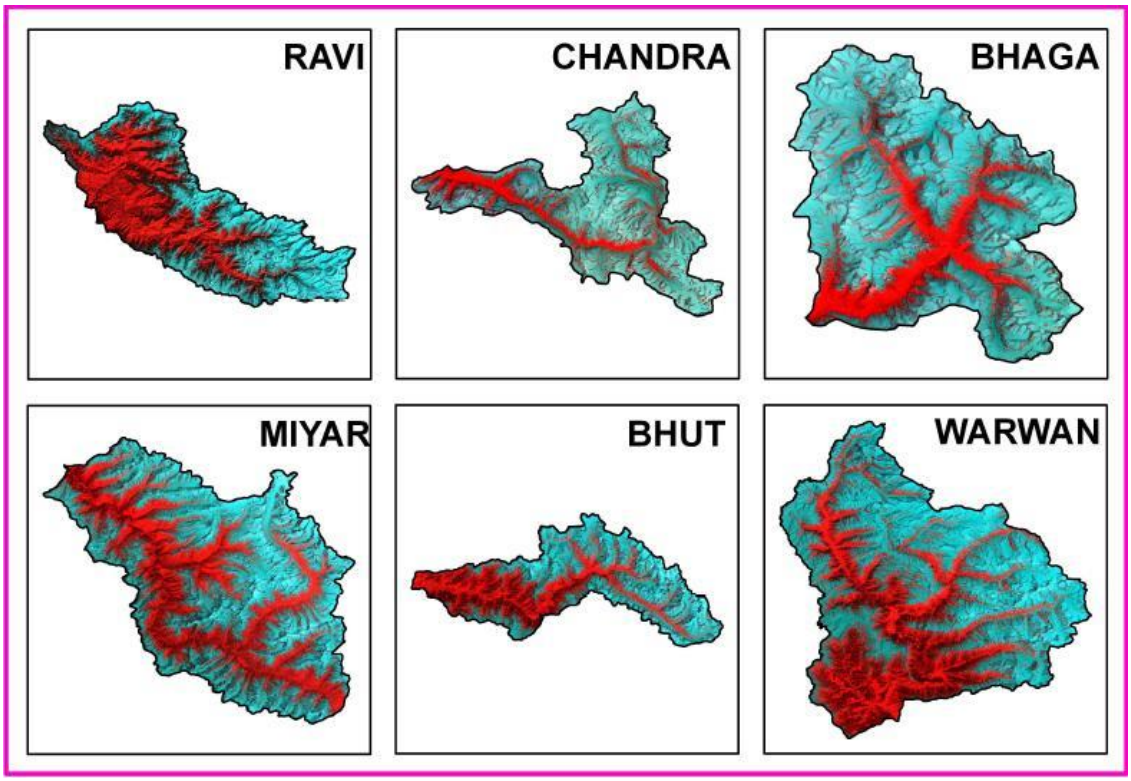
SNOW COVER ATLAS OF THE CHENAB BASIN

Sub-basins: Ravi, Chandra, Bhaga, Miyar, Bhut and Warwan

(Integrated *Studies of Himalayan Cryosphere*
A Project of Indian Space Research Organisation)

Year 2014-2015



Prepared by
Space Applications Centre (ISRO)
Ahmedabad-380015

February 2019

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State Centre on Climate Change

(State Council for Science Technology & Environment, Shimla), Himachal Pradesh

&

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Abstract	This atlas gives sub-basin wise distribution of snow cover in the Chenab basin from October 2014 to June 2015. The sub-basins included in this report are Ravi, Chandra, Bhaga, Miyar, Bhut and Warwan. The areal extent of snow cover was estimated in fully automatic mode using Normalized Difference Snow Index (NDSI) based algorithm. For this purpose, AWiFS sensor of Resourcesat satellite was used. This atlas gives snow cover products, statistics and seasonal snow depletion curve. It is expected that this data will be useful for hydrological and climatological applications.
Key words	Snow cover, NDSI, AWiFS, depletion curve, Ravi, Chandra, Bhaga, Miyar, Bhut and Warwan basins.
Security Classification	Unrestricted
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1. **Introduction**

Snow covers almost 40 per cent of the Earth's land surface during Northern Hemisphere winter. This makes albedo and areal extent of snow as important component of the Earth's radiation balance (Foster and Chang, 1993). In addition, large areas in the Himalayas are also covered by snow during winter. Area of snow can change significantly during winter and spring. This can affect stream flow for rivers originating in the higher Himalayas. All the rivers originating from higher Himalayas receive almost 30-50 % of annual flow from snow and glacier melt run off (Agarwal et al., 1983). In addition, snow pack ablation is highly sensitive to climatic variation. Increase in atmospheric temperature can influence snowmelt and stream runoff pattern (Kulkarni et al., 2002). Therefore, mapping of the areal extent and reflectance of snow are important parameter for various climatological and hydrological applications. In addition, extent of snow cover can also be used as input for numerous other applications.

Mapping and monitoring of seasonal snow cover using field methods are normally very difficult in a mountainous terrain, like the Himalayas. Therefore, remote sensing techniques have been extensively used for snow cover monitoring. Snow cover monitoring using satellite images were started by using the TIROS-1 satellite from April 1960 (Singer and Popham 1963). Since then, the potential for operational satellite-based mapping has been enhanced by the development of higher temporal frequency and satellite sensors with higher spatial resolution. In addition, satellites with better radiometric resolutions, such as NOAA have been used successfully for snow mapping (Hall et al., 1995). This is possibly due to the distinct spectral reflectance characteristics of snow in visible and near infrared regions. India has launched series of Indian Remote Sensing satellite (IRS) to study the different earth resources. Previously launched satellites have flown with many sensors having different spatial, temporal and spectral resolutions. Recently launched RESOURCESAT-1 satellite has three different sensors namely LISS III, LISS IV & AWiFS with different spatial, temporal and spectral resolutions as desired for different applications. AWiFS (Advanced Wide Field Sensor) is an advanced version of earlier Indian satellite sensor WiFS (Wide Field Sensor) with improved spectral and spatial resolutions maintaining the same repetivity. There are a series of other polar orbiting satellites, like Landsat, NOAA and MODIS etc., which have provided information on different aspects of

snow. Geo-stationary satellites also proved their utility in mapping/monitoring the snow-covered regions. Information generated from satellite observations has been extensively used for snowmelt runoff modeling (Kulkarni et al., 1997).

2. Study Area:

This Atlas gives distribution of snow cover in six subbasins of the Chenab basin. These are Ravi, Chandra, Bhaga, Miyar, Bhut and Warwan sub basins. Locations of these basins are shown in Figure 1.

3. Data used:

AWiFS data from October 2014 to June 2015 were used in this study.

4. Normalised Difference Snow Index (NDSI):

In general, the reflectance of snow is high at the red end of the visible spectrum. It tends to decline in the near-infrared region until 1090 nm, where slight gain in reflectance occurs and gives a minor peak at approximately 1090 to 1100 nm. One of the important difficulties in snow cover monitoring is the presence of cloud cover. Cloud has strong reflectivity in visible, NIR and SWIR regions while snow absorbs in SWIR, and this difference can be utilized for snow/cloud discrimination. Normalized Difference Snow Index (NDSI) utilize the normalized ratio of green and SWIR and is used as an automated approach for snow mapping addressing the shadow and cloud problems in snow bound areas.

Normalized Difference Snow Index was calculated using the ratio of green wavelength (band 2) and SWIR (band 5) of AWiFS sensor:

$$Normalized\,Difference\,Snow\,Index(NDSI) = (band2 - band5)/(band2 + band5) \quad ..(1)$$

To estimate NDSI, DN numbers were converted into reflectance. This involves conversion of digital numbers into the radiance values, known as sensor calibration, and then estimation of reflectance from these radiance values. Various parameters needed for estimating spectral reflectance are maximum and minimum radiances and mean solar exo-atmospheric spectral irradiances in the satellite sensor bands, satellite data acquisition time, solar declination, solar zenith and solar azimuth angles, mean Earth-Sun distance etc. (Markham and Barker, 1987; Srinivasulu and Kulkarni, 2004).

5. Snow cover monitoring algorithm

An algorithm is developed to provide changes in the areal extent of snow (Kulkarni et. al., 2006). Snow extent is estimated at an interval of 5-days and 10-days, depending upon availabilities of AWiFS data. In 5-daily product, snow extent is generated scene-wise. In this product, snow and cloud extents are given. Estimate of cloud is important because, at times, snow is covered by cloud and this may be classified as non-snow area, leading to erroneous conclusions. In 10-daily product, three scenes are analyzed, if available. For example, 10 March product data of 5, 10 and 15 March was used. If any pixel is identified as snow on any one date then this pixel will be classified as snow on final product. This provides snow cover at an interval of 10 days, an important requirement in hydrological applications. Therefore, this product is generated basin-wise. Since this product is using three scenes, probability becomes high that at least in one scene, pixel may be cloud-free and this helps in overcoming problem associated with snow under cloud cover. If three consecutive scenes are not available, then all available scenes in 10 days window was used in the analysis. Differentiation between water and snow is difficult using NDSI image. In addition, separation of snow and water pixels is also difficult based on reflectance due to mountain shadow. Therefore, in the present algorithm, water bodies are marked in pre-winter

season and are masked in the final products during winter. Flow diagram of the algorithm is given in Figure 2.

