

International Charter Space and Major Disasters



Charter Activation # 212

Charter Call ID # 250

Disaster Event Floods in North Dakota

Disaster Location Red River, North Dakota,
USA

Date of Final Reporting 10 March 2010

Final Report

Reporting forms completed by: Lance D Yarbrough

Reporting forms reviewed by: Brenda Jones

Project Managers for Charter activations are expected to provide the final report to the Charter Executive Secretariat within 45 days after the start of the activation.

*Completion of these fields is mandatory.

A. Disaster Event Summary

*A1. Emergency type: (indicate choice with an [X])	<input type="checkbox"/> Earthquake <input checked="" type="checkbox"/> Flood <input type="checkbox"/> Landslide <input type="checkbox"/> Storm/Hurricane <input type="checkbox"/> Other (specify):	<input type="checkbox"/> Fires <input type="checkbox"/> Volcano <input checked="" type="checkbox"/> Ice <input type="checkbox"/> Industrial danger
*A2. Date disaster initiated (dd/mm/yyyy): 26/03/2009		
*A3. Disaster location and extent: Red River of the North, North Dakota and Minnesota, USA and southern Manitoba, Canada		
A4. Estimated number of deaths: 3		
A5. Estimated number of people affected: 800,000+		
A6. Estimated economic losses: unknown		
A7. Additional disaster impacts (environmental, infrastructure, etc):		
A8. Additional disaster event details:		

B. Activation Information

*B1. Date of Charter activation (dd/mm/yyyy): 25/03/2009

*B2. Geographical Coordinates (Lat – Long)

Bounding Box:	Upper left corner: 48 0 0 N 97 12 0 N	Centre Point(s):	
	Upper right corner:		
	Lower left corner:		
	Lower right corner: 47 50 0 N 96 55 0 N		

*B3. Authorized User/Requestor: Lance Yarbrough *Organization: University of North Dakota *Date AU contacted ODO (dd/mm/yyyy): 25/03/2009

*B4. Identify the agency that requested the Charter activation and why:
University of North Dakota requested the activation to support flood fighting efforts.

*B5. ECO: Mademba-Sy Odile [odile.mademba-sy@adecco.cnes.fr]	*Organization: International Charter Executive Secretariat representative for CNES (Lead Agency)	*Date ECO contacted PM (dd/mm/yyyy): 25/03/2009
*B6. Project Manager: Lance Yarbrough	*Organization: University of North Dakota	*Date PM nominated (dd/mm/yyyy): 25/03/2009

*Completion of these fields is mandatory.

*B7. Value-adding Reseller or organization(s): Internal		*Date VAR received first images (dd/mm/yyyy): 25/03/2009
*B8. End User(s): Jim Campbell City of Grand Forks, ND	*Organization: University of North Dakota City of Grand Forks, North Dakota	Date first product delivered to End User (dd/mm/yyyy): 02/04/2009

C. Intervention Summary

*C1. Describe the activation in detail and describe the interaction between the PM and the AU:
The possibility of increased flooding in the Red River Valley was the cause for the activation. The USGS AU then nominated the PM..

*C2. Provide a chronology of events associated with the disaster and the Charter activation:

Mon 03/16/2009 – Governor of North Dakota declares a State Emergency
Wed 03/24/2009 03:13 PM – Activation request was to USGS representative
Wed 03/25/2009 2:34 AM – Charter was activated

*C3. Fill in the table below identifying the available satellite data with an [X]. List the date (mm/dd/yyyy) that each image was collected).

Agency	Satellites	Dates of frames requested ¹		*Dates of frames acquired		Dates of frames used in value-adding	
		Programmed	Archived	Programmed	Archived	Programmed	Archived
[] CONAE	[] SAC-C(HSTC)						
	[] SAC-C (MMRS)						
	[] SAC-C(HRT)						
[] CNES	[] SPOT-1						
	[] SPOT-2						
	[] SPOT-3						
	[] SPOT-4						
	[] SPOT-5(HRG)						
	[] SPOT-5(HRS)						
	[] SPOT-5(Veg)						
	[] FORMOSAT						
[] CNSA	[] CBERS(WFI)						
	[] CBERS(CCD)						
	[] CBERS(IMS)						
[X]	[X] RADARSAT-1						

¹ This information may be available on the ERF. If not, you may leave this section blank.

