



Frontline

Forestry Research Applications

Canadian Forestry Service - Sault Ste. Marie

Technical Note No. 105

The Ontario Research Sites Database Project

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Introduction and Context

The Ontario Research Sites (ORS) database project has evolved as a joint solution to the need for an electronic method of documenting forestry related research, and for recording historical forest-based scientific research studies within the province of Ontario. The result is an online Internet database that allows a user to search, browse, map, and view details of each included study. By presenting this information on the Internet, at no cost to the end user, the Canadian Forest Service (CFS) is able to showcase past and present studies from any and all research organizations, to the public and scientific community, on a national and international scale. The ORS database is located at <http://www.glfc.cfs.nrcan.gc.ca/ors>.

The project developed following ideas proposed by Mr. Geoff Munro, former Director General (DG) of the Great Lakes Forestry Centre and now DG of the CFS Science Directorate in Ottawa. The Canadian Foundation for Innovation provided seed funding for a prototype web-based system. A Steering Committee was formed comprised of the CFS, the Ontario Ministry of Natural Resources, Sault College, and the Upper Lakes Environmental Research Network. The system has now been adopted by the Great Lakes Forestry Centre and is being used or supported by several partners such as the Forest Research Partnership and the Ontario Ministry of Natural Resources.

Background: Great Lakes Forestry Centre's Study Register

From 1978 to 1997, the CFS's Great Lakes Forestry Centre (GLFC) stored information describing its research studies in a central study register. The documents were all paper hardcopies stored in binders. During those years, some 89 GLFC research studies were documented. The common research descriptors used to outline each study are the title, investigator, research manager, cooperating agencies, and year of research commencement and completion. Detailed maps displaying locations and describing access to the plot locations accompany each study in the registry. The study register was compiled to identify

research plots for their protection. Annual compilations were sent out to the Ontario Ministry of Natural Resources District Offices and to the sustainable forest license holders, forest managers and industries, in the areas neighbouring the study plots.

After 1997, resource constraints prevented the adequate maintenance and annual study compilation required for the study register. In addition, there was a substantial need for the study registry to store data electronically for increased ease of updating, and to permit the sharing of information with researchers, other organizations, industry, and the public.

The development of the ORS database in 2003 facilitated the shift from hard copy to an electronic, and easily accessible study archive. The metadata of all the study records in the GLFC Study Registry are now included in the ORS database. Hard copy maps are being digitally scanned and archived on compact discs.

ORS Database Structure

The ORS database is an Oracle® database. The website of the ORS database is programmed using Macromedia's ColdFusion®. The objective during the development of the database was to design a metadata structure that is general enough that the structure can be used to classify varying types of study plots, yet also specific enough to make the collection meaningful to the forestry community.

The ORS database stores metadata for a study only. Metadata refers to the data describing data, meaning the descriptive details of the study are included, but not the actual study results. For example, metadata would include that a plot was revisited yearly for growth re-measurement, but would not include the actual growth data itself.

The metadata that the ORS collects for a study includes the study title, initial plot objectives, study abstract, plot establishment year,



current plot status, study type, data collection organizations, keywords, organisms associated with research, geographic coordinates (including projection, accuracy, elevation, and plot area), textual location description, indicator of additionally available information or data, location of additionally stored data, website link, publication stemming from research, and the name and contact information of the study's contact person, as well as any other names of associated researchers.

Database Features Forest Research from Ontario

In addition to the migration of the GLFC's study register to the ORS database, the database also contains studies from the Ontario Ministry of Natural Resources, the Upper Lakes Environmental Research Network (ULERN), and the Forest Renewal Co-op. The ORS website has a special notation and search capability to highlight research done in major research areas such as the Petawawa Research Forest, Turkey Lakes Watershed, the Lake Abitibi Model Forest,

the Eastern Ontario Model Forest, Fallingsnow Ecosystem Forest, Rinker Lake, and the White River Boreal Mixedwood Area. There are also some large, multi-partnered projects currently stored in the ORS database, such as the NEBIE, and SLAM projects. The NEBIE (Natural, Extensive, Basic, Intensive, Elite) Project was developed to create accurate models to forecasting allowable cuts while maintaining ecological and economic viability. The SLAM (Stand-Level Adaptive Management) Project tests innovative techniques for achieving productive mixtures of conifers and hardwoods at operational scales, and monitors associated changes in ecological indicators.

Powerful Search Engine

As the number of studies stored in the database grows, the powerful capabilities of the ORS website will become more and more evident. Users can query the database in a general, non-specific fashion, or they can combine search fields to search very specifically. The search

page (Figure 1) is equipped with many fields and drop boxes. The first field allows a user to enter text and the search engine will search the content of all studies to find matches for the text query. If the user would like to perform a more specific search, they can narrow their scope by selecting items from the selection boxes. These allow a user to search for specific study types and plot status, as well as by specific organizations, major research study areas, species, keywords, and by scientists. A user is able to use one of these selection boxes to narrow their search, or they may combine several, or all, to query for a specific study. A text field at the top of the search page allows a user to enter a study's identification code to jump to a specific study record they might have previously printed or made note of.