6. Results and discussions

In this atlas, basin-wise snow cover statistics, maps, and seasonal depletion curves have been provided from October 2014 to June 2015. Snow ablation pattern varies from basin to basin, depending on area altitude distribution in the basins. Accumulation and ablation pattern in Chandra and Bhaga river basin is almost same. From January to end of April almost entire basin is covered by snow for Chandra, Bhaga and ablation starts from the mid of April. In the Bhut and Warwan sub-basins accumulation starts from mid of December and in the mid of March ablation was observed. In case of Ravi sub-basin no accumulation is found till mid of December then in the month of March, maximum snow was observed 80% and it reduces up to 44% in the mid of April. It may be because of lower altitude & lower latitude.

Acknowledgements

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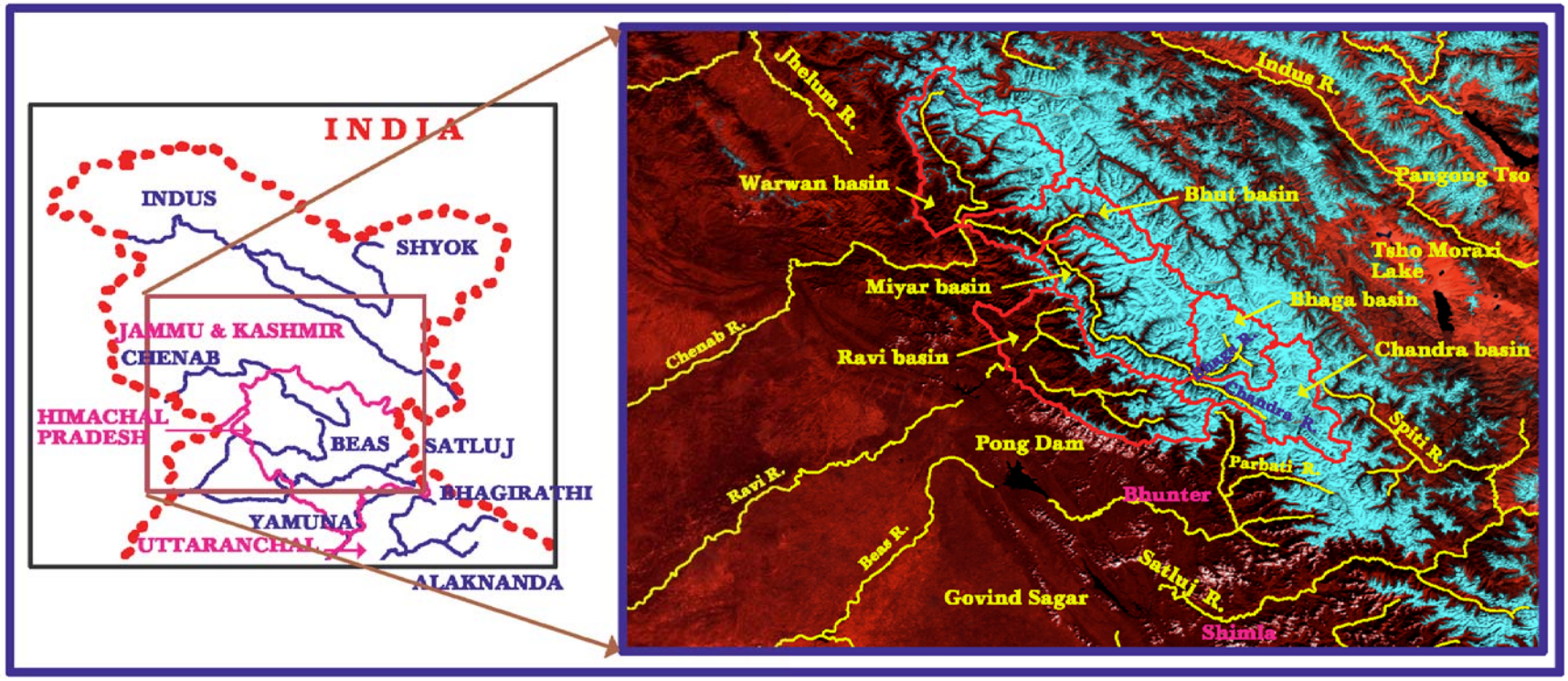


Figure 1: Location map of Ravi, Chandra, Bhaga, Miyar, Bhut and Warwan sub-basins (Part of Chenab basin)

RAVI SUB-BASIN

AREAL EXTENT OF SNOW (5 DAILY)

BASIN NAME: RAVI **BASIN AREA: 4907 Sq km**

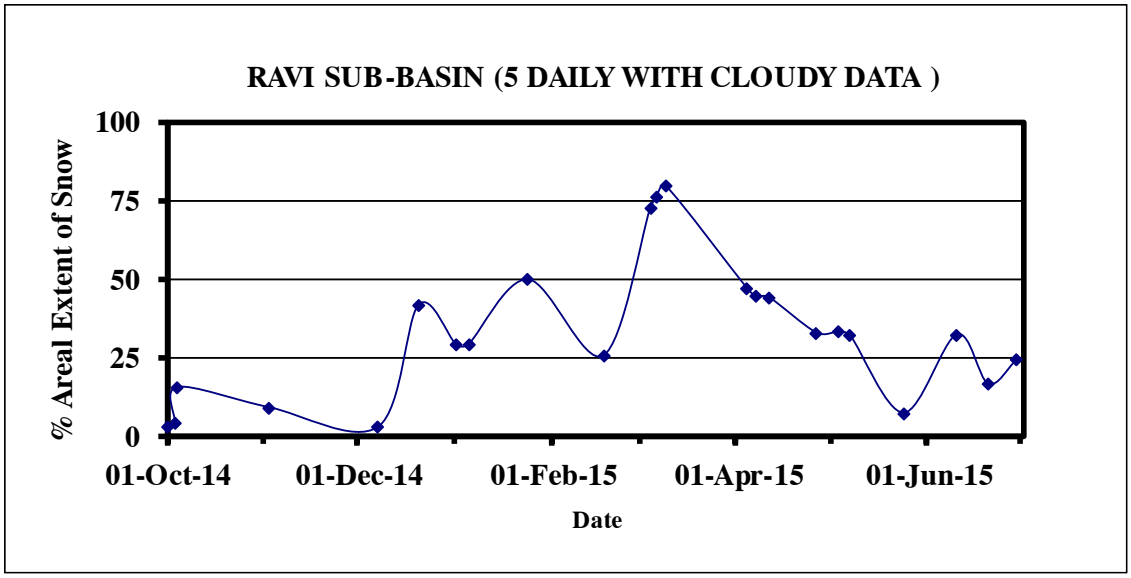
S. No	Date	Snow cover (sq. km)	Snow cover (%)	S. No	Date	Snow cover (sq. km)	Snow cover (%)
October 2014							
1.	01 Oct 2014	145	3	3.	04 Oct 2014	768	16 ©
2.	03 Oct 2014	220	4				
November 2014							
4.	02 Nov 2014	452	9				
December 2014							
5.	07 Dec 2014	142	3	6.	20 Dec 2014	2057	42
January 2015							
7.	01 Jan 2015	1432	29	9	24 Jan 2015	2454	50
8.	05 Jan 2015	1441	29				
February 2015							
10.	17 Feb 2015	1259	26 ©				
March 2015							
12.	04 Mar 2015	3573	73	14.	09 Mar 2015	3920	80
13.	06 Mar 2015	3734	76				
April 2015							
15.	04 April 2015	2311	47	17	11 April 2015	2173	44
16.	07 April 2015	2179	44 ©	18	26 April 2015	1622	33
May 2015							
19.	03 May 2015	1633	33	21	24 May 2015	362	7 ©
20.	07 May 2015	1568	32				
June 2015							
22.	11 June 2015	1591	32 ©	24.	29 June 2015	1188	24 ©
23.	15 June 2015	820	17				

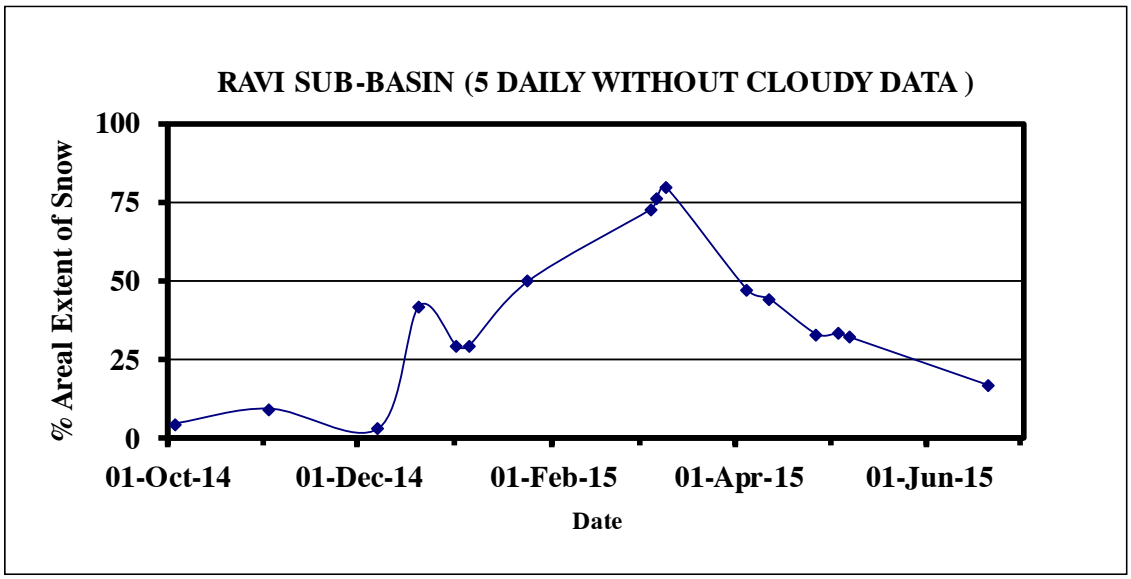
AREAL EXTENT OF SNOW (10 DAILY)