CSA	<input checked="" type="checkbox"/> RADARSAT-2	03/28/2009		03/28/2009		03/28/2009	
[] DMC	[] DMC						
	[] TopSat						
[X] ESA	[X] ENVISAT	03/25/2009 03/27/2009 03/30/2009	02/17/2006 03/08/2006	03/25/2009 03/27/2009 03/30/2009	02/17/2006 03/08/2006	03/25/2009 03/27/2009 03/30/2009	03/08/2006
	[] ERS2						
	[] PROBA						
[] ISRO	[] IRS1C						
	[] IRS1D						
	[] IRSP4						
	[] IRSP6						
[X] JAXA	[] ALOS(PRISM)						
	[] ALOS (AVNIR-2)						
	[X] ALOS (PALSAR)	03/29/2009		03/29/2009		03/29/2009	
[] NOAA	[] POES						
	[] GOES						
[] USGS	[] LANDSAT-5						
	[] LANDSAT-7						
	[] IKONOS						
	[] QuickBird						
	[] WorldView						
	[] GEOEYE1						
[] Other (insert satellite names)	[]						
	[]						
	[]						
	[]						

D. Intervention Assessment

D1. Explain how the value-adding service provider was chosen:

PM provided value adding

*D2. List the value-added products obtained from the Charter data:

Flood inundation polygons, ice jam locations, maps to show possible saturated soils and inundated locations

*D3. Comment on the quality of the value-added products:

The VAPs were useful for reconnaissance and indentifying the flood water extent.

*Completion of these fields is mandatory.

D4. Identify the end users of the value-added products and how they used the products during the various phases of the disaster cycle. If the value-added products were used to illustrate the impact or extent of the disaster during briefing meetings, include this information:

*D5. Comment on how useful the value-added products were in practice for the end user. Include any other relevant information about how the Charter assisted the end user in mitigating the effects of the disaster:

No levees were breached in the Fargo and Grand Forks area. The VAPs were used to help identify saturated soils and ice jams.

*D6. Identify data provided by the Charter that was not used. If possible, explain why it was not used:
All was used.

D7. Based on use of the data provided by the Charter, provide recommendations to improve the scenarios for Charter activations of this type in the future:

The RADARSAT2 data could not be properly ingested using ITT ENVI 4.5. The raw data required a additional rectification process.

*D8. Summarize the conclusions of the project. Discuss any relevant issues associated with the use of the value-added products in the emergency response; the functional units of the Charter; the ability of the PM, value-added service provider and end users to work within the Charter structure; and/or, any other issues encountered during the activation:

The activation of the Charter went very smoothly. The data was requested and provided in a timely manner. The delivery time of a single SAR scene from a Charter participant was less than 12 hours from the time of acquisition. This expedited service allowed additional time for creating image-based derivations, field checking and delivery to a decision maker or emergency responder. SAR-derived data sets include identification of river ice and saturated ground conditions. This data could be provided to experts in river ice engineering for use in the development of plans to reduce ice jamming, its effect on water levels and additional stresses on river infrastructure.

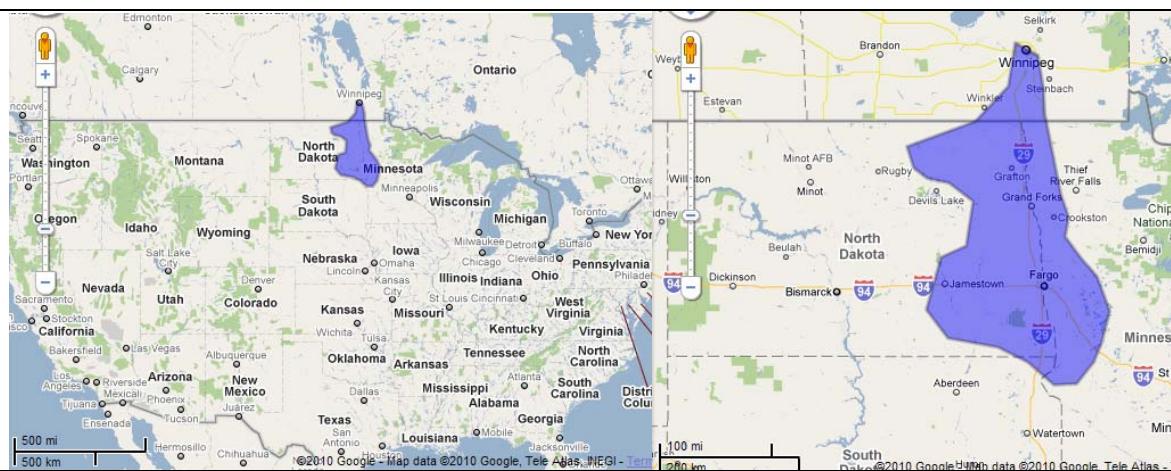
During disaster response applications, SAR data was found to very useful in indentifying open water and the front of ice jams. Using a river mask from historical imagery, the SAR data helped to confirm if areas behind flood protection were, in fact, frozen flood water or snow-covered field.

