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CRREL's Ice Jam Database and Website

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CRREL's Ice Jam Database and website was created in 1992 and currently contains over 15,500 ice jam entries. It was established to integrate current information related to ice jams and ice jam flooding potential across the United States, to provide links to technical assistance available from the U.S. Army Corps of Engineers, and to serve as a repository for historic ice events dating back to 1780. The site offers technical information on river ice safety, causes and possible solutions to ice jam flooding, ice guides, ice jam data collection information, and a variety of ice jam-related bulletins and reports. Real-time river conditions may be viewed via webcam links on certain historically jam-challenged rivers in various US locations. Links updated daily, or frequently, include NOAA/NOHRSC's nationwide snow depth and snow water equivalent maps, and NWS Alaska-Pacific River Forecast Center's snow depth, river ice thickness, and river ice breakup maps. The Ice Jam Database interactive map is linked directly to the database records and displays the location and status of current and historic jams in real-time. Events in the database can be queried by location using the interactive map or through text-based queries by selecting any of the ice jam entry parameters (river name, state, city, year, jam type, damages, gage station, Hydrologic Unit Code (HUC)). The results from both query methods are displayed on-screen and are exportable in a variety of data formats (comma-delimited CSV files, tab- and tilde-delimited files, and/or GIS shapefiles). The database was recently migrated to an Oracle database and the Web-accessible application was re-coded as an Oracle Application Express (APEX) application. The focus of this report will be to provide an introduction to the Ice Jam Database and Web-accessible application, and to describe the details of database and application navigation.

1. Introduction

The Cold Regions Research and Engineering Laboratory (CRREL) Clearinghouse and Ice Jam Database (IJDB), has entered its 15th year of nationwide ice jam documentation. The IJDB was initiated in 1992 after CRREL researchers recognized that the lack of systematically compiled data on ice events hampered effective ice jam emergency response and hindered research and development in the areas of ice processes (White, et al., 2007). The IJDB website comprises two components: the Clearinghouse and the Oracle Database with a Web-accessible interactive map and query tools.

The Clearinghouse provides links to a wide variety of information regarding and relating to ice jams. Examples of links include Technical Resources and Reports, Flooding Conditions and Flood Outlooks, Ice and Snow Maps and Reports, Webcams, Ice Safety Instruction including a video of how to survive a fall through an ice cover, and a variety of real-time, recent, and historic information related to meteorological and hydrologic conditions courtesy of National Weather Service (NWS), National Oceanic and Atmospheric Administration (NOAA), National Operational Hydrologic Remote Sensing Center (NOHRSC) among other agencies.

The Database's more than 15,500 ice jam event entries, include historical events, those witnessed and reported in newspapers, television, internet, and near real-time events reported by the NWS. An ice event can be described by the broad definition used by the International Association for Hydraulic Research: "An accumulation of ice at a given location which, in a river, restricts the flow of water" (Starosolszky, 1977) (White, 1996). The database is useful not only as a centralized record of ice events, but also for the many potential applications of the information, including rapid identification of potential ice jam stages, flooded areas, and mitigation methods at some known ice jam locations (White, Eames 1999). Information about events in the database is obtained via text-based or map-based queries of the database through a Web-accessible application.

Staff at the Remote Sensing/GIS Center of Expertise have recently migrated the IJDB from a system where data are stored as a series of system directories and HTML files to a spatially-enabled Oracle database. The Web-based application used for viewing and querying the data in the IJDB has been re-coded from PHP to Oracle Application Express (APEX). This migration to an Oracle database and application development environment was performed to expand the accessibility of data in the IJDB, promote connectivity between this database and other Corps databases, and increase distribution of data and information to stakeholders and the general public. The underlying database format and configuration will permit robust data storage, seamless data sharing, and open-source data acquisition and distribution. The database structure and Web-accessible application are consistent with Federal and Corps Enterprise Architecture guidance. An introduction to the IJDB and an overview of how data are accessed and displayed will be the focus of this report.

Access to the new Oracle database is via the "Access the Ice Jam Database" hyperlink found on the left side bar under "Home" on the Clearinghouse Homepage, found on the Web at <http://www.crrel.usace.army.mil/icejams/>.

2. The New Oracle Database—What’s the same as the original IJDB?

Currently, the Clearinghouse Homepage and the new Database Homepage have links in common, directing users to the same locations (figures 1 and 2):

1. Flood Conditions and Flood Outlook
2. Ice and Snow Maps and Products
3. Related Links
4. Technical Resources
5. Web Camera Links (Clearinghouse)
Web Camera Images (new Database)
6. Text Query
7. Map View and Query

The screenshot shows the homepage of the Ice Jam Database. At the top, there is a navigation bar with links: Return to Clearinghouse, Terminology, Summaries, Help, Contact Us, and Logout. Below this is a header with the title "Ice Jam Database, Bulletins & Surveys" and a sub-header "Home" with tabs for Home, Text Query, Map View and Query, and Administration. On the left side, there is a "Links" section with five items: Flood Conditions and Flood Outlook (1), Ice and Snow Maps and Products (2), Related Links (3), Technical Resources (4), and View the most recent Web Camera Images (5). The main content area includes an "Introduction" section, an "Accessing the Ice Jam Database" section, and a table titled "The Ice Jam Database application is organized into several components, including:". The table has three rows: Home, Text Query, and Map View and Query, each with a brief description. At the bottom left, there is contact information for the Ice Engineering Research Group and the CRREL logo. At the bottom right, there is funding information from USACE Headquarters.

