

Agriculture and Agri-Food Canada Agriculture et Agroalimentaire Canada



#### Background

- In biodiversity / taxonomic applications, methods are required to capture and guery point data from distributed sources.
- As part of ongoing research, mapping capability has been added to two point mapping applications: -the Integrated Taxonomic Information System (ITIS) / Biological Observations, Specimens and Collections (BiOSC Gateway)

-the Generic Point Mapper

#### Need

To incorporate point mapping into the ITIS / BiOSC Gateway online application.

#### **Biological Observations, Specimens and Collections (BiOSC Gateway)**

- BiOSC is a global metadata search engine that accesses
- holdings from multiple distributed biodiversity networks • It contains approximately 4 million biological records from 120,000 taxa
- Interactive mapping is provided for records containing latitude and longitude data. An XML stream containing header information and biodiversity records is sent to a Mapserver PHP/Mapscript application.
- The Mapserver application extracts points from the XML stream and adds the points as features to a point maplayer. The points are displayed on a world map provided via Web Map Service (WMS) protocol. The user can zoom in and out, pan, and query an individual point.
- Querying the points on the maps results in the retrieval of information directly from the original source of the point data, in real time.
- The point distribution layers were made OpenGIS compliant. The WMS Getmap request can be used to display points in other web mapping applications that support the WMS OpenGIS protocol. The point layers can also be queried using the WMS GetFeatureInfo request.

ITIS: <u>http://sis.agr.gc.ca/pls/itisca/taxaget?p\_ifx=plglt</u> BiOSC White paper: <u>http://www.cbif.gc.ca/biosc/biosc\_e.php</u>

#### Sample XML Stream

<?xml version="1.0" encoding="iso-8859-1"?> (response)

- <header> <author>John Doe</author> <boundingbox>-180,-90,180,90,World</boundingbox>
- <description></description> <ifx>cbif</ifx> language>en</language>
- <projection>latlong</projection></projection> <recordcount></recordcoun <timestamp>2003-05-13T20:16:41Z</timestamp> <title>Map of Canadian Cities</title
- <url></url) /header <records</pre>
- <record> <longitude>-123.3666</longitude> <latitude>48.43333</latitude
- <recordurl>http://www.city.victoria.bc.ca/common/index.shtml</recordurl> </record> <record
- longitude>-75.75</longitude <latitude>45.26666</latitude <recordurl>http://www.city.ottawa.on.ca/</recordurl>
- </record> <record> <longitude>-79.416666</longitude>
- <latitude>43.7</latitude> <recordurl>http://www.city.toronto.on.ca/</recordurl>
- </record) </records </response

#### **Mapserver Mapfile** - contains 3 layers

- 1) Basemap layer: World map
- provided via WMS from Demis bv
- http://www.demis.nl/ 2) Collections layer:
- an empty point layer - sets symbol rendering: colour red,
- size 5
- 3) Highlight layer: - an empty point layer
- sets symbol rendering: colour yellow, size 6

**XML Schema:** http://sis.agr.gc.ca/xml/point\_map.xsd

#### Need

To provide users and application developers the ability to interactively map and query point data of any kind (e.g. biodiversity, health, etc.) in real time.

#### **Generic Point Mapper**

- This application can be used to map point distributions on any subject matter.
- Coordinate information can be cut and pasted into a
- browser window or a file can be uploaded. • Coordinate information is added in the format:
- Longitude, Latitude, Query url (optional)
- If a point is queried, a new browser window is opened to display the URL provided with each coordinate.
- Potential uses of this application:
- Biodiversity collections (e.g. map and query collection information representing many biological species from multiple remote data holding sources)
- Point of interest applications (e.g. Cities and City
- homepages)
- Health Mapping e.g. SARS
- Plot temporal changes in species ranges due to human activities

CBIF: <u>http://www.cbif.gc.ca/mc/index\_e.php</u>

#### Government Gouvernement of Canada du Canada Canada Canada site Canadian Biodiversity Information Facil Section 1. Fill out the following fields. Optional fields are marked

## ¥ 44 14 with (\* ITIS

**Biological name search** BiOSC <u>Global specimen</u> information networks Species Analyst

Inputs

Canada <u>Canadian specimen</u> information network

<u>SpeciesBank</u> BKIN

39 VE 3

## Section 2.

-123.116666,49.25,http://www.city.vancouver.bc.ca/

Inputs Partnering with: Species 2000 images.google.com searching specialized Internet databases The Species Analyst (TSA)