BASIN NAME: RAVI **BASIN AREA: 4907 sq km**

S. No	Date	Snow cover (sq. km)	Snow cover (%)	S. No	Date	Snow cover (sq. km)	Snow cover (%)
October 2014							
1.	01 Oct 2014	220	4				
1.	03 Oct 2014						
November 2014							
2.	05 Nov 2014	452	9				
December 2014							
3.	05 Dec 2014	141	3		15 Dec 2014	2057	42
January 2015							
4.	01 Jan 2015	1441	29		25 Jan 2015	2454	50
5.	05 Jan 2015						
February 2015							
6.	15 Feb 2015						
March 2015							
7.	04 Mar 2015	3920	80				
7	06 Mar 2015						
7	09 Mar 2015						
April 2015							
8	04 April 2015	2311	47	9	15 April 2015	2173	44
8	06 April 2015			10	25 April 2015	1622	33
May 2015							
11	03 May 2015	1634	33				
11	07 May 2015						
June 2015							
12	15 June 2015	820	17				

SNOW COVER DEPLETION CURVE





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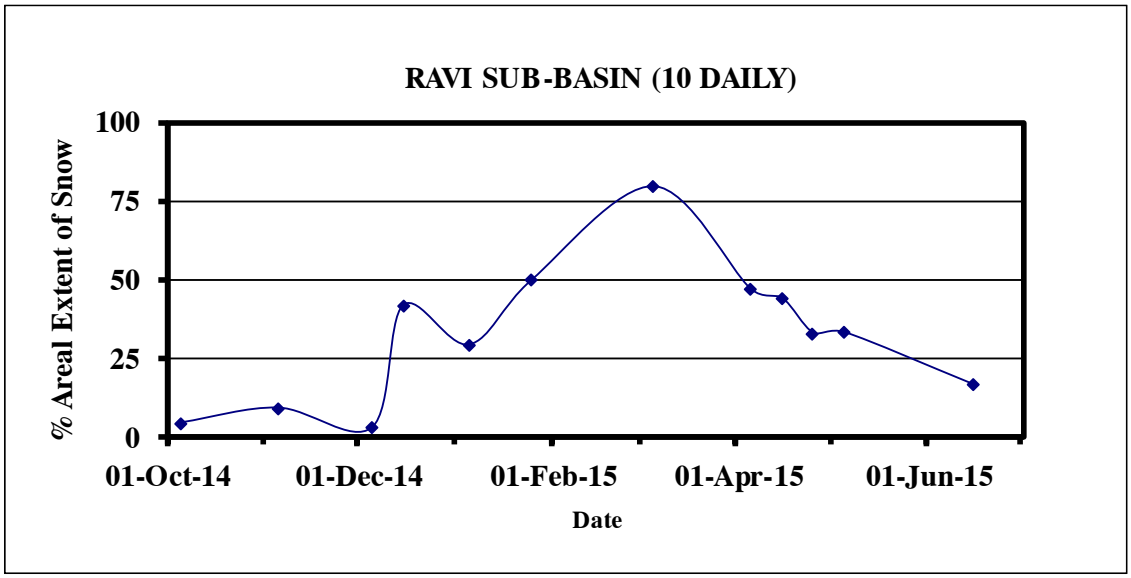
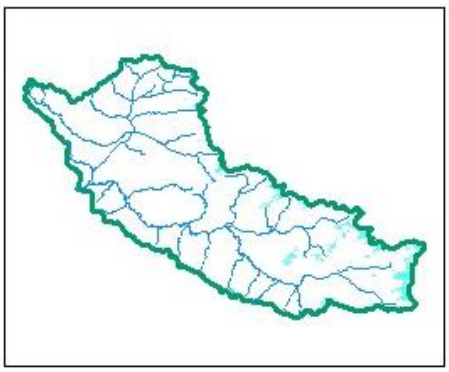


SNOW COVER MAP

SNOW COVER MAP : RAVI BASIN



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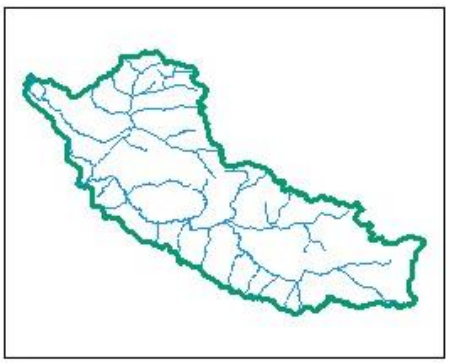

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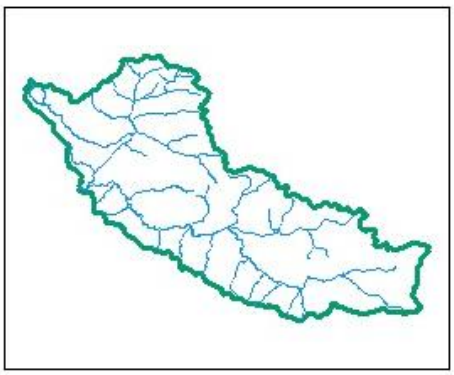

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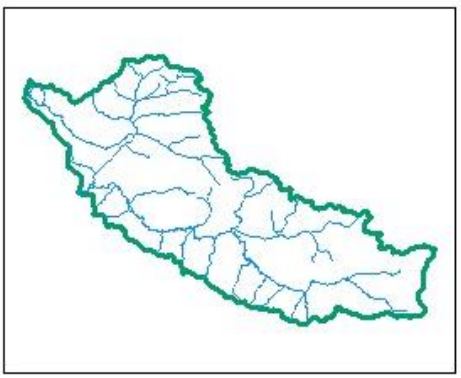

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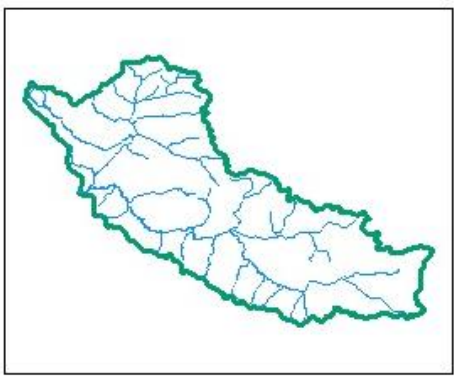

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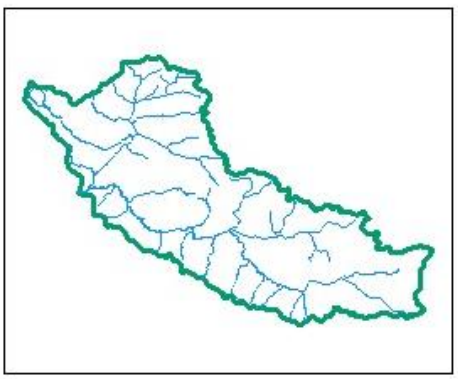

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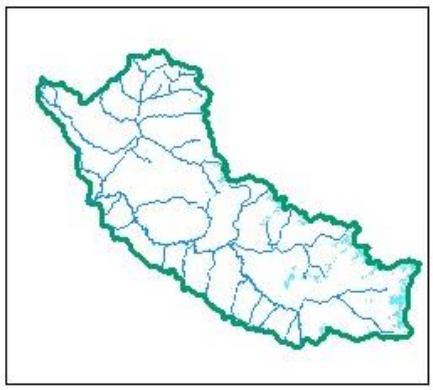
SNOW

0 15 30 60 90 120

Kilometers

10 DAILY SNOW COVER MAP: **RAVI BASIN**



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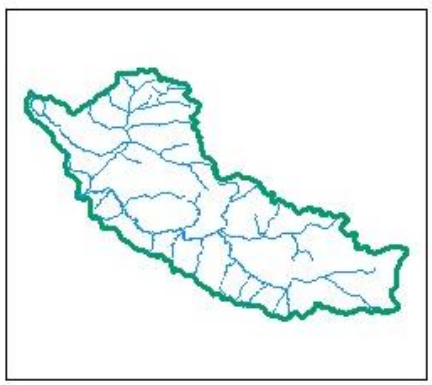

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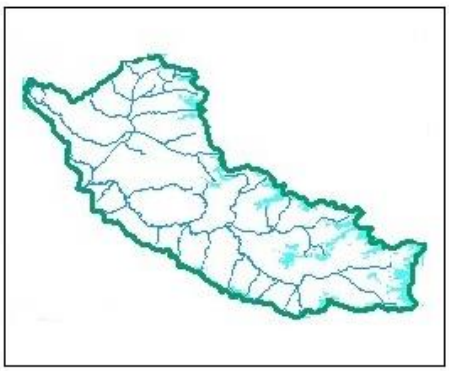
SNOW

0 12.525 50 75 100

Kilometers

SNOW COVER MAP : RAVI BASIN



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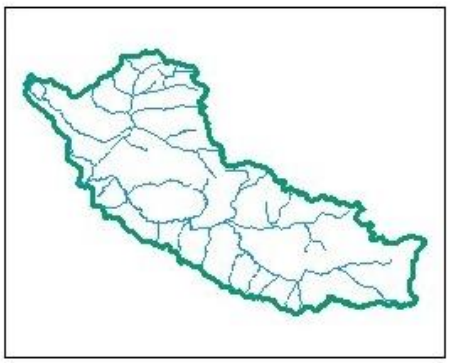