Return to Clearinghouse Terminology Summaries Help Contact Us Logout

Ice Jam Database, Bulletins & Surveys

Home Text Query Map View and Query Administration

Links

- 1 Flood Conditions and Flood Outlook
- 2 Ice and Snow Maps and Products
- 3 Related Links
- 4 Technical Resources
- 5 View the most recent Web Camera Images

Introduction
The Ice Jam Database is maintained by the **Ice Engineering Group** at CRREL and currently consists of approximately 15,000 records from across the US. Additional information about the Ice Jam Database and related Ice Engineering Group activities can be found [here](#).

Accessing the Ice Jam Database
The Ice Jam Database application contains several tools for accessing information about both historic and current ice jams, and relate information about the processes involved in the formation of an ice jam. All of the tools and reports in the application are available by clicking the hyperlinked tabs at the upper left and slightly lower right of the application pages. Additional information about application navigation and the query tools can be found in the help documentation by clicking the "Help" tab.

The Ice Jam Database application is organized into several components, including:

Home	The "Home" tab contains general information about the CRREL Ice Engineering Group and the Ice Jam Database, Bulletins and Surveys. Additional information and links are also available at the upper left of the application from all pages.
Text Query	The "Text Query" tab contains a tool to obtain information about current and historic ice jams from the Ice Jam Database. Database results can be customized by selecting records that meet the selected location, date, and content criteria.
Map View and Query	The "Map View and Query" tab provides a mechanism for querying the Ice Jam Database using an interactive map. The map interface also includes map utilities for measuring area and distance, and creating a pre-formatted printable map of the selected map view.

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CRREL

Funding for Site provided by
USACE Headquarters
Civil Works Directorate
Civil Emergency Management

Figure 1. New Oracle Database Homepage

CRREL Ice Jam Information Clearinghouse - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://www.crrel.usace.army.mil/icejams/index.htm

7-Day Forecast for Lati... National Weather Servi... Personal Weather Stati... Experimental Graphical... CRREL Ice Jam Infor

CRREL Ice Jam Information ... https://rsgis.crre....army.mil/icejam/

**Welcome to the US Army Corps of Engineers
Engineer Research and Development Center
Cold Regions Research and Engineering Laboratory**

Army USACE ERDC Search CRREL Site Map Contact CRREL

Ice Jam Information Clearinghouse
[Ice Jam Database and Map Updated Daily](#)

Home

7 [Query Ice Jam Database](#)

6 [Map Based Query](#)

[Text Based Query](#)

1 [Flood Conditions and Flood Outlook](#)

5 [WebCamera Links](#)

[Summary and Monitoring Reports](#)

2 [Ice and Snow Maps and Reports](#)

3 [Related Links: USACE, NWS, NOAA, etc.](#)

4 [Technical Resources](#)

email us:
icejam@usace.army.mil

Current Ice Jams

Quick Looks

Emergency Assistance

Ice Jams & Ice Jam Flooding

Advance Measures & Technical Assistance

Overview

This Web Site has been established to integrate current information related to Ice Jam and Ice Jam Flooding Potential across the United States and to provide links to technical assistance available from the U.S. Army Corps of Engineers.

During the winter months, you can expect frequent changes as data will be updated daily if possible and new products added as they are completed. Information resources available include:

- Ability to view and query the CRREL Ice Jam Database (map or text based)
- Access to current Spatial Data (in winter) :
 - Ice thickness (empirical and measured)
 - Snow depth and water equivalence
- Downloadable maps
- Index map to potential ice jam flooding
- Ice guides, reports, and other information
- Links to other agencies providing ice or snow related information

Ice Safety Information

Safety on Floating Ice Sheets

How to Survive a Fall Through the Ice

Technical Information

[Ice Jam Flooding: Causes & Possible Solutions](#)
Engineering & Design

[Introduction to Ice Jams](#) (pdf)

[Ice Jam Mitigation](#) (pdf)

[Ice Engineering Bulletins and Tech Notes](#)

[Ice Engineering Technical](#)

Figure 2. Clearinghouse Homepage. Numbers 6 and 7 will be replace with the “Access the Ice Jam Database” hyperlink

3. Ice Jam Views

The IJDB map displays ice jams occurring during the current water year (October—September), with a star placed at the jam location (Figure 3), and the location name when zoomed close enough. Jam type is indicated by the color of the stars: red—causing flooding, blue—frozen in place, yellow—freeze up, pink—breakup, no flooding, and green—the jam has released. This layer may be queried.

Historic jams are represented by colored boxes, based on the number of jams occurring at that location; small yellow—one jam, medium yellow—2 to 5 jams, orange—5 to 10 jams, red—more than 10 jams (Figure 4). Once magnified with zoom option sufficiently, the actual number of jams is displayed on the map in addition to the colored box (Figure 5). This layer may also be queried.