Client

Browser

1 Query ITIS

2 Click Map it

button

3 Get record

index data

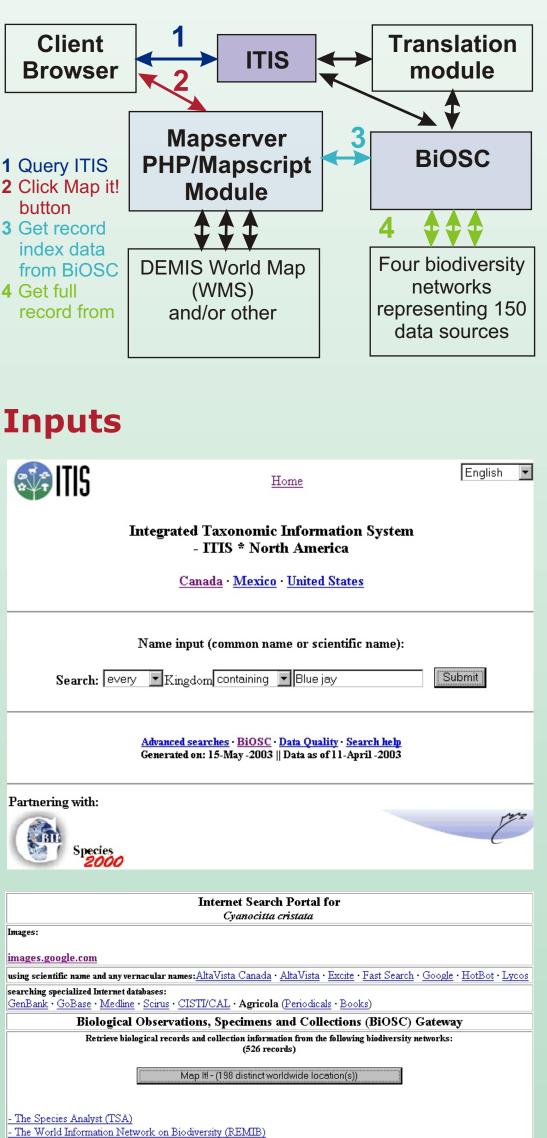
from **BiOS** 

record from

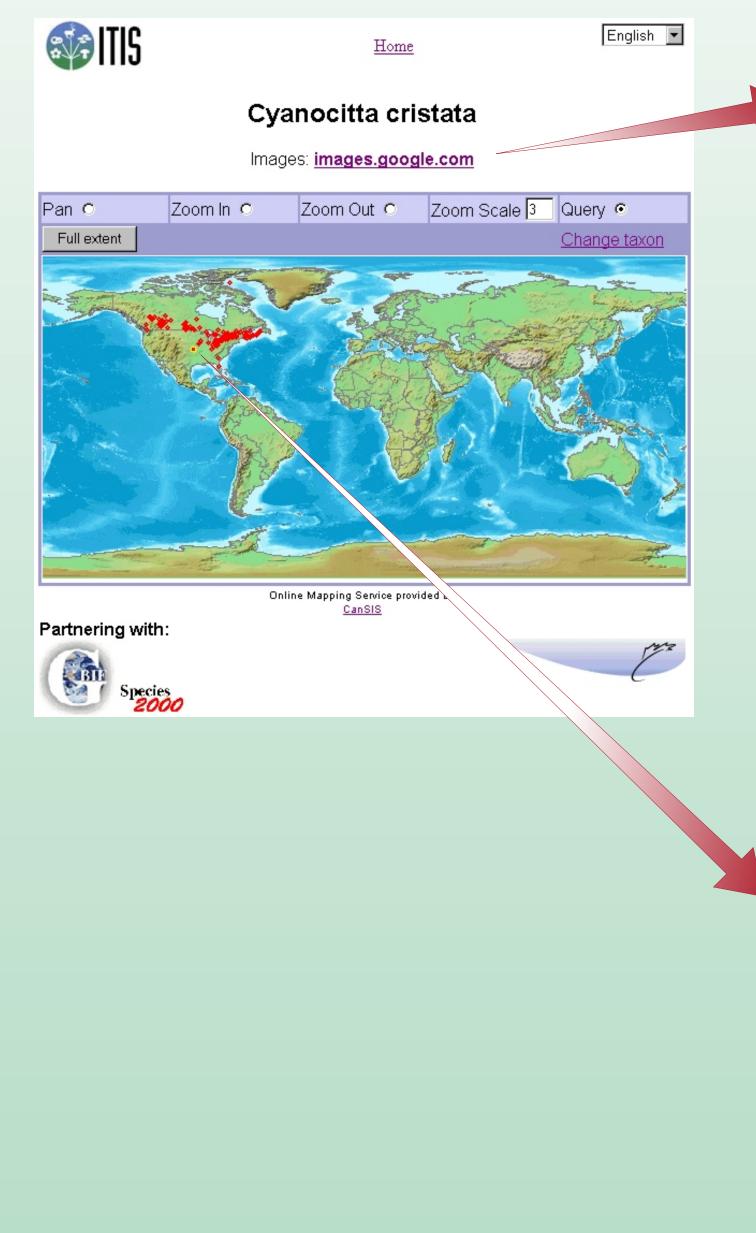
4 Get full

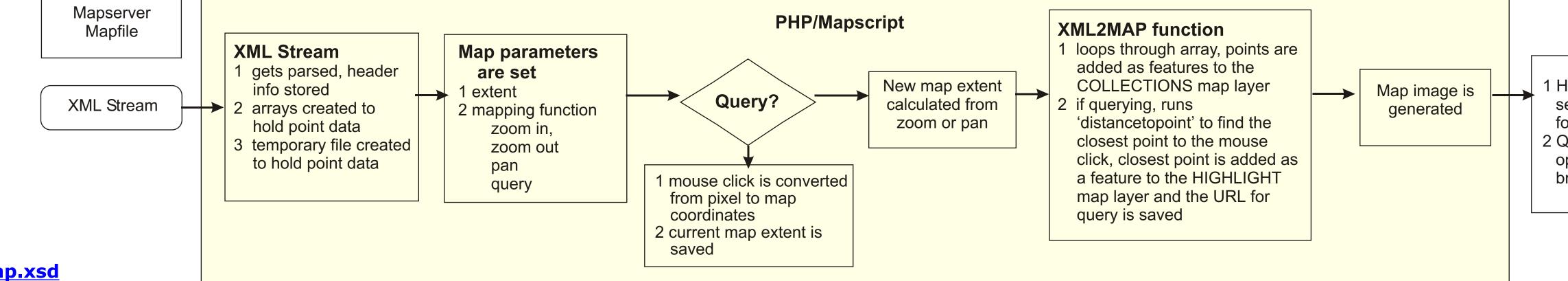
## Mapping Point Data in a Distributed Environment using XML and Mapserver

#### **Context Diagram**

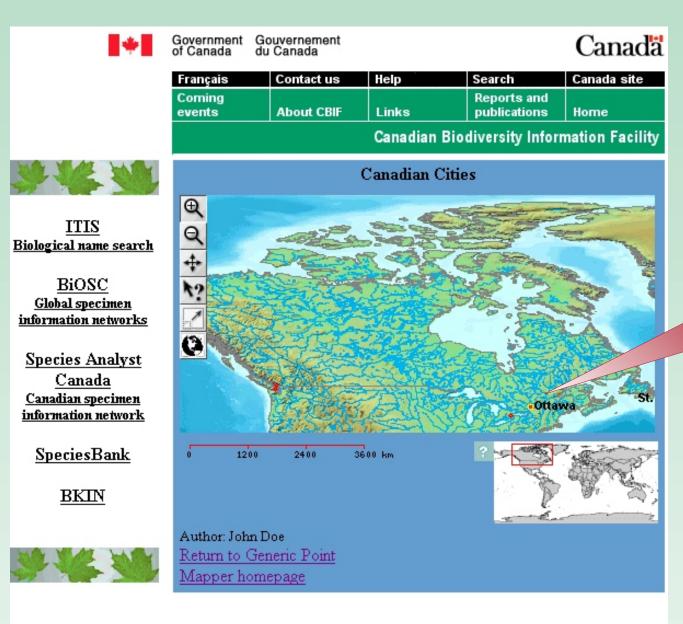


#### **Application**





## Application



#### Français | Contact Us | Help | Search | Canada site oming Events | About CBIF | Links | Reports and Publications | Home Date Modified: 2003-03-2;

Important Notices

#### List of records

- Format for point records (note: the URL is optional) -75.75,45.26666,http://www.city.ottawa.on.ca/
- -79.41666,43.7,http://www.city.toronto.on.ca/
- -123.366,48.4333,http://www.city.victoria.bc.ca/common/ index.shtml
- -123.116666,49.25,http://www.city.vancouver.bc.ca/

#### Input the title information that you would like to appear above the map (\*)

- Canadian Cities Input Author information (your name etc.), this will appear below
- the map (\*) John Doe
- Choose the map projection (Default is recommended for most
- users Default (Geographic / Latitude-Longitude) 💌
- Select a country (Default is the world map)
- Canada
- Original Country picklist courtesy of Demis by

#### Enter coordinates into the text box.

- Enter Longitude and Latitude in decimal degrees (one location/line) separated by a comma ( , ). Make sure to put a minus sign in front of Longitudes that are west of the 0 meridian and in front of Latitudes that are south of the equator. Optionally, you can add a Web address (URL) to some or all coordinates so that additional information will be shown when a point is queried. Add the url after the latitude, separated by a comma. e.g. 79.416666,43.7,http://www.city.toronto.on.ca/
- For example, try copying the following four records into the text box:
- -123.3666,48.43333,http://www.city.victoria.bc.ca/common/index.shtml 75.75,45.26666,http://www.city.ottawa.on.ca/ -79.416666,43.7,http://www.city.toronto.on.ca/