As an example of the search capabilities, the search form will allow the user to search for the following:

- all the genetic study plots
- all the plots that were established between 1930 and 1940
- all the plots with Dr. Whoever as an associated scientist
- all the Canadian Forest Service's studies
- all the insect related study plots
- all the plots related to *Picea mariana*
- all the plots with the words "Petawawa" and "provenance" in their content
- all the plots that are classified as dormant

Or, the search boxes can be combined so that the user can search for information such as:

- all the white spruce, genetic studies, that were conducted by the MNR, and have currently active plots
- all the soil sampling plots that Dr. Whoever is involved with
- all the *Larix* studies that have plots that were established before 1980 and that have additional online information available
- all the permanent sample plots that were initiated before 1950 that have *Pinus banksiana* as an involved species

After a search is performed, the user is presented with a summary of studies that match their query (Figure 2). The summary lists the project titles, establishment years, organizations involved in the research, study type, and the

The screenshot shows a search form with the following fields and options:

- Search all Fields:** A text input field containing "jack pine".
- Plot Establishment Year between:** Two empty input boxes with the text "(Format as yyyy)" below them.
- Current Research Status:** A dropdown menu with "Doesn't Matter" selected.
- Study Type:** A dropdown menu with "Doesn't Matter", "Climate", "Environmental Impact", and "Fire" as options. Below it is the text "(Hold 'CONTROL' to select multiple values.)".
- Lab or Field Based Research?:** A dropdown menu with "Doesn't Matter" selected.
- Collection Entity/Organization:** A dropdown menu with "Doesn't Matter", "AVENOR", "Abitibi Consolidated Company of Canada", and "Abitibi Paper Company Ltd." as options. Below it is the text "(Hold 'CONTROL' to select multiple values.)".
- Research Affiliated with Major Research Area of:** A dropdown menu with "Doesn't Matter", "Black Sturgeon Boreal Mixedwood Forest", "Eastern Ontario Model Forest", and "Fallingsnow Ecosystem Project" as options. Below it is the text "(Hold 'CONTROL' to select multiple values.)".
- Organisms:** A dropdown menu with "Doesn't Matter", "Abies balsamea (balsam fir)", "Abies fraseri (Fraser fir)", and "Abies sp. (firs)" as options. Below it is the text "(Hold 'CONTROL' to select multiple values.)".
- Keywords:** A dropdown menu with "Doesn't Matter", "3 dimensional", "3D", and "acid rain" as options. Below it is the text "(Hold 'CONTROL' to select multiple values.)".
- Require Availability of Additional Info?:** A dropdown menu with an empty box selected.
- Require Additional Info to be Digital?:** A dropdown menu with an empty box selected.
- For Field Research - Required Coordinate Accuracy of at least:** A dropdown menu with an empty box selected.
- Person(s) Involved with Research Plot:** A dropdown menu with "Doesn't Matter", "Abraham, Ken Dr.", "Adams, Mike J. - Canadian Forest Service", and "Addison, Jan Dr." as options. Below it is the text "(Hold 'CONTROL' to select multiple values.)".

Figure 1. Search Page

SEARCH RESULTS

There were 42 matches found for your query.
Search Terms: *jack pine*

Re-sort List of Matches by: Plot Establishment Year Descending Re-sort

[Print Search Results](#)

Reference Id	Project Name/Title	Plot Establ. Year	Collection Entity/Organization	Study Type	Current Research Status
<input type="checkbox"/> 397	Developing Sustainable Mixedwood Practices in a Stand Level Adaptive Management Framework (a.k.a. SLAM)	2003	Ontario Forest Research Institute	Forest Management	Active
<input type="checkbox"/> 164	NEBIE	2002	Ontario Ministry of Natural Resources, Upper Lakes Environmental Research Network, Forestry Research Partnership	Forest Management	Active
489	Product parameter based decision support system for jack pine.	2001	Forestry Research Partnership, Forintek Canada Corp.	Forest Management	Active
484	Decision support systems for allowable cut effect.	2000	Canadian Forest Service, Ontario Ministry of Natural Resources	Forest Management	Active
485	Commercial thinning opportunities and challenges in northeastern Ontario.	2000	Ontario Ministry of Natural Resources, Forestry Research Partnership, Cutter Forestry Consulting Inc.	Forest Management	Dormant

Figure 2. Example search results

current research status. This summary list can be re-sorted by any of the columns. A user can click on the reference id number to view the details of any of the records. Or, if they wish to view an overview of the study plot locations for one or multiple studies, they can click the check boxes located to the left of all field based studies, and click the 'Map Checked Studies' box at the bottom of the page. A map is then generated and displayed in a new window. If the user holds his mouse over any of the plot point locations, the title and reference id number of that plot is displayed (as shown in Figure 3). The user can then click that