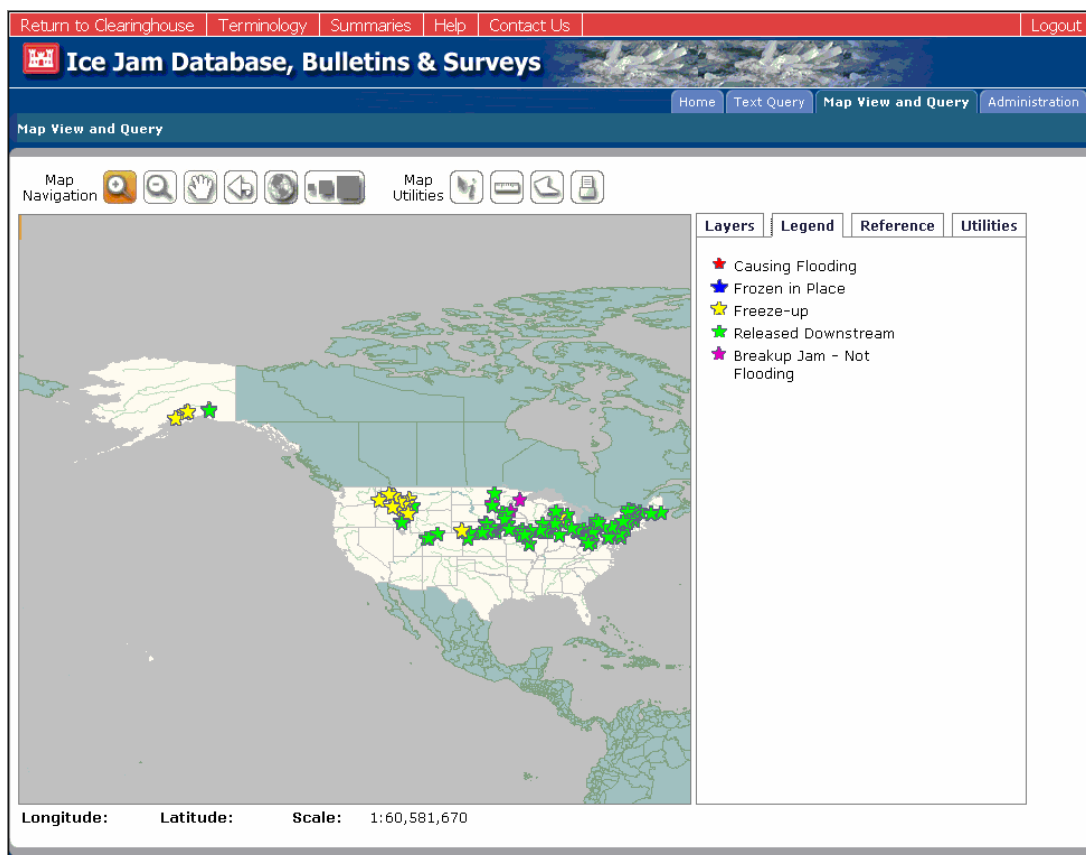


Figure 3. Jam types and locations of current water year as of 24 April 2007

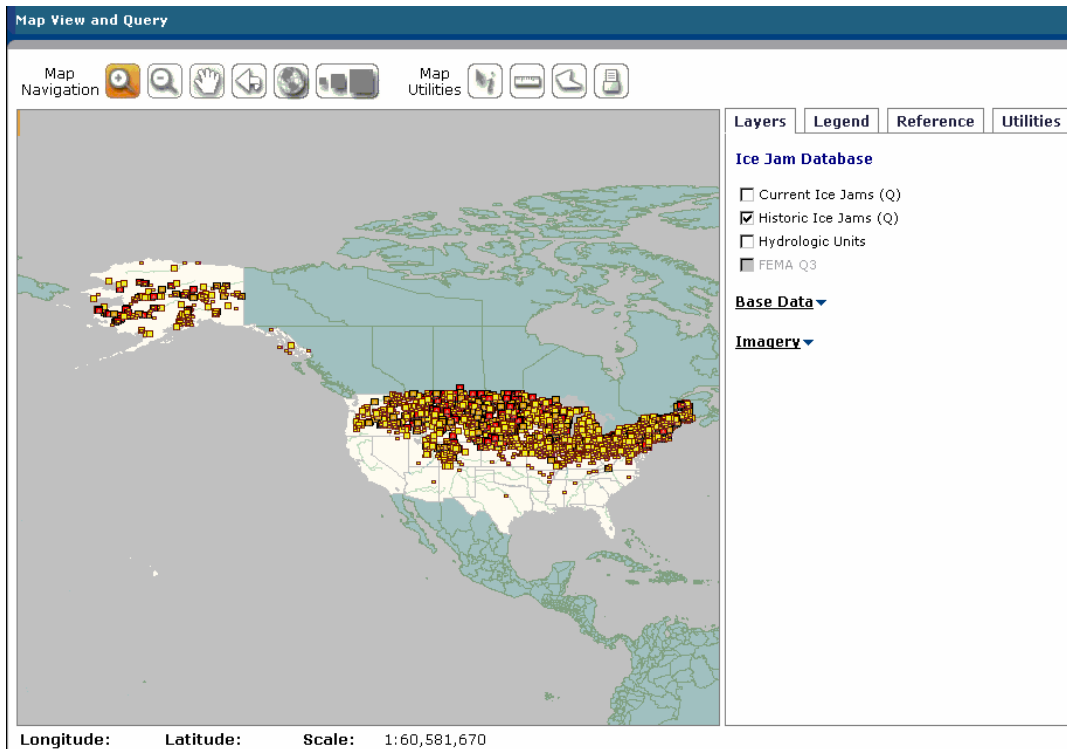


Figure 4. Location of historic jams, dating back to 1780

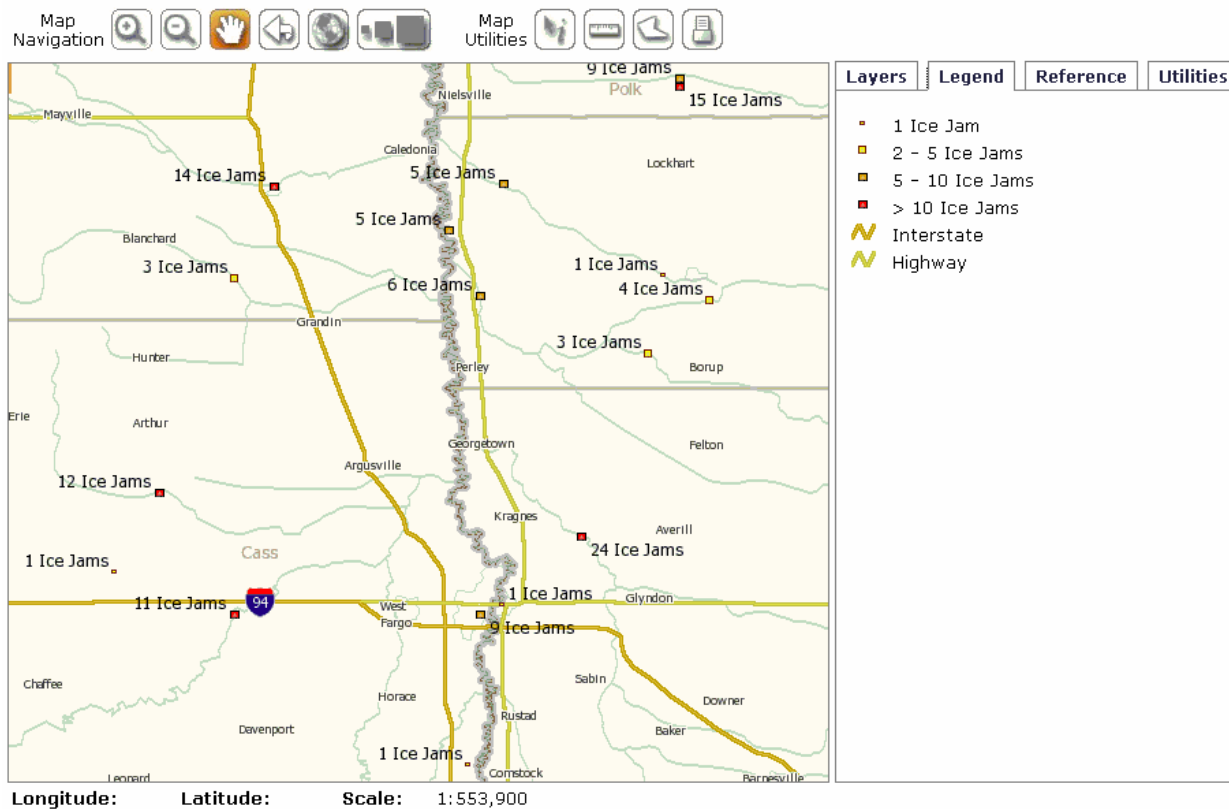


Figure 5. Historic jams along the South Dakota/Minnesota border. At this level of magnification, the number of jams is displayed.

4. Map-Based Query

The Map View is accessed by selecting the “Map View and Query” tab on the top right banner of the database homepage. The IJDB may be queried directly from the Map View, by zooming in to the area of interest, selecting the map utility identify (“i”) button, selecting