, including shoreline use, forest cover, substrate type, and access. Only a few lakes have been surveyed more than once.

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
GENERAL ASSESSMENT INFORMATION				
Assessment ID	Identifier assigned to each lake survey. Assigned by the Data Warehouse	Assmt_ID	Numeric (4)	
Water Body ID	Unique identifier of the surveyed lake	Water_ID	Numeric (8)	
Water Body Name	Name of the surveyed lake	Water_Name	Character (40)	
Drainage Codes	Drainage system codes representing the drainage unit in which the lake belongs	Drainge_Cd	Character (17)	Appendix A
Survey Date	Date of survey. Format: YYYY.MM.DD	Assmt_Date	Character (10)	
Agency Code	Code representing the agency who collected the data	Agency_Cd	Character (4)	Code Table 6
Region	DNRE region in which lake is located	Region	Character (1)	
County Code	Code representing the county in which the lake is located	County_cd	Character (2)	
County	Name of the county in which the lake is located	County	Character (20)	
Parish Code	Code representing the parish in which the lake is located	Parish_cd	Character (3)	
Parish	Name of the parish in which the lake is located	Parish	Character (30)	
Air Temperature	Ambient air temperature measured in ºF	Air_Temp	Numeric (3)	
TOPOGRAPHY				
Flat	Percentage of drainage basin which is considered flat	Flat	Numeric (3)	
Rolling	Percentage of drainage basin which is rolling hills	Rolling	Numeric (3)	
Hilly	Percentage of drainage basin which is hilly	Hilly	Numeric (3)	
Mountainous	Percentage of drainage basin which is mountainous	Mountains	Numeric (3)	
FOREST COVER				
Softwood	Percentage of forest cover which is softwood only	Softwood	Numeric (3)	

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Hardwood	Percentage of forest cover which is hardwood only	Hardwood	Numeric (3)	
Softwood/ Hardwood	Percentage of forest cover which is predominantly softwood with some hardwood	Soft_Hard	Numeric (3)	
Hardwood/ Softwood	Percentage of forest cover which is predominantly hardwood with some softwood	Hard_Soft	Numeric (3)	
SHORELINE USE				
Recent Cutover	Percentage of shoreline with forest which has recently been cut	Cutover	Numeric (3)	
Mature Timber	Percentage of shoreline that has mature timber	Mature_Tim	Numeric (3)	
Immature Timber	Percentage of shoreline that has immature timber	Immat_Tim	Numeric (3)	
Residential	Percentage of shoreline that is residential	Residents	Numeric (3)	
Cottages	Percentage of shoreline that has cottages	Cottages	Numeric (3)	
Farm Land	Percentage of shoreline that is used for farming	Farms	Numeric (3)	
Wetland	Percentage of shoreline that is wetland	Wetlands	Numeric (3)	
AQUATIC VEGETATION				
Submerged	Percentage of submerged aquatic vegetation	Submrg_Veg	Numeric (3)	
Emergent	Percentage of emergent aquatic vegetation	Emrg_Veg	Numeric (3)	
SHORELINE VEGETATION				
Sedge	Percentage of shoreline shrubs which are sedge	Sedge	Numeric (3)	
Heath	Percentage of shoreline shrubs which are heath	Heath	Numeric (3)	
Cedar	Percentage of shoreline shrubs which are cedar	Cedar	Numeric (3)	
Alder	Percentage of shoreline shrubs which are alder	Alder	Numeric (3)	
SHORELINE SUBSTRATE COMPOSITION				
Mud	Percentage of shoreline substrate consisting of mud	Mud	Numeric (3)	
Sand	Percentage of shoreline substrate consisting of sand	Sand	Numeric (3)	
Gravel	Percentage of shoreline substrate consisting of gravel	Gravel	Numeric (3)	
Rubble	Percentage of shoreline substrate consisting of rubble	Rubble	Numeric (3)	