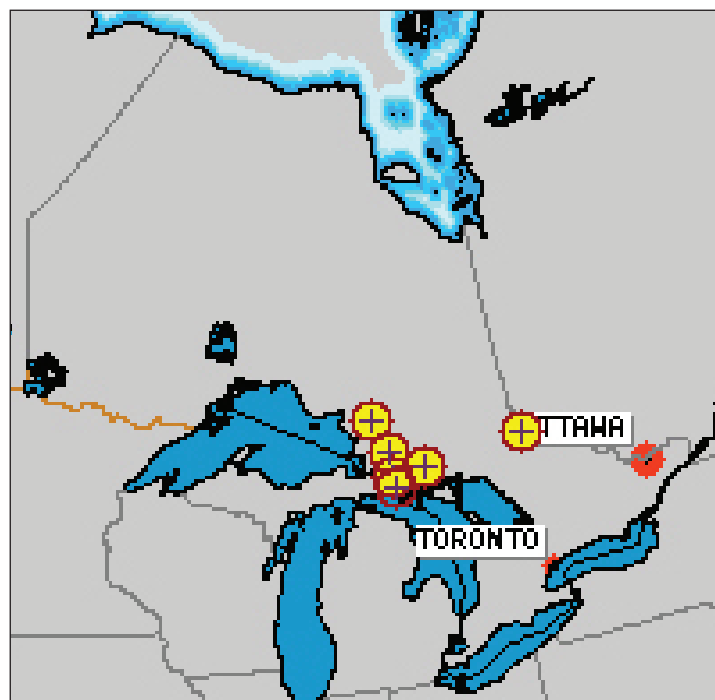


Figure 3. Map displaying selected search results

plot point to open the details of the study in a new window.

Preserving Field Site Integrity

As important as the geographical coordinates are for mapping the precise location of each study plot, the ORS database steering committee was very concerned about the security of the research locations. The precise location of the plots is of primary importance to external organizations that are working in the area to preserve the integrity of the research plot. However, publicly broadcasting the precise coordinates of study plots on the Internet raises the possibility of plot tampering. To address these concerns, all plot coordinates are entered precisely, but displayed to the user rounded-off to two decimal places. This feature allows a plot to be geo-referenced to within approximately one kilometer, without disclosing the precise location. Precise coordinates are stored and may be released by the database administrator with the approval of study leaders and research managers. Persons interested in plot and study information may contact the person identified in each record. Historical, non-active studies from the GLFC study register usually refer users to GLFC's Marketing and Technology Transfer Section.

Adding New Studies

Currently, direct record addition is limited to personnel within the Great Lakes Forestry Centre. External organizations are encouraged to view the contact page for information on how they can contribute their research studies to the ORS database.

Future Directions

The ORS database was generically programmed, which will allow the database to store information from a larger geographic range with minimal additional programming. This offers the potential to store metadata for scientific research plots nationwide. The online mapping tool that currently allows a user to map selected studies will be updated to allow the reverse methodology. This will make it possible to zoom in on a geographical area of the map and viewing the studies that have plots in that region. As of May, 2005 approximately 480 studies have been entered into the ORS system (see Table 1). This will continue to grow over time, making the database increasingly valuable to all potential users.

by Major Research Area:

Turkey Lakes Watershed	11
Black Sturgeon Boreal Mixedwood Forest	1
Eastern Ontario Model Forest	2
Fallingsnow Ecosystem Project	1
Lake Abitibi Model Forest	26
Petawawa Research Forest	77
Rinker Lake	3
White River Boreal Mixedwood Area	3
Swan Lake Research Area	19

by Study Type:

Growth and Yield	14
Genetic	72
Silviculture	128
Other	13
Fisheries	3
Pest Management	25
Soils	4
Climate	2
Wildlife	6
Fire	6
Pulp and Paper	10
Forest Management	105
Forest Health	9
Environmental Impact	31
Planting Stock	52
	480

Table 1. Summary of ORS data - May, 2005

Acknowledgements

The ORS database project is supported by the Canadian Forest Service (CFS), the Forest Research Partnership (FRP), the Upper Lakes Environmental Network (ULERN), the Ontario Ministry of Natural Resources (OMNR), Sault College, the Ontario Innovation Trust, and the Canada Foundation for Innovation. Kevin Lawrence provided valuable programming advice. Janette Desharnais and Saul Fraleigh have each entered dozens of studies into the ORS database and provided useful feedback. Heather Marcks, Michelle Forest, and Carey Angeconeb have also made contributions.

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Catalogue No. Fo123-1/105E-PDF
ISBN 0-662-40480-7
ISSN 1717-6980