the query layer (Current or Historic Ice Jams) which appears when identify button is selected (Figure 6), and clicking the star to query. A brief query result will populate the lower right space (Figure 7). Selecting “View” next to “View Complete Info” will open a new window containing all the information regarding that jam (Figure 8). If visuals or reports accompany the data, they may be viewed by selecting the visuals/reports hyperlinks (Figure 9).



Figure 6. Map based query: zoom, select identify “i” button, and “current ice jams” layer

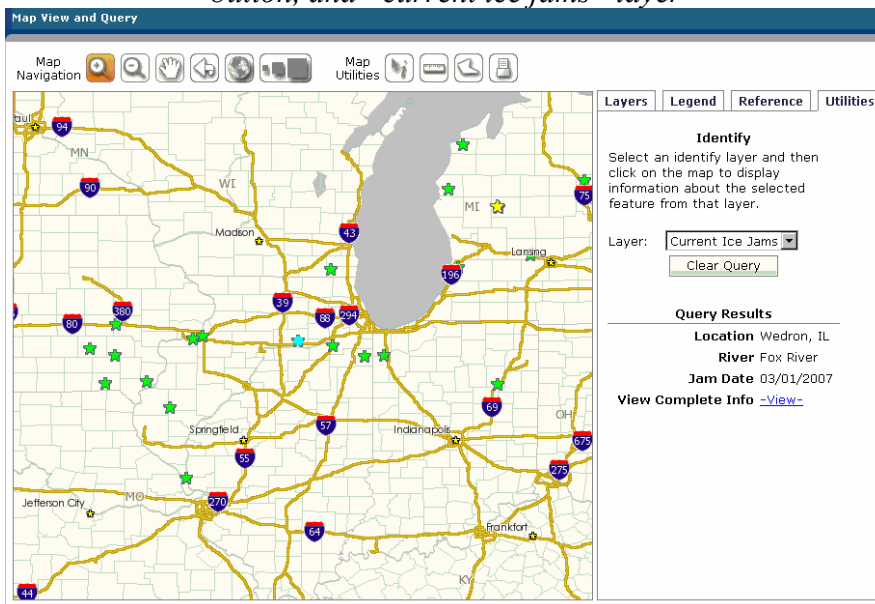


Figure 7. Query result: star selected using “i” button, result displayed lower right