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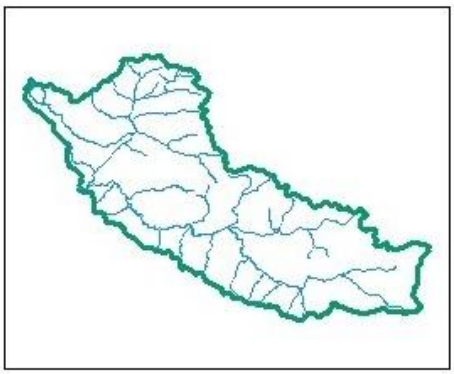

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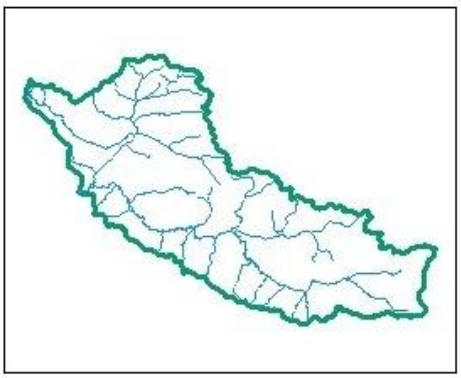

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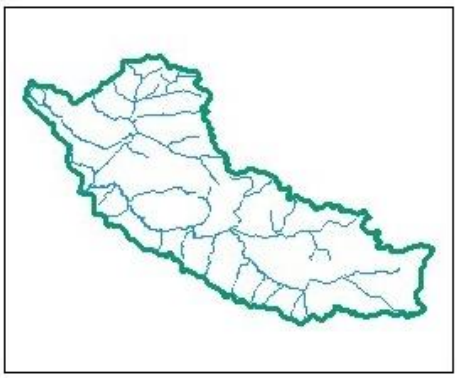

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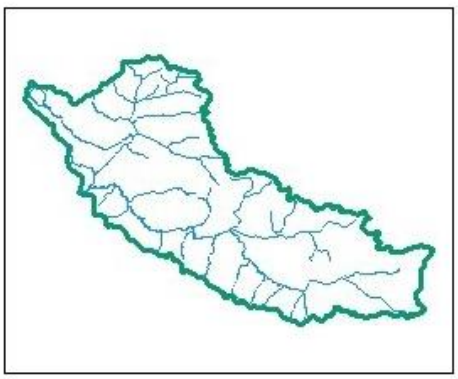

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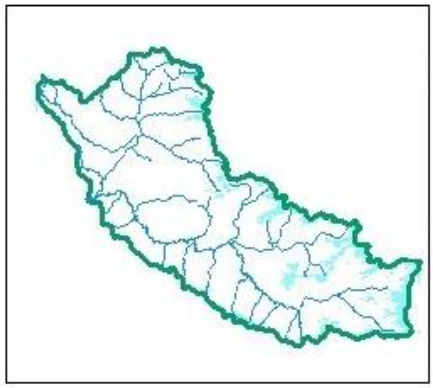
SNOW

0 15 30 60 90 120

Kilometers

10 DAILY SNOW COVER MAP: **RAVI BASIN**



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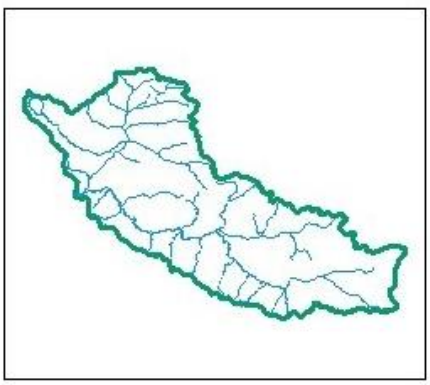

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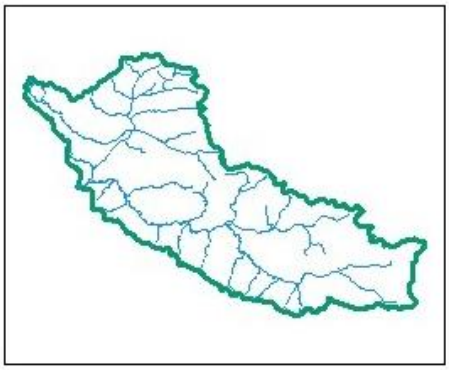
SNOW

0 12.525 50 75 100
Kilometers

SNOW COVER MAP : RAVI BASIN



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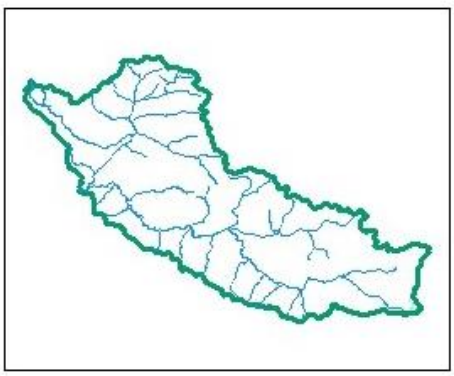

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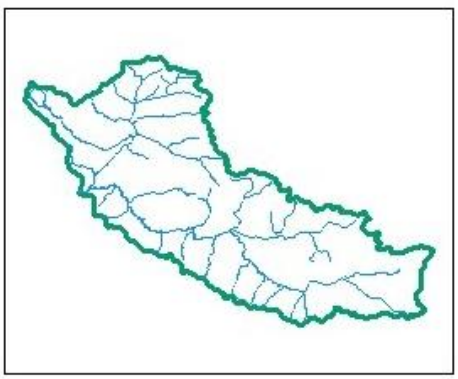

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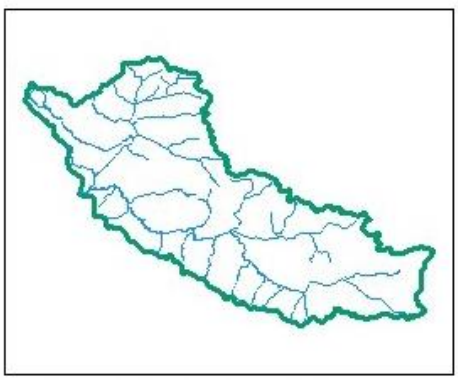

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SNOW

0 15 30 60 90 120

Kilometers

10 DAILY SNOW COVER MAP: RAVI BASIN

DATA USED
07 Dec 2014

DATA USED

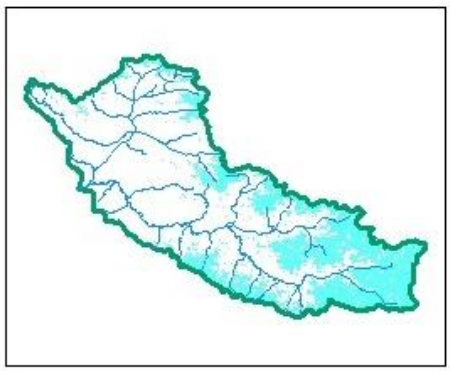
DATA NOT AVAILABLE

DATA USED
20 Dec 2014

SNOW

0 12.525 50 75 100
Kilometers

SNOW COVER MAP : RAVI BASIN



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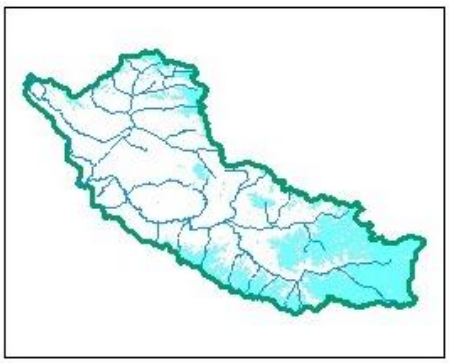

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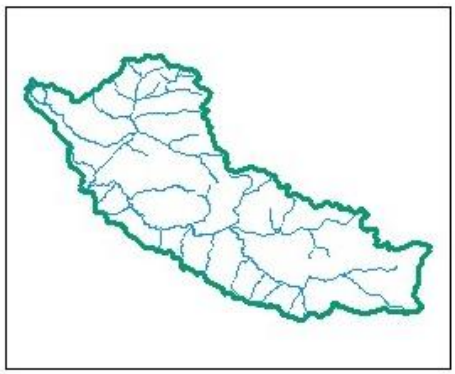

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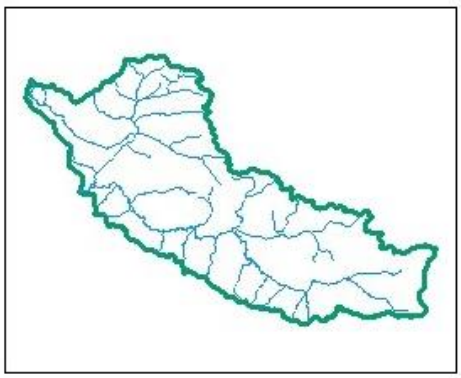

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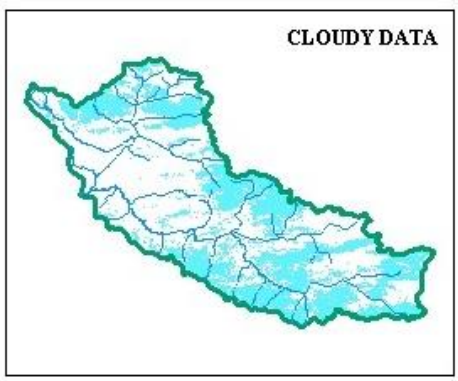

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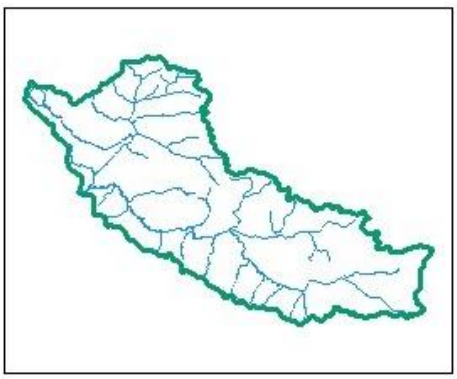