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Rock	Percentage of shoreline substrate consisting of rocks	Rock	Numeric (3)	
Boulder	Percentage of shoreline substrate consisting of boulders	Boulder	Numeric (3)	
Bedrock	Percentage of shoreline substrate consisting of ledge	Bedrock	Numeric (3)	
PUBLIC ACCESS				
Trail	Number of public right of ways by trails	Pub_Trail	Numeric (3)	
Car	Number of public right of ways by roads suitable for cars	Pub_Car	Numeric (3)	
Jeep	Number of public right of ways by roads suitable for 4x4's only	Pub_Jeep	Numeric (3)	
Boat	Number of public right of ways by boat	Pub_Boat	Numeric (3)	
PRIVATE ACCESS				
Trail	Number of private right of ways by trails	Priv_Trail	Numeric (3)	
Car	Number of private right of ways by roads suitable for cars	Priv_Car	Numeric (3)	
Jeep	Number of private right of ways by roads suitable for 4x4's only	Priv_Jeep	Numeric (3)	
Boat	Number of private right of ways by boat	Priv_Boat	Numeric (3)	
OTHER INFORMATION				
No. of Boat Landings	Number of public boat landings	Landings	Numeric (3)	
Shoreline Ownership - Crown	Percentage of shoreline owned by the Crown	PC_Shr_Crn	Numeric (3)	
Shoreline Ownership - Private	Percentage of shoreline privately owned	PC_Shr_Prv	Numeric (3)	
No. of Camps	Number of camps or cottages	No_Camps	Numeric (3)	
No. of Beaches	Number of beaches	No_Beaches	Numeric (3)	
Debris on Shore	Classifies the amount of woody debris in the littoral area (<6 ft) as considerable, light or none	Debris	Character (14)	
Water Level	Classifies lake water level as high, moderate or low	WaterLvlCd	Character (8)	
Shoreline Shape	Classifies the shoreline shape as irregular, moderately irregular, or circular	Shape	Character (16)	
Spawning Potential	Classifies the potential for salmonid shoreline spawning as good, fair, or poor	Spawn_Pot	Character (4)	

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Secchi Disc Depth	Depth at which a secchi disc becomes invisible (feet)	Secchi	Numeric (5.2)	
Water Color	Classifies observed water color as colorless, yellow/brown, or blue/green	Water_Clr	Character (14)	
Water Sample Analysed Indicator	Indicates whether a water sample was collected for chemical analysis in the lab	ChemAn_Ind	Character (1)	Y = Yes Blank = No
Angling Information Available Indicator	Indicates whether there is any creel census information available	Ang_Ind	Character (1)	Y = Yes Blank = No

LAKE MEASUREMENTS

The ***Lake Measurements*** table (lakefmsr.dbf) maintains the field data collected during a lake survey. It includes water temperatures, dissolved oxygen and chemistry (as tested by a field kit) at various lake depths. There is a record for each depth.

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Assessment ID	Identifier assigned to each lake survey. Assigned by the Data Warehouse	Assmt_ID	Numeric (4)	
Water Body ID	Unique identifier of the surveyed lake	Water_ID	Numeric (8)	
Water Body Name	Name of the surveyed lake	Water_Name	Character (40)	
Drainage Codes	Drainage system codes representing the drainage unit in which the lake belongs	Drainge_Cd	Character (17)	Appendix A
Agency Code	Code representing the agency who collected the data	Agency_Cd	Character (4)	Code Table 6
Survey Date	Date of survey. Format: YYYY.MM.DD	Assmt_Date	Character (10)	
Time of Day	Time of day when measurement was taken	Assmt_Time	Character (4)	
Air Temperature	Ambient air temperature measured in ºF	Air_Temp	Numeric (3)	
Sample Depth	Depth of the water sample or depth measurement taken	Samp_Depth	Numeric (5)	
Water Temperature	Temperature of the water measured in ºF	Water_Temp	Numeric (3)	
Dissolved Oxygen	Amount of dissolved oxygen measured in parts per million	Diss_O2	Numeric (5)	
Oxygen Saturation	Percent oxygen saturation	O2_Saturat	Numeric (5)	
pH	Water chemistry parameter	pH	Numeric (5.1)	
Alkalinity - Pheno	Water chemistry parameter in ppm	Pheno_Alk	Numeric (5)	
Alkalinity - Methyl Orange	Water chemistry parameter in ppm	M_O_Alk	Numeric (5)	
Total Hardness	Water chemistry parameter in ppm	Total_Hard	Numeric (5)	
Carbon Dioxide	Water chemistry parameter in ppm	CO2	Numeric (5.1)	
Free Acid	Water chemistry parameter in ppm	Free_Acid	Numeric (5)	

LAKE TRIBUTARIES

The ***Lake Tributaries*** table (laketrib.dbf) describes the various tributaries flowing into a lake. Its primary focus is fish habitat. Each record represents a single tributary.