Export Report

Index Number	20070306165240
Location	Wedron, IL
River	Fox River
Jam Date	03/01/2007
Water Year	2007
Jam Type	Released
Current Condition	-
Damages	-
CRREL Contact	K. White
Local Contact	William Morris, NOAA, NWS Chicago
Visuals	View 1 visual(s) available
Reports	-
Latitude	41° 26' 0" N
Longitude	88° 46' 16" W
Gage Number	05552500
Hydrologic Unit	07120007
Description	William Morris, National Weather Service, Chicago, reported a breakup jam occurring on the lower Fox River in LaSalle county, Thursday 1 March 2007 around 3 PM. Ice movement began, then jammed at a bridge in Wedron, Illinois, resulting in some residential flooding. The channel is now ice free, according to the LaSalle county EMA. -- Keywords: Fox River at Wedron, IL on Mar 01, 2007 [20070306165240]
Publication	Correspondence from William Morrison, NWS Chicago to Pat Weyrick -- Keywords: Fox River at Wedron, IL on Mar 01, 2007 [20070306165240]

Figure 8. Detailed query result (selecting "View" in Figure 7)

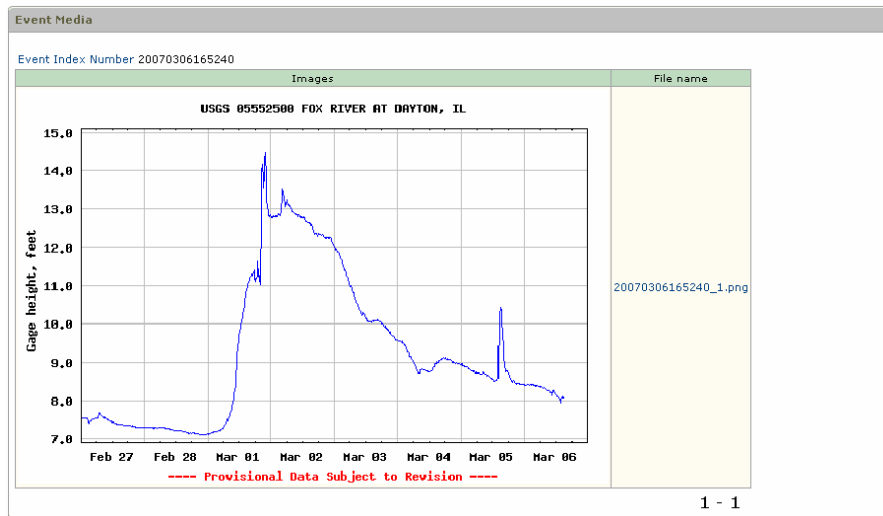


Figure 9. “Visual” selected from detailed query result

It is not unusual for more than one jam to occur in the same location in the same water year. These jams may be missed if the user’s view is not magnified enough. An example of this can be seen in Figures 6 and 7. Note the yellow star in Michigan. When zoomed in close enough, a second star can be seen (Figure 10). The application will note the location of each jam, hence 2 “Big Rapids” appear on the map.

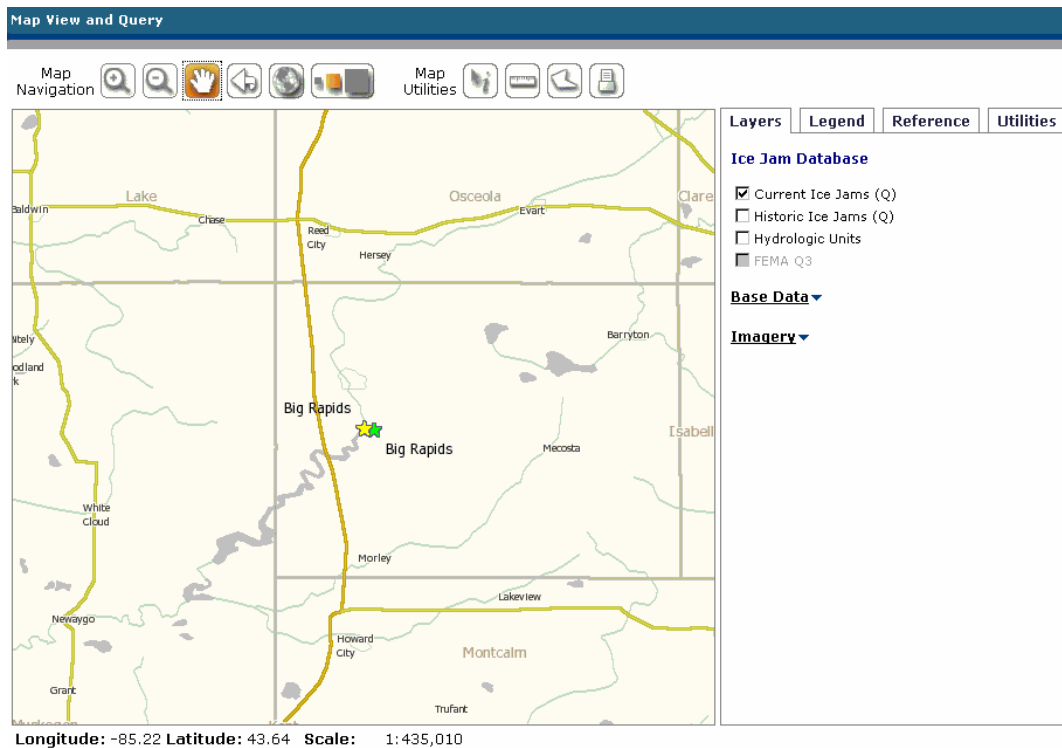


Figure 10. Two jams in the same location during the same water year can be seen if the user’s view is magnified enough

5. Text-Based Query

The IJDB may also be queried based on a variety of text-based parameters. The pull-down menus contain all the states, cities, and rivers currently in the database. Once a state is chosen, the cities and rivers of that state will populate those pull-down menus. Queries can also be based on (USGS) station numbers, HUCs, jam types, current jam conditions, and those parameters listed in “optional” pull-down menu. Date ranges can be chosen as an additional filter by using the calendars to the right of “start” and “end” dates. Jam records exist from 1780 to the present; however, to query prior to 1921, the date will have to be hand-entered into the text boxes in a DD-MON-YYYY format.