DATA NOT AVAILABLE

SNOW

0 15 30 60 90 120

Kilometers

10 DAILY SNOW COVER MAP: RAVI BASIN

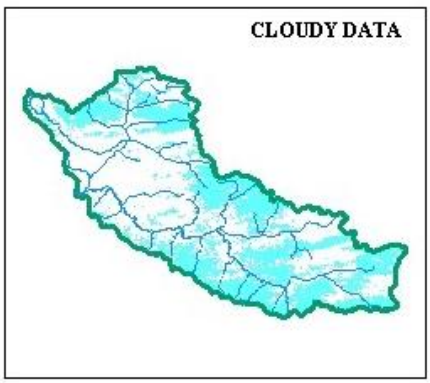
DATA USED

01 Jan 2015

05 Jan 2015

DATA USED

DATA NOT AVAILABLE



DATA USED

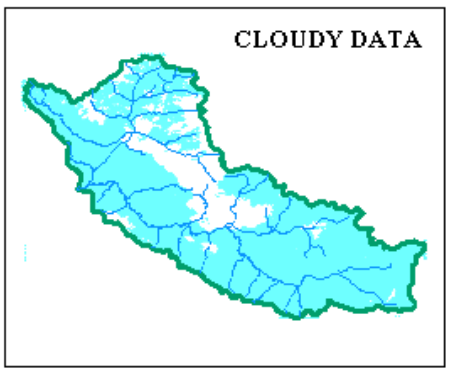
24 Jan 2015

SNOW

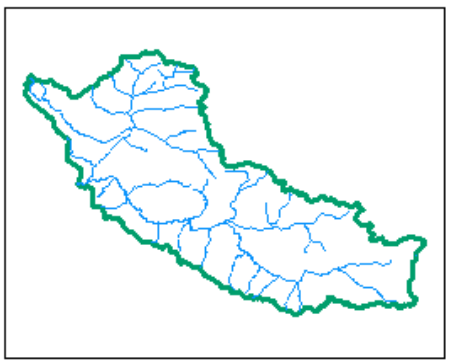
0 12.525 50 75 100

Kilometers

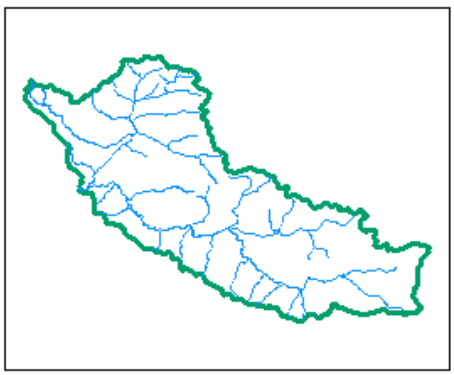
SNOW COVER MAP : RAVI BASIN



01 Feb 2015



DATA NOT AVAILABLE



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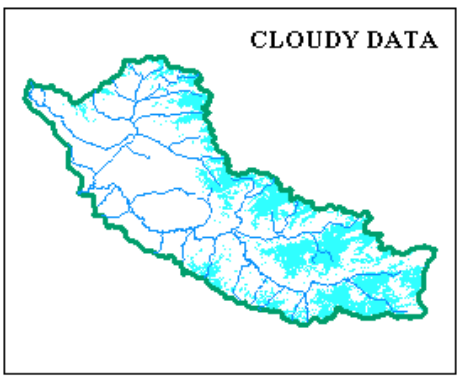
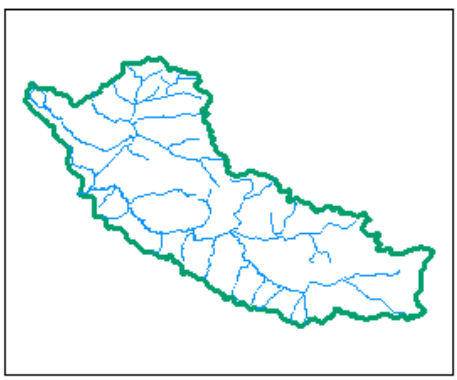


17 Feb 2015



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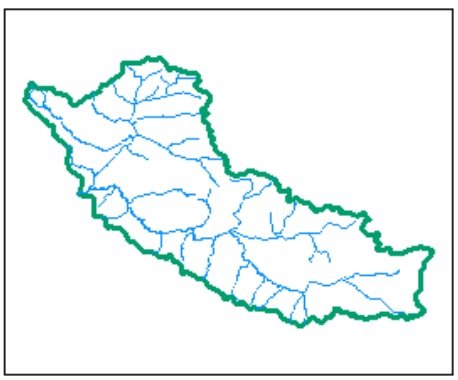


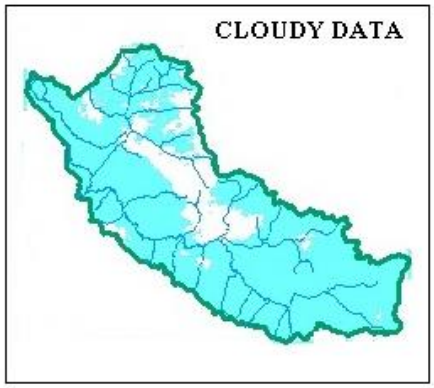
DATA NOT AVAILABLE

SNOW

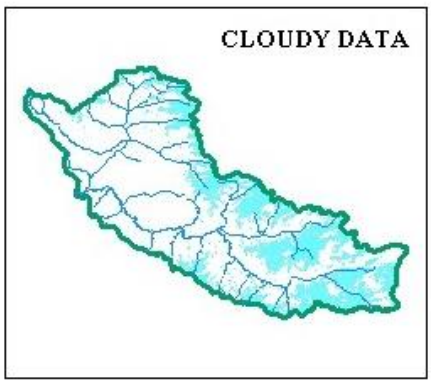
0 15 30 60 90 120

Kilometers

10 DAILY SNOW COVER MAP: RAVI BASIN



DATA USED
01 Feb 2015



DATA USED
17 Feb 2015

DATA USED
DATA NOT AVAILABLE

SNOW

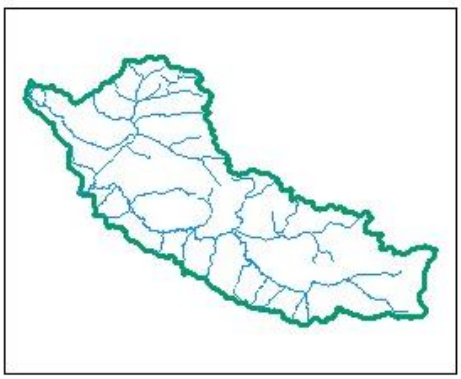
0 12.525 50 75 100
Kilometers

SNOW COVER MAP : RAVI BASIN

04 March 2015

06 March 2015

09 March 2015



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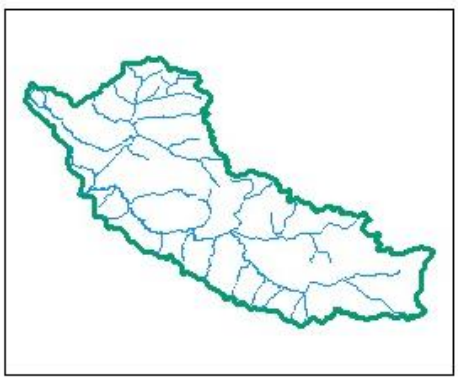

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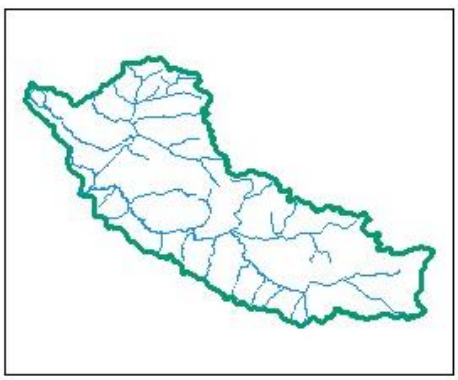