D9. Additional comments, questions, observations, and lessons learned:

E. Supporting Documentation

*E1. Insert a map of the affected area and extent of the disaster impact:

*Completion of these fields is mandatory.



*E2. Provide samples of media coverage of the disaster event from TV, radio, news papers, websites, etc. Where possible, copy the content of the article into the PM report rather than only the web addresses:
 "Fargo residents rushing to fill sandbags for flood onslaught". *Winnipeg Free Press*. March 20, 2009.
"Winnipeg flood clean-up expected to cost millions: mayor". CBC news. April 23, 2009.
<http://www.cbc.ca/canada/manitoba/story/2009/04/22/mb-flood-city-costs.html>. Retrieved 2009-04-27.

Winnipeg flood clean-up expected to cost millions: mayor

Last Updated: Thursday, April 23, 2009 / 3:08 PM CT

[CBC News](#)



A resident on Glenwood Crescent in Winnipeg was forced to carry belongings from his flood garage after the Red River breached the dikes last week. (Sean Kavanagh/CBC)

*Completion of these fields is mandatory.

Winnipeg Mayor Sam Katz estimates the city's tab for fighting the 2009 flood will total at least \$5 million.

The numbers are still very preliminary, but officials estimate includes the expense of making sandbags, distributing them, and having city crews patrol the dikes around the clock will be around \$4 million.

Katz expects the bill for cleaning up and removing the sandbags will be at least another \$1 million.

Neither of those tabs includes the estimated cost of repairing roads, bridges and riverbanks. That cannot be calculated until after the water recedes, Katz said.



Most of the land around Peguis First Nation, about 145 kilometres north of Winnipeg, is under water. (John Redekop/CBC)

More than 200 low-lying properties in the city either flooded or were at serious risk of flooding as the Red River and its tributaries — the Assiniboine River and Seine River — became bloated with rain and spring runoff. High flows on local streams such as Sturgeon Creek and the La Salle River also contributed to the problem.

Fortunately, the levels of most tributaries and rivers in Manitoba are now on the decline, according to the provincial flood forecast. Only the Souris River continues to rise; it is expected to do so until the end of the month.

Across the province, 1,680 square kilometres of land is under water and 2,470 people have registered as evacuees with the Red Cross or Manitoba Association of Native Fire Fighters.

First Nations hit hard

More than half of the evacuees are from First Nations communities.

A few hundred of the 800 people who live in Roseau River Anishinabe First Nation in southern Manitoba remain in Winnipeg, while 230 residents of Fisher River First Nation north of Winnipeg were forced out of their homes. About 180 people from Fisher River have since returned and the remaining 50 were expected to go back on Wednesday as the floodwaters recede.

'We are very restricted in where we can build our homes in the community just because the land is really unusable, a lot of swamp.'—Chief David Crate, Fisher River First Nation

Hundreds of residents of Peguis First Nation, also north of Winnipeg, have no idea when they will be able to go home as nearly 80 per cent of the reserve land is submerged.

*Completion of these fields is mandatory.

Fisher River Chief David Crate is demanding a commitment from government to find and fund solutions to the problem, which is that much of the First Nations live in flood-prone area.

"We are very restricted in where we can build our homes in the community just because the land is really unusable, a lot of swamp," he said. "The key factor is government and their commitment to funding the long-term solutions for both Fisher River and Peguis."

In 1908, Peguis First Nation was forcibly moved by the federal government from its original location near the town of Selkirk, onto the present flood plain.

Peguis Chief Glen Hudson is also worried about the cost his community is facing as a result of the flood. The evacuation and dike construction alone has already cost \$3 million, he said.

Disaster funding assistance

The federal and provincial governments have committed to covering up to 90 per cent of costs for the flooding, for municipalities and individuals.

For the latter, the maximum compensation is \$200,000, which is double the amount originally provided under the disaster assistance program.