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Assessment ID	Identifier assigned to each lake survey. Assigned by the Data Warehouse	Assmt_ID	Numeric (4)	
Water Body ID	Unique identifier of the surveyed lake	Water_ID	Numeric (8)	
Water Body Name	Name of the surveyed lake	Water_Name	Character (40)	
Drainage Codes	Drainage system codes representing the drainage unit in which the lake belongs	Drainge_Cd	Character (17)	Appendix A
Agency Code	Code representing the agency who collected the data	Agency_Cd	Character (4)	Code Table 6
Survey Date	Date of survey. Format: YYYY.MM.DD	Assmt_Date	Character (10)	
Tributary Name	Name of the stream being surveyed	Trib_Name	Character (20)	
Length Surveyed	Length of stream surveyed measured in tenths of a mile	Survey_Len	Numeric (6.1)	
Average Width	Average width of the stream measured in feet	Ave_Width	Numeric (4)	
Water Level	Description of water level at the time of the survey - low, moderate or high	WaterLvlCd	Character (8)	
Substrate - Silt	Percentage of substrate which is composed of silt	Silt	Numeric (3)	
Substrate - Sand	Percentage of substrate which is composed of sand	Sand	Numeric (3)	
Substrate - Gravel	Percentage of substrate which is composed of gravel	Gravel	Numeric (3)	
Substrate - Rubble	Percentage of substrate which is composed of rubble	Rubble	Numeric (3)	
Substrate - Rock	Percentage of substrate which is composed of rock	Rock	Numeric (3)	
Substrate - Boulder	Percentage of substrate which is composed of boulder	Boulder	Numeric (3)	
Substrate - Bedrock	Percentage of substrate which is composed of bedrock	Bedrock	Numeric (3)	
Salmonid Nursery Length	Length of surveyed stream which is considered salmonid nursery area (feet)	Nur_Len	Numeric (4)	
Salmonid Nursery Width	Average width of the salmonid nursery area (feet)	Nur_Width	Numeric (4)	

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Salmonid Nursery Quality	Assessment of the salmonid nursery area as good, fair, or poor	Nur_Qualty	Character (4)	
Salmonid Spawning Length	Length of the surveyed stream which is considered salmonid spawning area (feet)	Spa_Len	Numeric (4)	
Salmonid Spawning Width	Average width of the salmonid spawning area (feet)	Spa_Width	Numeric (4)	
Salmonid Spawning Quality	Assessment of the salmonid spawning area - good, fair, or poor	Spa_Qualty	Character (4)	
No. Pools <3 ft Deep	Number of pools less than 3 ft deep	Pools_Lt_3	Numeric (4)	
No. Pools 3 - 6 ft Deep	Number of pools between 3 - 6 ft deep	Pools_3_6	Numeric (4)	
No. Pools > 6 ft Deep	Number of pools greater than 6 ft deep	Pools_Gt_6	Numeric (4)	
Obstruction Indicator	Indicates whether there is an obstruction in the stream	Obstr_Ind	Character (1)	Y = Yes Blank = No
Obstruction Type	Describes the type of obstruction - beaver, concrete, rock fill, or wood	Obstr_Type	Character (10)	
Fishway Indicator	Indicates whether there is a fishway installed around the obstruction	Fshway_Ind	Character (1)	Y = Yes N = No Blank = Fishway Not Needed
Vertical Jump	Height of the obstruction over which fish must jump	Vert_Jump	Numeric (3)	
Horizontal Jump	Horizontal distance a fish must jump to clear an obstruction	Horz_Jump	Numeric (3)	

FISH SPECIES PRESENT

The ***Fish Species Present*** table (lakefish.dbf) maintains the information on fish population assessments as a component of lake surveys.

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Assessment ID	Identifier assigned to each lake survey. Assigned by the Data Warehouse	Assmt_ID	Numeric (4)	
Water Body ID	Unique identifier of the surveyed lake	Water_ID	Numeric (8)	
Water Body Name	Name of the surveyed lake	Water_Name	Character (40)	
Drainage Codes	Drainage system codes representing the drainage unit in which the lake belongs	Drainge_Cd	Character (17)	Appendix A
Agency Code	Code representing the agency who collected the data	Agency_Cd	Character (4)	Code Table 6
Survey Date	Date of survey. Format: YYYY.MM.DD	Assmt_Date	Character (10)	
Hours Fished	Number of hours the net was in place	Hrs_Fished	Numeric (3)	
Fish Species Code	Code representing the fish species caught	Species_Cd	Character (2)	Code Table 17
Fish Species	Fish species name	Species	Character (30)	
Number of Fish	Number of the fish species caught	No_Fish	Numeric (4)	
Minimum Length	Minimum size of the fish species caught	Length_Min	Numeric (5.1)	
Maximum Length	Maximum size of the fish species caught	Length_Max	Numeric (5.1)	
Population Status	Indicates whether the fish species was actually found present in the lake, was reported to be there or known to be a stocked species	Pop_Status	Character (8)	

SPAWNING AREAS SURVEYS

The ***Spawning Areas*** table (lake-spawn-survy.dbf) maintains information on the location and size of lake shoreline spawning areas of brook trout.