DATA NOT AVAILABLE

SNOW

0 15 30 60 90 120

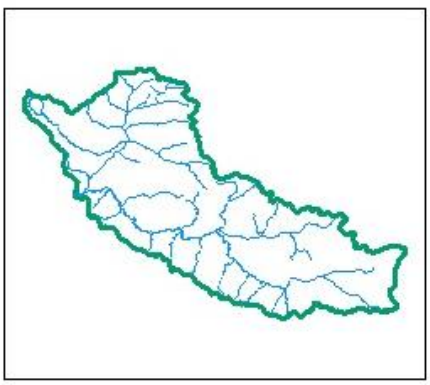
Kilometers

10 DAILY SNOW COVER MAP: RAVI BASIN

DATA USED
04 March 2015
06 March 2015
09 March 2015

DATA USED

DATA NOT AVAILABLE



DATA USED

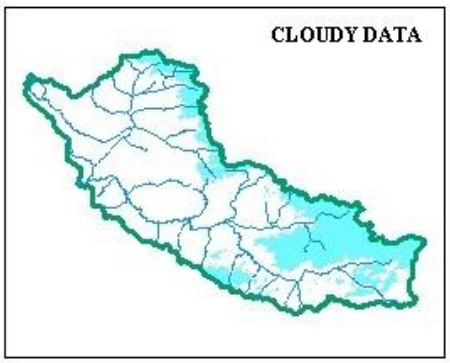
DATA NOT AVAILABLE

SNOW

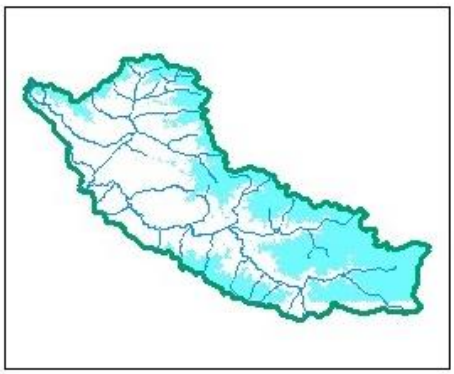
0 12.525 50 75 100
Kilometers

SNOW COVER MAP : RAVI BASIN

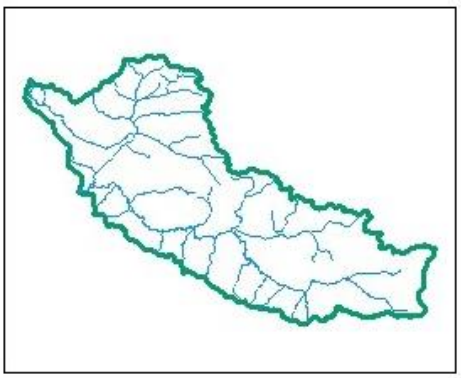
04 April 2015



06 April 2015



11 April 2015



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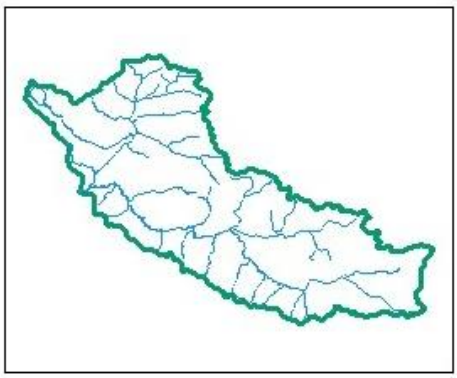
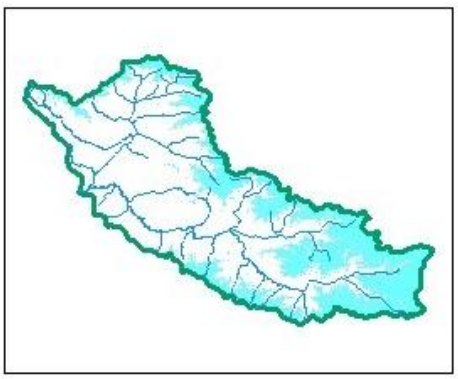


DATA NOT AVAILABLE



26 April 2015

SNOW

0 15 30 60 90 120

Kilometers

10 DAILY SNOW COVER MAP: RAVI BASIN

DATA USED
02 April 2015
04 April 2015
06 April 2015
07 April 2015

DATA USED
11 April 2015

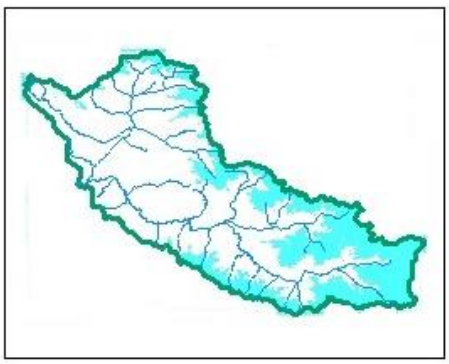
DATA USED
26 April 2015

SNOW

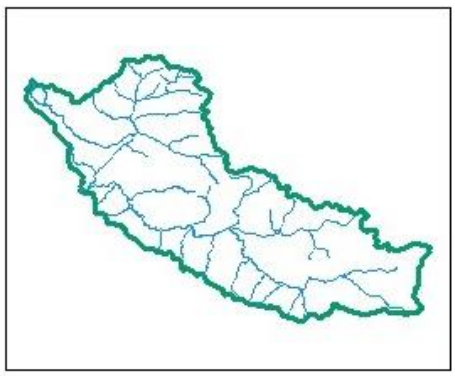
0 12.525 50 75 100
Kilometers

SNOW COVER MAP : RAVI BASIN

03 May 2015



07 May 2015



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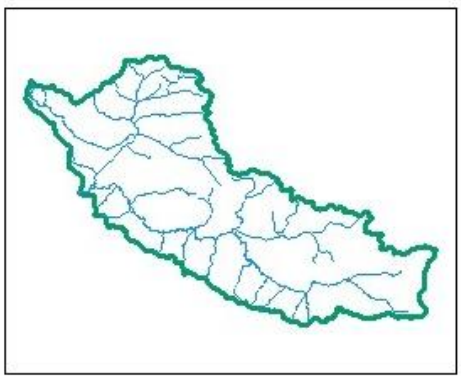

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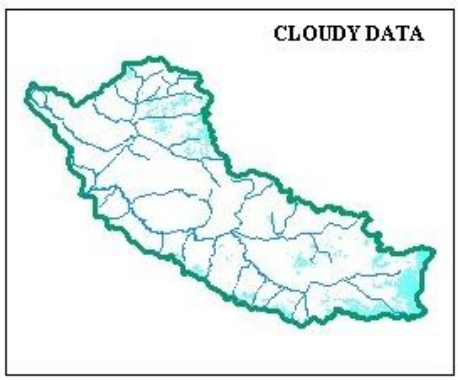
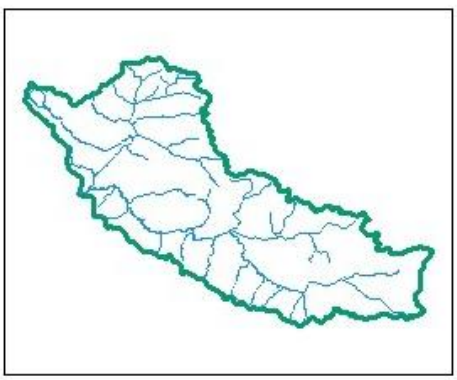