For more information on how to apply for disaster financial assistance, call 945-4772 or 1-888-267-8298 or go to the government of Manitoba website and follow the links to flood information and disaster financial assistance.

New snow will impact flood outlook

The chances of spring flooding for cities along the Red River will likely increase slightly because of snowfall Monday and Tuesday, said a National Weather Service hydrologist. A new spring flood outlook will be released Friday morning.

By: **Ryan Johnson**, Grand Forks Herald Published March 11 2009



A snowblower clears a sidewalk along University Park in Grand Forks on Wednesday after Tuesday's blizzard. Herald photo by Eric Hyden.

The chances of spring flooding for cities along the Red River will likely increase slightly because of snowfall Monday and Tuesday, said a National Weather Service hydrologist.

Mike Lukes said NWS officials were adding the new precipitation numbers to a forecast model Wednesday and today. A new spring flood outlook will be released Friday morning.

The previous outlook, released Feb. 27, put the chances of Grand Forks reaching major flood stage of 46 feet at 72 percent.

*Completion of these fields is mandatory.

There was a 90 percent chance of the river rising to 44.8 feet.

The likelihood of it climbing to 47.6 feet was 50 percent, and there was a 10 percent chance the river would crest at 50.3 feet.

A record crest of 54.35 feet was recorded April 22, 1997. The \$417 million flood protection system put in place after that flood is designed to protect Grand Forks up to 57 feet and East Grand Forks to 58 feet.

Storm's impact

The exact impact of this week's precipitation on the new outlook is hard to estimate before forecast models are completed, Lukes said.

Grand Forks saw 5 inches of new snowfall earlier this week, with a total of 49.7 inches so far this winter.

But the worst of the storm went south and east of the city.

Moorhead recorded 10.1 inches of snow, and other areas in the southern Red River Valley also received considerable snowfall.

Lukes said those areas will be impacted the most in the spring flooding, even though they are upstream of Grand Forks.

"Since we are downstream, we have a little more channel capacity to carry that water," he said. "It could carry a bit more water without significantly rising as fast as Fargo."

The last flood outlook said there was a 98 percent chance the Red River in Fargo would reach major flood stage of 30 feet.

Lukes said this new snowfall's impact in Fargo will most likely increase crest levels at the least likely end of the outlook. Previous numbers put the chances of the river reaching about 41 feet in the city at 2 percent, but this number now may increase to 42 feet.

These forecasts are based on 58 years of past data, he said, but the real levels of flooding will largely depend on the spring thaw season.

"Basically, how you melt the snow and if there's any additional precipitation will affect the actual flood," he said.

Getting prepared

Grand Forks officials declared a state of emergency Wednesday. But Kevin Dean, a public information officer for the city, said the declaration basically was the first step in a standard process.

"In order to be able to get any type of state or federal resources that we may need to tap, we would first have to declare an emergency," he said.

Dean said the city has done this many years in the past, but Wednesday's announcement may worry residents more this

*Completion of these fields is mandatory.

year.

"When you hear projections in excess of 47 to 50 feet, it certainly grabs peoples' attention," he said.

The city has learned a lot of lessons from the 1997 flood, he said, and now, officials want to be "proactive rather than reactive."

Some people may consider the declaration a bit early, he said. But because of the 14 miles of flood protection in the city, providing additional protection if forecasts suddenly change will take longer than it did in 1997.

"It's not meant to alarm anybody," he said. "We are simply trying to be open and honest about what we're doing and letting people know that we're taking all the steps necessary to provide the best protection for them that we can."

*E3. Insert a copy of the URF here:

From: Esrin.Nightops@esa.int
To: radarsat@mmo.satops.ca
Cc: executivesecretariat@disasterscharter.org, eco@disasterscharter.org
Date: 03/25/2009 02:31 AM
Subject: International Charter: Space and Major Disaster call ID: 250

Please find attached the URF concerning Flood in North Dakota Usa.
The upload directory CALL_250 for material related to call 250
has been created in:

<ftp://charterpm@uranus.esrin.esa.it/WhiteBoard/CALLS>

or: ftp uranus.esrin.esa.it
username: charterpm
password: xxxx
cd WhiteBoard
cd CALLS
cd CALL_250

Regards,
ODO
E. Lodadio; F. Venneri;

=====

This message and any attachments are intended for the use of the addressee or addressees only.
The unauthorised disclosure, use, dissemination or copying (either in whole or in part) of its content is prohibited. If you received this message in error, please delete it from your system and notify the sender. E-mails can be altered and their integrity cannot be guaranteed. ESA shall not be liable for any e-mail if modified.