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Spawning Area ID	Identifier for spawning areas assigned by the Data Warehouse	Spawng_ID	Numeric (6)	
Water Body ID	Unique identifier of the surveyed lake	Water_ID	Numeric (8)	
Water Body Name	Name of the surveyed lake	Water_Name	Character (40)	
Drainage Codes	Drainage system codes representing the drainage unit in which the lake belongs	Drainge_Cd	Character (17)	Appendix A
Agency Code	Code representing the agency who collected the data	Agency_Cd	Character (4)	Code Table 6
Personnel	Initials or names of individuals performing the survey.	Personnel	Character (20)	
Survey Date	Date of survey. Format: YYYY.MM.DD	Assmt_Date	Character (10)	
Area (m^2)	Area (m^2) of spawning zone (polygon) determined in ArcView	Area	Numeric (12.3)	
Perimeter (m)	Perimeter (m) of spawning zone (polygon) determined in ArcView	Perimeter	Numeric (12.3)	
Comments	General comments	Comments	Character (150)	

UPWELLING AREAS SURVEYS

The ***Upwelling Areas*** table (lake-upwell-survy.dbf) maintains the location and size of upwelling groundwater sources (springs) found within lakes.

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Upwelling Area ID	Identifier for upwelling areas assigned by the Data Warehouse	Upwell_ID	Numeric (6)	
Water Body ID	Unique identifier of the surveyed lake	Water_ID	Numeric (8)	
Water Body Name	Name of the surveyed lake	Water_Name	Character (40)	
Drainage Codes	Drainage system codes representing the drainage unit in which the lake belongs	Drainge_Cd	Character (17)	Appendix A
Agency Code	Code representing the agency who collected the data	Agency_Cd	Character (4)	Code Table 6
Personnel	Initials or names of individuals performing the survey.	Personnel	Character (20)	
Survey Date	Date of survey. Format: YYYY.MM.DD	Assmt_Date	Character (10)	
Area (m^2)	Area (m^2) of upwelling zone (polygon) determined in ArcView	Area	Numeric (12.3)	
Perimeter (m)	Perimeter (m) of upwelling zone (polygon) determined in ArcView	Perimeter	Numeric (12.3)	
Comments	General comments	Comments	Character (150)	

SPATIAL DATA FILES

LAKE DEPTH POINTS

The ***Lake Depth Points*** spatial file (*water_id-lake_name*.shp, e.g. 32484-Arnold.shp) is a point coverage representing the locations of depth measurements in lakes.

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Internal ID	Internal ID generated by GIS to uniquely identify each point	ID	Numeric (8)	
Water Body ID	Unique number of the lake with depth measurements	Water_ID	Numeric (8)	
Water Name	Name of lake with depth measurements	Water_Name	Character (40)	
Depth (metres)	Water depth measured in metres	Depth_m	Numeric (9.1)	
Depth (feet)	Water depth measured in feet	Depth_ft	Numeric (9.1)	
Sample Indicator	Indicates whether or not water sample was taken at point	Sample_Ind	Character (1)	

SPAWNING AREA POLYGONS

The ***Spawning Area Polygons*** spatial file (spawn-zones.shp) is a polygon coverage representing the spawning areas observed in lakes.

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Area (m^2)	Area of spawning polygon, measured in square meters	Area	Numeric (12.3)	
Perimeter (m)	Perimeter of spawning polygon, measured in meters	Perimeter	Numeric (12.3)	
Spawning Area ID	Identifier for spawning areas assigned by the Data Warehouse	Spawng_ID	Numeric (6)	
Agency Code	Code for agency who collected the data	Agency_Cd	Character (4)	
Water Body ID	Unique number of the lake with spawning areas	Water_ID	Numeric (8)	
Water Name	Name of lake with spawning areas	Water_Name	Character (40)	
Drainage Codes	Drainage system codes representing the drainage unit in which the lake belongs	Drainge_Cd	Character (17)	Appendix A

UPWELLING AREA POLYGONS

The ***Upwelling Area Polygons*** spatial file (upwell-zones.shp) is a polygon coverage representing the upwelling groundwater spring areas observed in lakes during first freeze-up.

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Area (m^2)	Area of upwelling polygon, measured in square meters	Area	Numeric (12.3)	
Perimeter (m)	Perimeter of upwelling polygon, measured in meters	Perimeter	Numeric (12.3)	
Upwelling Area ID	Identifier for upwelling areas assigned by the Data Warehouse	Upwell_ID	Numeric (6)	
Agency Code	Code for agency who collected the data	Agency_Cd	Character (4)	
Water Body ID	Unique number of the lake with upwelling areas	Water_ID	Numeric (8)	
Water Name	Name of lake with upwelling areas	Water_Name	Character (40)	
Drainage Codes	Drainage system codes representing the drainage unit in which the lake belongs	Drainge_Cd	Character (17)	Appendix A