24 May 2015



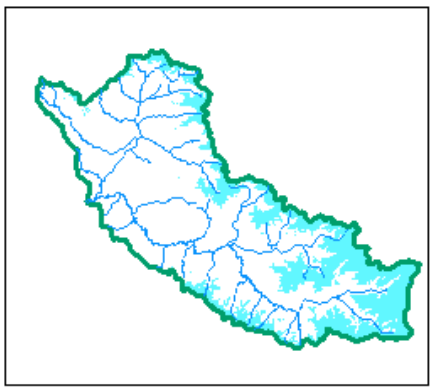
DATA NOT AVAILABLE

SNOW

0 15 30 60 90 120

Kilometers

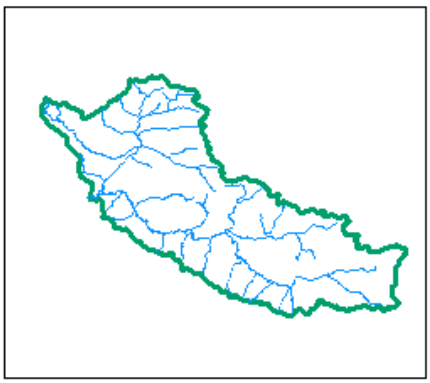
10 DAILY SNOW COVER MAP: **RAVI BASIN**



DATA USED

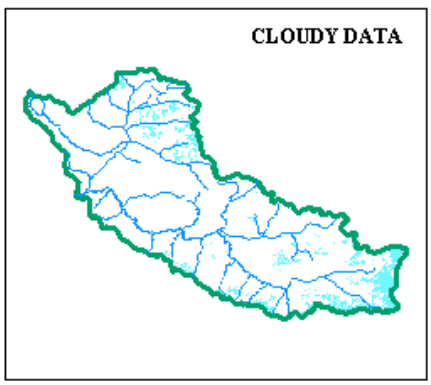
03 May 2015

07 May 2015



DATA USED

DATA NOT AVAILABLE



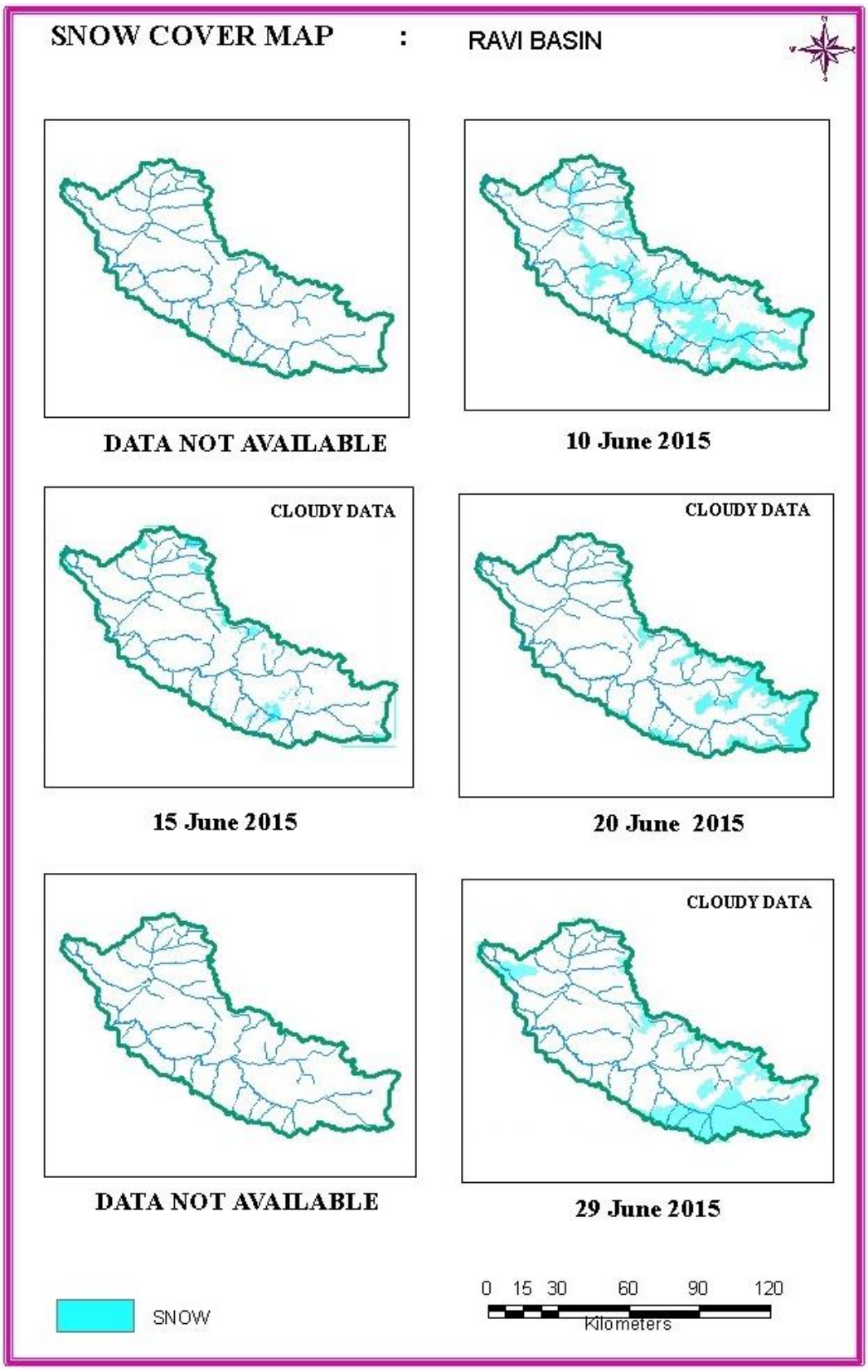
DATA USED

24 May 2015

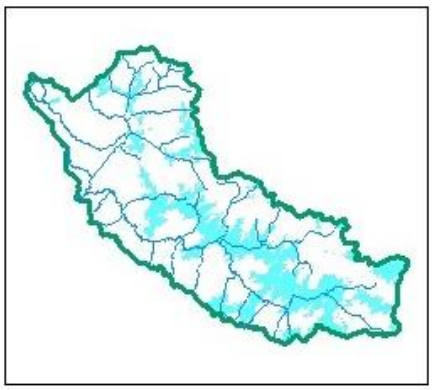
SNOW

0 12.525 50 75 100

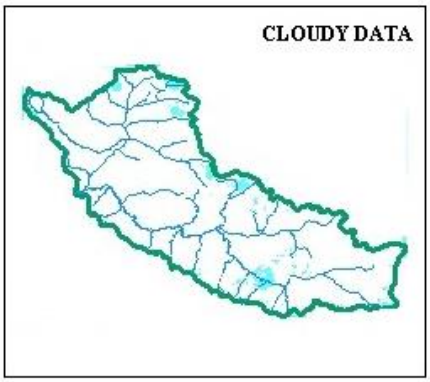
Kilometers


SNOW COVER MAP : RAVI BASIN
DATA NOT AVAILABLE
10 June 2015
CLOUDY DATA
15 June 2015
CLOUDY DATA
20 June 2015
DATA NOT AVAILABLE
CLOUDY DATA
29 June 2015
SNOW
0 15 30 60 90 120
Kilometers

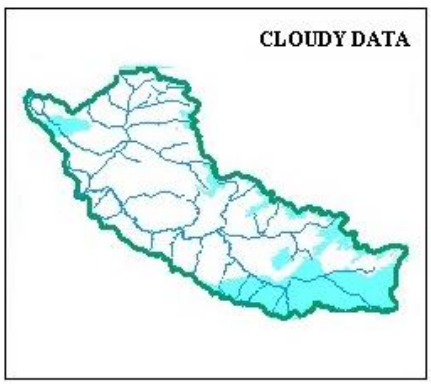
10 DAILY SNOW COVER MAP: RAVI BASIN



DATA USED
10 June 2015



DATA USED
15 June 2015
20 June 2015



DATA USED
29 June 2015

SNOW

0 12.525 50 75 100
Kilometers

CHANDRA SUB-BASIN

AREAL EXTENT OF SNOW (05 DAILY)

BASIN NAME: Chandra **BASIN AREA: 2433 Sq km**

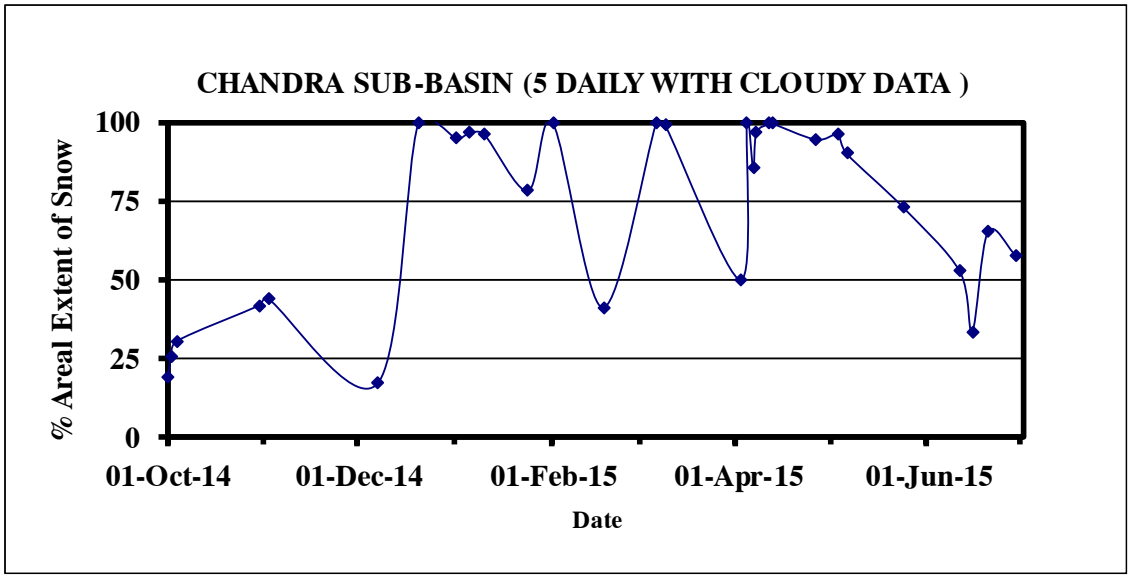
S. No	Date	Snow cover (sq. km)	Snow cover (%)	S. No	Date	Snow cover (sq. km)	Snow cover (%)
October 2014							
1.	01 Oct 2014	459	19 ©	3.	04 Oct 2014	746	31
2.	02 Oct 2014	621	26	4.	30 Oct 2014	1018	42
November 2014							
5.	02Nov 2014	1073	44				
December 2014							
6.	07 Dec 2014	415	17	7	20 Dec 2014	2432	100
January 2015							
8.	01 Jan 2015	2317	95	10	10 Jan 2015	2349	97
9.	05 Jan 2015	2354	97	11	24 Jan 2015	1909	78
February 2015							
12	01 Feb 2015	2433	100	13	17 Feb 2015	1004	41©
March 2015							
14.	06 Mar 2015	2433	100	15	09 Mar 2015	2413	99
April 2015							
16.	02 April 2015	1219	50©	19	11 April 2015	2433	100
17.	04 April 2015	2433	100	20	12 April 2015	2433	100
18.	06 April 2015	2080	86©		26 April 2015	2408	95
	07 April 2015	2360	97				
May 2015							
21.	03 May 2015	2343	96	23.	24 May 2015	1779	73
22.	06 May 2015	2195	90				
June 2015							
24.	11 June 2015	1284	53©	26	20 June 2015	1590	65
25.	15 June 2015	818	34©	27	29 June 2015	1405	58©

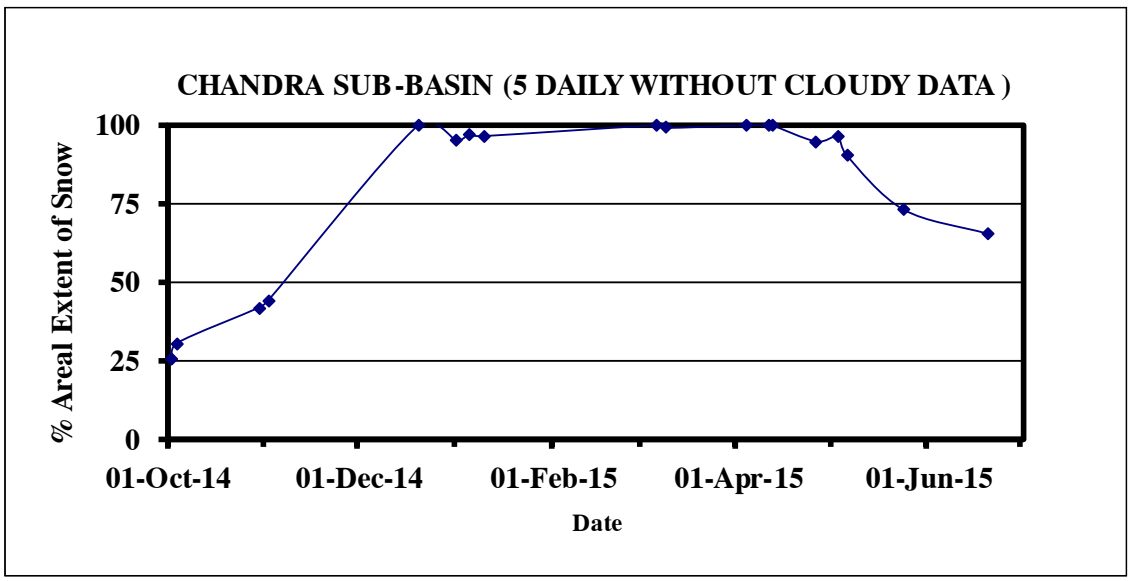
AREAL EXTENT OF SNOW (10 DAILY)