*Completion of these fields is mandatory.

[attachment "dakota_250.jpg" deleted by Brenda Jones/GEOG/USGS/DOI] [attachment "CALL_250.txt" deleted by Brenda Jones/GEOG/USGS/DOI]

1:Brenda Jones (USGS) To:Charter OPS (ESA) (390694180202) 03:15 03/25/09GMT-04 Pg 02-02

User Request Form (Affected area information)		
<i>To be filled by ODO</i> Call ID 250		
1. Date and time of the call	DAY 25 MONTH (Spell) March YEAR 2009 TIME 0200 LOCAL TIME ZONE CDT UTC TIME0700	
2. Name of the organization and caller Phone Fax Cellular phone E-mail to be used for call back	Brenda Jones/USGS on behalf of North Dakota +1605-594-6503 Exl. +1605-594-6150 Exl. +1605-321-3995 bkjones@usgs.gov	
3. Type of disaster <input checked="" type="checkbox"/> flood <input type="checkbox"/> landslide <input type="checkbox"/> volcano	<input type="checkbox"/> storm/hurricane <input type="checkbox"/> fire <input type="checkbox"/> ice	<input type="checkbox"/> earthquake <input type="checkbox"/> oil spill <input type="checkbox"/> other (specify)
4. Geographical location Region/Country name, approximate geographical location and surface extent. Region/country name:North Dakota/USA Location From Fargo To Bismarck Extent (km2)	5. Geographical Coordinates in Degrees, minutes, seconds a) Center Point Lat ° ' " N / S Long ° ' " E / W b) Upper left Lat 97° 12' 0" N Long 48° 0' 0" W Lower right Lat 96° 55' 0" N Long 47° 50' 0" W	
6. Approximate date/time of occurrence or predicted occurrence	It is occurring now	
7. Additional information on the disaster	Flooding continues in the Red River Basin of North Dakota and Minnesota, along with flooding in the Missouri River Basin of western North Dakota and in the Minnesota and Mississippi River basins of southern Minnesota. National Weather Service continues to predict a crest that will be at or exceed record stages for the Red River at Fargo, ND.	
8. Additional instructions (shipping instructions)	The box listed above is for the Grand Forks area. Following are the coordinates for Fargo. UL 97 00 00 N, 47 00 00 W, LR 96 30 00 N, 46 45 00 W Need Radar imagery over the areas now, if clouds clear later may request optical	
<i>To be filled by ODO</i> Authorized User <input checked="" type="checkbox"/> Cooperating Body <input type="checkbox"/> Other <input type="checkbox"/>		

Authorized User/Cooperating Body: Fill the form as indicated above and fax it to +39-06-94-180 202. A completed form may additionally be sent as a backup via email to: charterops@disasterscharter.org.

*E4. Provide a copy of the Emergency Data Request Submission forms for the various satellites:

JAXA EMERGENCY REQUEST FORM (Specific Part)

International Charter on "Space and Major Disasters"

*Completion of these fields is mandatory.

Date and Time of Request	03/25/2009 (MM/DD/YYYY) : (UTC)
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ALOS Data Request

New Acquisition

Sensor	Mode	Acquisition Date (MM/DD/YYYY)	Path	Remarks
<input type="checkbox"/> PRISM	<input type="checkbox"/> OB1 <input type="checkbox"/> OB3			Pointing Angle (deg.)
<input type="checkbox"/> AVNIR-2	OBS			Pointing Angle (deg.)
X PALSAR	X FBS <input type="checkbox"/> FBD <input type="checkbox"/> PLR <input type="checkbox"/> WB1	03/29/2009 17:21:49	505	Off-nadir Angle (34.30 deg.) Polarization: X HH <input type="checkbox"/> VV (FBS/WB1) <input type="checkbox"/> HH+HV <input type="checkbox"/> VV+VH (FBD)

Archive Data

Sensor	Mode	Acquisition Date (MM/DD/YYYY)	Path	Frame	Remarks

Processing Level: All products will be processed at the Level 1B2 for AVNIR-2/PRISM and Level 1.5 for PALSAR unless specified below.

AVNIR-2, PRISM: _____ **X** PALSAR:

Delivery Details: Upload to the recipient's FTP server

FTP address:

Username: _____ Password:

Download from JAXA FTP server

X Other: Charter FTP (under Call 250) See general ERF

Additional Remarks

RADARSAT EMERGENCY REQUEST FORM (specific part)

*Completion of these fields is mandatory.