Figure 11 displays the result of a text query for “DE”: all jams recorded occurring in Delaware. The result shows one jam in Wilmington on 14 February 1948.

Text Query	Text Query Results																																				
<p>Total Number of Records in database 15556</p> <p>Select geographic data to filter your query.</p> <p>State Name <input type="text" value="DE"/></p> <p>City Name <input type="text" value="Select a City..."/> OR Enter City Name <input type="text"/></p> <p>River Name <input type="text" value="Select a River..."/> OR Enter River Name <input type="text"/></p> <p>Select USGS gage or hydrologic data to filter your query.</p> <p>Enter USGS Gage <input type="text"/></p> <p>Enter USGS HUC <input type="text"/></p> <p>Select ice jam status information to filter your query.</p> <p>Jam Type <input type="text" value="Select a Jam Type..."/></p> <p>Current Conditions <input type="text" value="Select a Condition..."/></p> <p>Select additional information to filter your query.</p> <p>Optional <input type="text" value="Search Field"/> Search Value <input type="text"/></p> <p>Reports With <input type="checkbox"/> Visuals Only Reports With <input type="checkbox"/> Reports Only</p> <p>Select a date range to filter your query.</p> <p><small>* Note: Records exist from 1780 to the present. However, to query any date prior to 1921, please hand enter the dates into text boxes (DD-MON-YYYY)</small></p> <p>Start Date <input type="text"/> End Date <input type="text"/></p> <p style="text-align: right;"><input type="button" value="Submit"/> <input type="button" value="Reset All"/></p>	<p>row(s) 1 - 1 of 1 Export Report</p> <table border="1"> <tbody> <tr><td>Index Number</td><td>3934</td></tr> <tr><td>Location</td><td>Wilmington, DE</td></tr> <tr><td>River</td><td>Brandywine Creek</td></tr> <tr><td>Jam Date</td><td>02/14/1948</td></tr> <tr><td>Water Year</td><td>1948</td></tr> <tr><td>Jam Type</td><td>-</td></tr> <tr><td>Current Condition</td><td>-</td></tr> <tr><td>Damages</td><td>-</td></tr> <tr><td>CRREL Contact</td><td>K. White</td></tr> <tr><td>Local Contact</td><td>-</td></tr> <tr><td>Visuals</td><td>-</td></tr> <tr><td>Reports</td><td>-</td></tr> <tr><td>Latitude</td><td>39° 44' 8" N</td></tr> <tr><td>Longitude</td><td>75° 35' 5" W</td></tr> <tr><td>Gage Number</td><td>01481500</td></tr> <tr><td>Hydrologic Unit Code</td><td>02040205</td></tr> <tr><td>Publication</td><td>Tice, RH (1968) "Magnitude and Frequency of Floods in the United States Part 1-B. North Atlantic Slope Basins, New York to York River" USGS Water-Supply Paper 1672. -- Keywords: Brandywine Creek at Wilmington, DE on Feb 14, 1948 [3934]</td></tr> <tr><td>Description</td><td>maximum annual gage height of 8.72 feet, affected by backwater from ice, reported at USGS gage Brandywine Creek at Wilmington, on February 14, 1948. -- Keywords: Brandywine Creek at Wilmington, DE on Feb 14, 1948 [3934]</td></tr> </tbody> </table>	Index Number	3934	Location	Wilmington, DE	River	Brandywine Creek	Jam Date	02/14/1948	Water Year	1948	Jam Type	-	Current Condition	-	Damages	-	CRREL Contact	K. White	Local Contact	-	Visuals	-	Reports	-	Latitude	39° 44' 8" N	Longitude	75° 35' 5" W	Gage Number	01481500	Hydrologic Unit Code	02040205	Publication	Tice, RH (1968) "Magnitude and Frequency of Floods in the United States Part 1-B. North Atlantic Slope Basins, New York to York River" USGS Water-Supply Paper 1672. -- Keywords: Brandywine Creek at Wilmington, DE on Feb 14, 1948 [3934]	Description	maximum annual gage height of 8.72 feet, affected by backwater from ice, reported at USGS gage Brandywine Creek at Wilmington, on February 14, 1948. -- Keywords: Brandywine Creek at Wilmington, DE on Feb 14, 1948 [3934]
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Figure 11. Text-based query (left) and result (right) for jams in database located in DE (Delaware)

6. New Features of the Map View

- ✧ Base Data Options:
Roads, railroads, places, and 109th Congressional Districts are layers available at most map scales. Hydrologic Unit Codes (HUCs), postal zip codes, landmarks, and recreation areas become available layers as zoom level increases (Figures 12 and 13).
- ✧ Imagery options:
Blue Marble Global MODIS, Ortho Imagery, TeraServer DRG, NEXRAD Radar, Natural Vue (15m), USGS Gulf/Atlantic Mosaic (0.5m)
- ✧ Historic Jams: number of jams per location displayed on map at appropriate scale
- ✧ Multiple Legends displayed based on layers selected and zoom level
- ✧ Hand Pan Tool provides easier navigation

7. New Map Tools

- ✧ Distance Measurement:
The distance between points clicked is displayed in kilometers, for each segment and the total distance.
- ✧ Area Measurement:
The area of a polygon described by the user is displayed in square kilometers.
- ✧ Printable Map:
Once the user has created the map desired, using all the options and tools available, the map may be printed by selecting the “print” icon.