# Canada

#### **OpenGIS capabilities Query results** OpenGIS (http://www.opengis.org/) specifications enable Resulting query information is retrieved spatial information sharing via interoperable solutions on the directly from original data holder. internet. <u>dvanced Image Search</u> <u>Preferences</u> The Web Map service (WMS) Getmap request can be used to JOOgl Cyanocitta cristata display points in other web mapping applications that mage Search 💭 Moderate SafeSearch is on support the WMS OpenGIS protocol. rched images for **Cyanocitta cristata**. Results **1 - 20** of about " Arctic Cordiller 🔲 🔲 Northern Arctic 🗖 Southern Arcti Ecoregions 🗌 🔲 Taiga Plains Ecodistricts 🔲 🔲 Taiga Shield 🛛 🔲 Boreal Shield 🔲 Atlantic Maritime 🔲 Mixed Wood Plains bluejay.jpg JAYBLUPB.JPG 🔲 Boreal Plains 🔜 Prairies 640 x 480 pixels - 153k 400 x 281 pixels - 20k 🔲 🔲 Taiga Cordillera Imph ufl edu/NAT9 🔲 Boreal Cordillera RNITH/GALLERY/JAVBLUPBUP 🔲 🔲 Pacific Maritime 🔲 💻 Montane Cordillera Hudson Plains Find Clear Placename 0 1000 2000 3000 km English 💌 <u>Home</u> Results • The point mapping is very fast: 4 seconds for >2000 points, Integrated Taxonomic Information System 15 seconds for > 4000 points. - ITIS \* North America • The WMS Getmap request can be used to display points in Canada · Mexico · United States other web mapping applications that support the WMS OpenGIS protocol. • The application uses POST rather than GET method due to Biological Records and Collections: Cyanocitta cristata the potentially large XML stream sent via http. atitude 38.4 Longitude -96.1833 There is a challenge in making a proper GetCapabilities Images: images.google.com document due to the large number of potential map layers Use of the data may be restricted. Read the Disclaimer and Proviso for each Network. available (>120,000). Animalia **Future activites** The Species Analyst - Disclaimer and Proviso • The current XML stream is non-standard. It can be converted **University of Michigan - Birds** to be compliant with Web Feature Service (WFS) or Country Latitude Longitude Collection Date Taxon Geography Markup Language (GML) specifications. Cyanocitta cristata United States 38.4 -96.1833 Birds • If one of the new emerging web mapping clients (e.g. the CGDI WMS Client Component) that allows searching of WMS Advanced searches · BiOSC · Data Quality · Search help registries/catalogs is used, the points can be mapped on a Generated on: 16-May -2003 || Data as of 11-April -2003 variety of background map layers. • There is a need to add the ability to map more than one taxa Partnering with: or other type of point distribution at a time. Canto A There is a need to add the ability to map different symbol Species types, colours and sizes via Style Layer Descriptor (SLD) specification

## **Query results**

The query results appear in a new browser window



## Results

- Points provided in decimal degrees can be mapped in "geographic" or they can be projected on the fly and mapped in Robinson projection
- The user has the ability to map more than one taxon or other type of point distribution at a time.
- End users can use the Generic Point Mapper for their own use and application developers can wrap their own applications around this mapping application.

## **Future activities**

- More map projections can be provided in the application.
- If one of the new emerging web mapping clients (e.g. the CGDI WMS Client Component) that allows searching of WMS registries/catalogs is used, the points can be mapped on a variety of background map layers.
- The application can be built to accept UTM coordinates to facilitate GPS users.

This project relies on: Mapserver: http://mapserver.gis.umn.edu/home.html Demis by world map server: <u>http://www.demis.nl/</u>

**Debbie Pagurek**, Agriculture and Agri-Food Canada, 960 Carling Avenue, Ottawa, Ontario, Canada, K1A 0C6, Email address: pagurekd@agr.gc.ca Telephone: (613) 759-1543 Fax: (613) 759-1937

**Derek Munro**, Agriculture and Agri-Food Canada, 960 Carling Avenue, Ottawa, Ontario, Canada, K1A 0C6, Email address: <u>munrodb@agr.gc.ca</u> Telephone: (613) 759-6636, Fax: (613) 759-6639

1 HTML is generated with selected headers and footers 2 Query result URL is opened in a second browser window

compliant application

(Blue Jays) in another OpenGIS

WMS Getmap request for Cyanocitta cristata