Charter Space and Major DisastersCall_ID #: 250

DATE/Time received at CSA:	CSA On-Call:
CSA Internal Use Only	

Number of Acquisitions Requested: New: 4 Archives: 2 (Max.: 5 Image Frames)

Available Beams	Scene Size	Resolution	Polarization (Dual: RADARSAT-2 Only)
	Kilometres	Metres	
<input type="checkbox"/> ScanSAR Wide	500 * 500	100	<input type="checkbox"/> Single or <input type="checkbox"/> Dual
<input type="checkbox"/> ScanSAR Narrow	300 * 300	50	<input type="checkbox"/> Single or <input type="checkbox"/> Dual
<input type="checkbox"/> Wide	150 * 150	30	<input type="checkbox"/> Single or <input type="checkbox"/> Dual
<input checked="" type="checkbox"/> Standard Radarsat-1	100 * 100	25	<input checked="" type="checkbox"/> Single or <input type="checkbox"/> Dual
<input checked="" type="checkbox"/> Fine Radarsat-2	50 * 50	8	<input checked="" type="checkbox"/> Single or <input type="checkbox"/> Dual

SPECIALITY BEAMS (RADARSAT-2 ONLY)

<input type="checkbox"/> Fine Quad Pol ¹	25 * 25	8	Quad
<input type="checkbox"/> Standard Quad Pol ¹	25 * 25	25	Quad
<input type="checkbox"/> Ultra Fine ¹	20 * 20	3	Single

¹ Justification for Specialty Beams:

PROCESSING DETAILS:

Product: Path Image (SGF) Path Image Plus (SGX) Single Look Complex (SLC)

Data Format: GeoTIFF NITF

Application: Geology Forestry Oceans Agriculture Ice Hydrology
 Other -Specify:

Comments:

2 new Radarsat-1 with corresponding archives, 2 new Radarsat-2

Approved by CSA:

Date / Time:

Comments:

CSA Internal Use Only

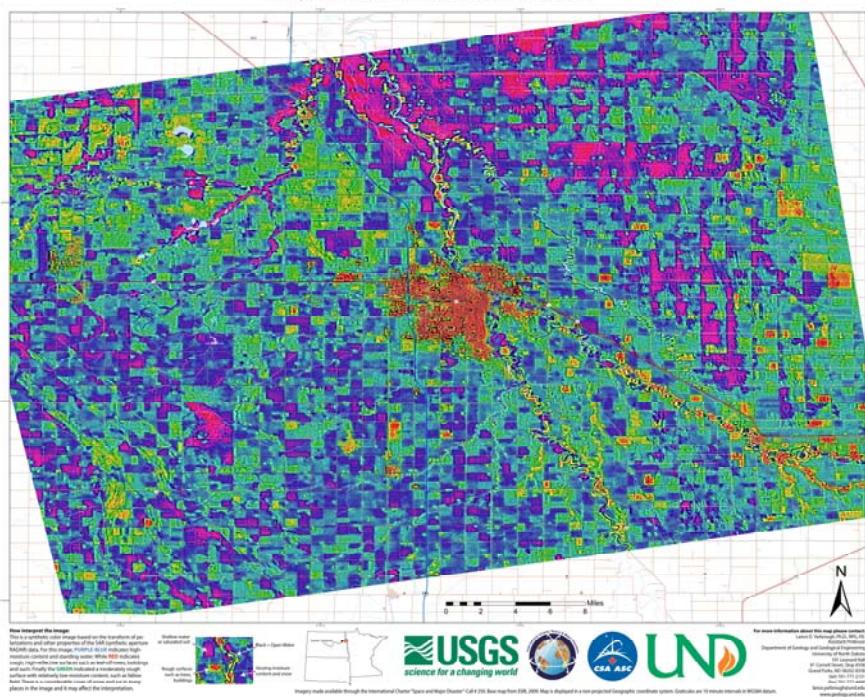
*E5. Provide a copy of any user feedback forms submitted by the end users or email correspondence regarding the end use(s). None

*Completion of these fields is mandatory.

*E6. Provide a copy of the value-added products here. Please insert copies into this document as .jpeg or other small file formats:

RADARSAT-2 Imagery of Grand Forks Area

Acquired 28 March 2009 @ 05:27HRS (CDT)



*Completion of these fields is mandatory.