8. Home Page Red Banner

- ✧ Summaries:
A list of summaries available, such as “Number of Events Ranked by State”, may be selected and may also be sorted by any of the parameters within that report. For instance, the total number of ice events can be listed by the most to the least number, or alphabetically by state, in ascending or descending order.
- ✧ Terminology:
A list of “Multilingual Ice Terminology” published by the Research Centre for Water Resources Budapest in 1980, is displayed.

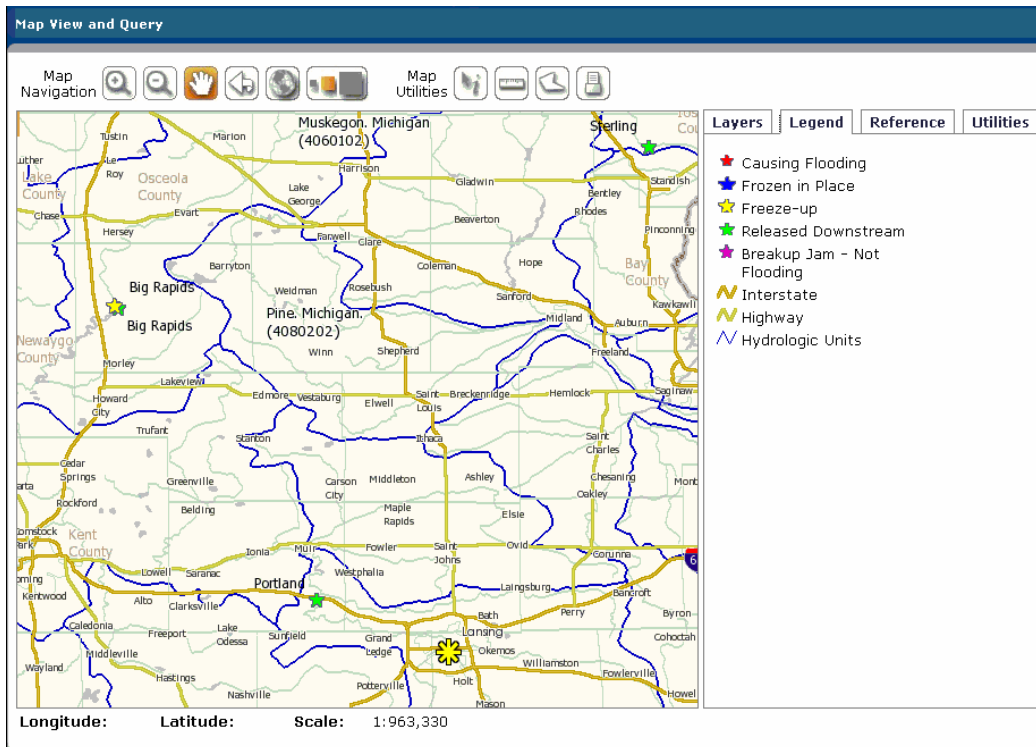


Figure 12. Hydrologic Unit Code (HUCs) layer, with name and number displayed

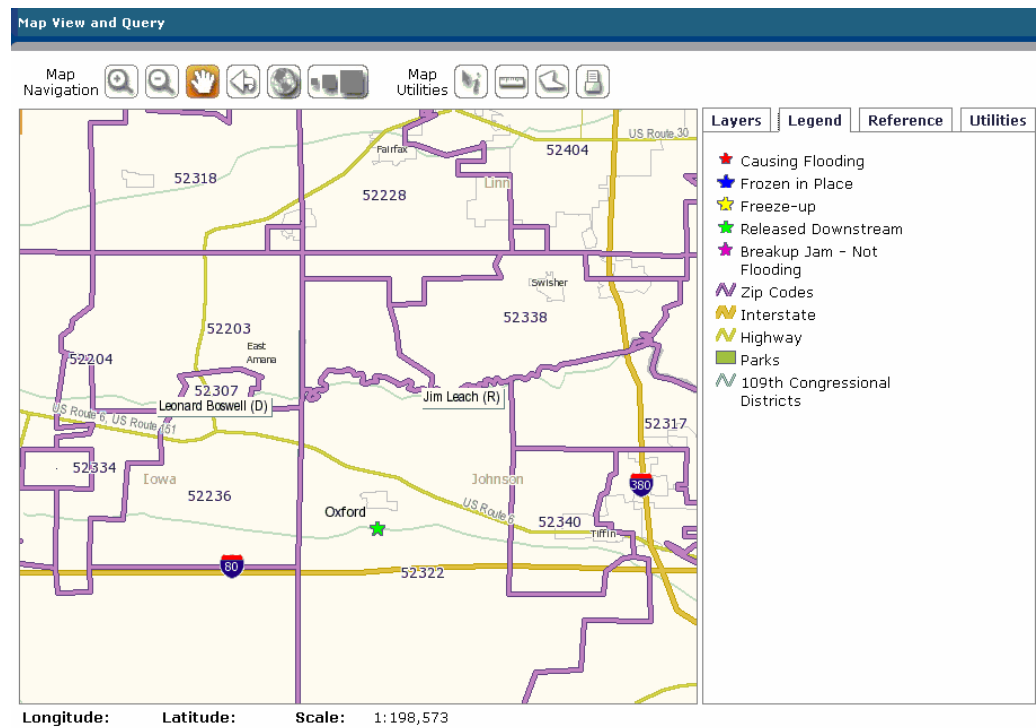


Figure 13. Zip Code and Congressional District layers

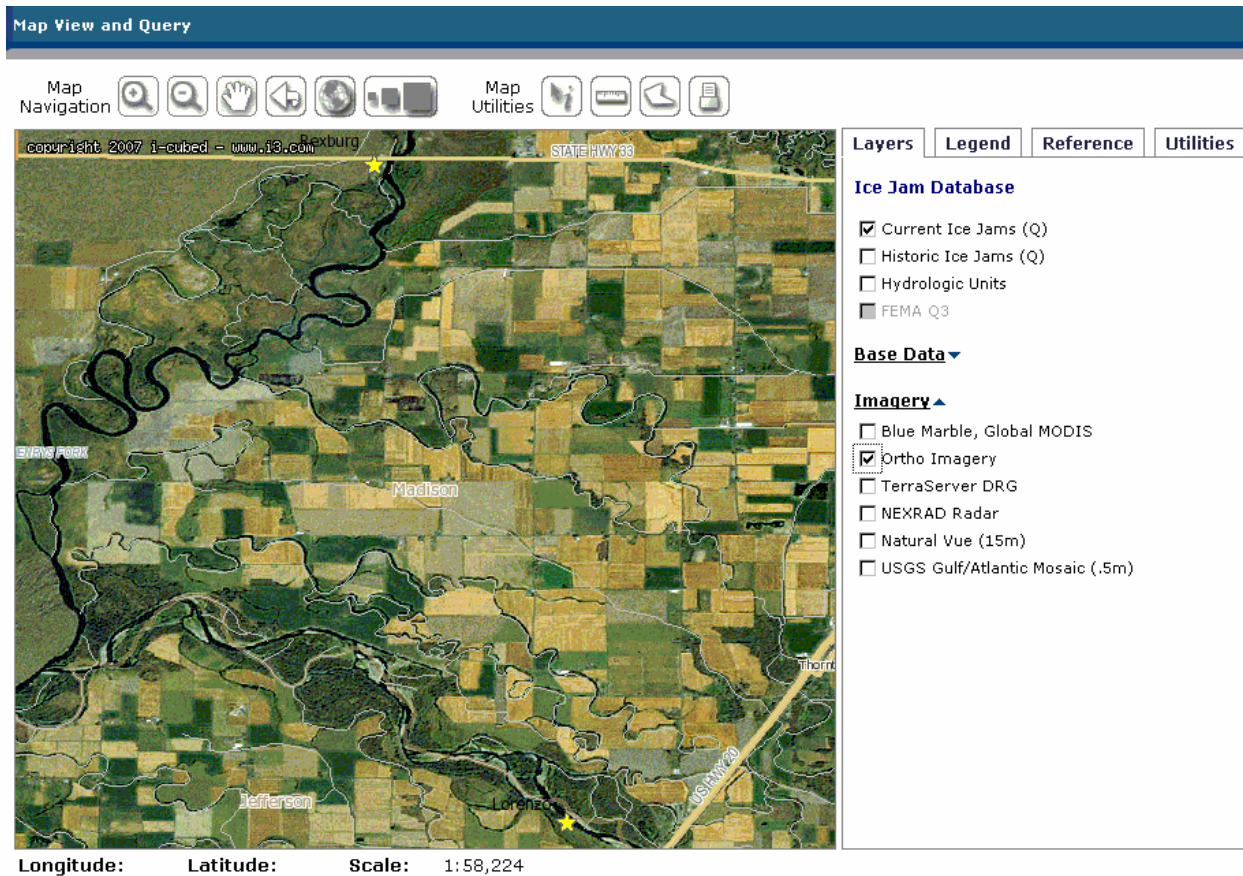


Figure 14. Two freeze-up jams in Idaho overlay Ortho Imagery

9. Summary

As of 1 June 2007, the new Oracle Ice Jam Database was made public. Access to the database is available on the Clearinghouse Homepage found on the Web at <http://www.crrel.usace.army.mil/icejams/>. “Access the Ice Jam Database” link on the left below “Home” will bring the user to the new database. The new Oracle application will improve data accessibility and provide connectivity between this and other Corps databases, and allow for the increased distribution of ice jam data and information to emergency response personnel, researchers, and the general public. Hyperlinks to ice jam information, such as Technical Resources and Flood Conditions and Outlook, and Ice and Snow Maps, Web Camera images and all other products are accessible on both the Clearinghouse Homepage and the Ice Jam Database Homepage. The map- and text-based querying capabilities remain, but are much more user-friendly and informational. Multiple map layers, utilities, and imagery options give the user a wide variety of options to capture and portray the data of interest to them, as well as a variety of exportable data formats.

Acknowledgements

This work was funded in part by USACE Civil Works General Investigations-funded research in the Flood and Coastal Storm Damage Reduction Research Program focus area of Emergency Management Technologies (Program Management); the USACE Directorate of Homeland Security Civil Emergency Management Branch; and the CRREL Technical Area of Hydrology and Hydraulics.

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