BASIN NAME: CHANDRA **BASIN AREA: 2433 sq km**

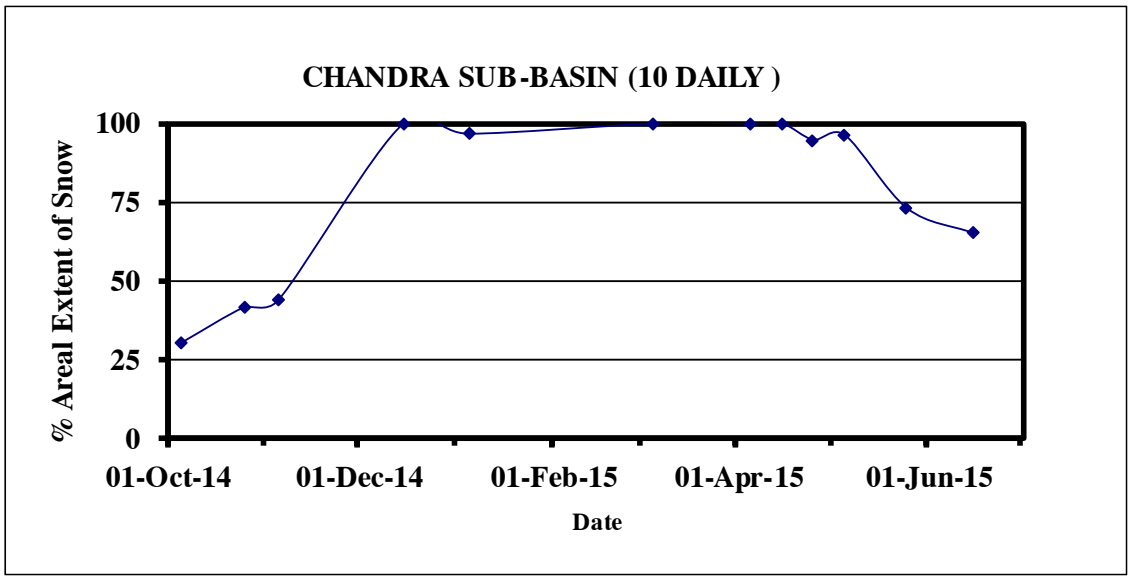
Sr. No	Date	Snow cover (sq. km)	Snow cover (%)	Sr. No	Date	Snow cover (sq. km)	Snow cover (%)
October 2014							
1.	01 Oct 2014	746	31	2	25 Oct 2014	1018	42
1	03 Oct 2014						
November 2014							
3.	05 Nov 2014	1073	44				
December 2014							
4.	15 Dec 2014	2433	100				
January 2015							
5.	01 Jan 2015	2354	97				
5	05 Jan 2015						
5	10 Jan 2015						
March 2015							
6	06 Mar 2015	2433	100				
6	09 Mar 2015						
April 2015							
7	05 April 2015	2433	100				
8	15 April 2015	2433	100				
May 2015							
9	05 May 2015	2344	96	10	25 May 2015	1779	73
June 2015							
11	15 June 2015	1591	65				

SNOW COVER DEPLETION CURVE

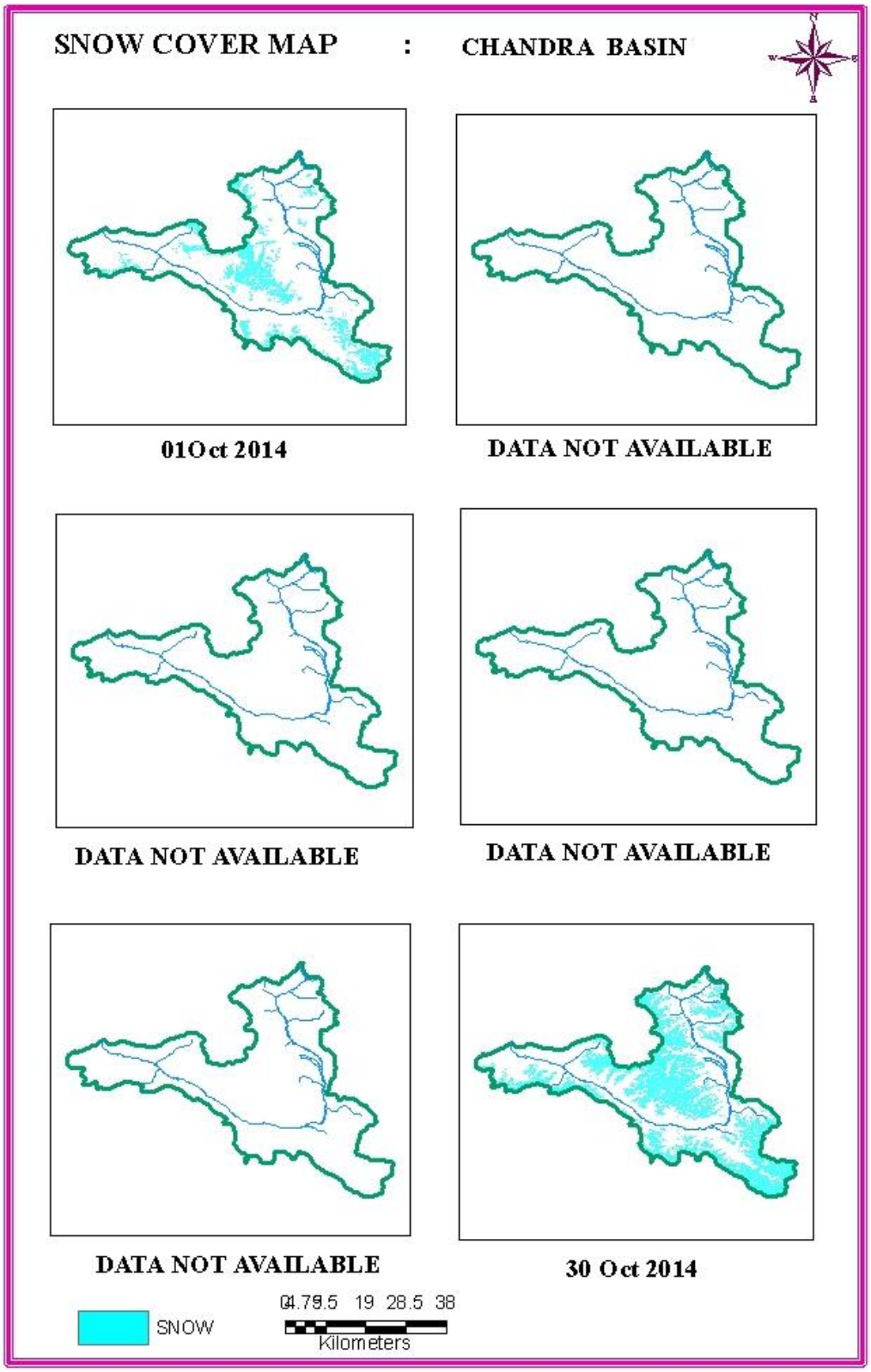




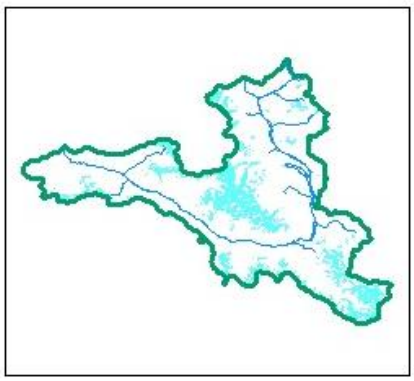
SNOW COVER DEPLETION CURVE



SNOW COVER MAP

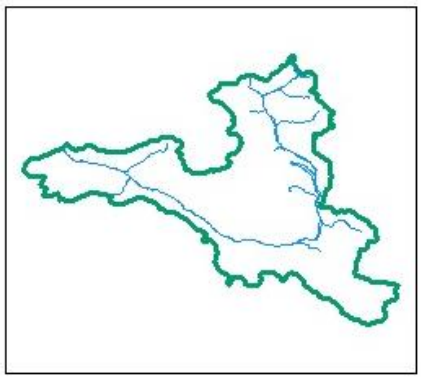

SNOW COVER MAP : CHANDRA BASIN
01Oct 2014
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
30 Oct 2014
SNOW
0 4.75 9.5 19 28.5 38
Kilometers

10 DAILY SNOW COVER MAP: CHANDRA BASIN



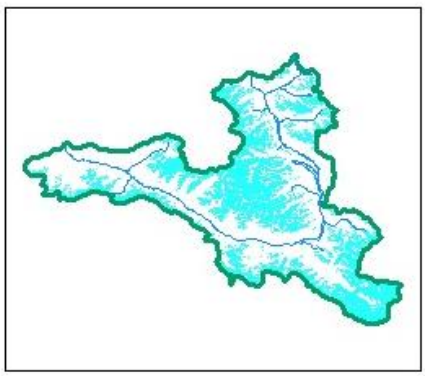
DATA USED

01Oct 2014
02 Oct 2014



DATA USED

DATA NOT AVAILABLE

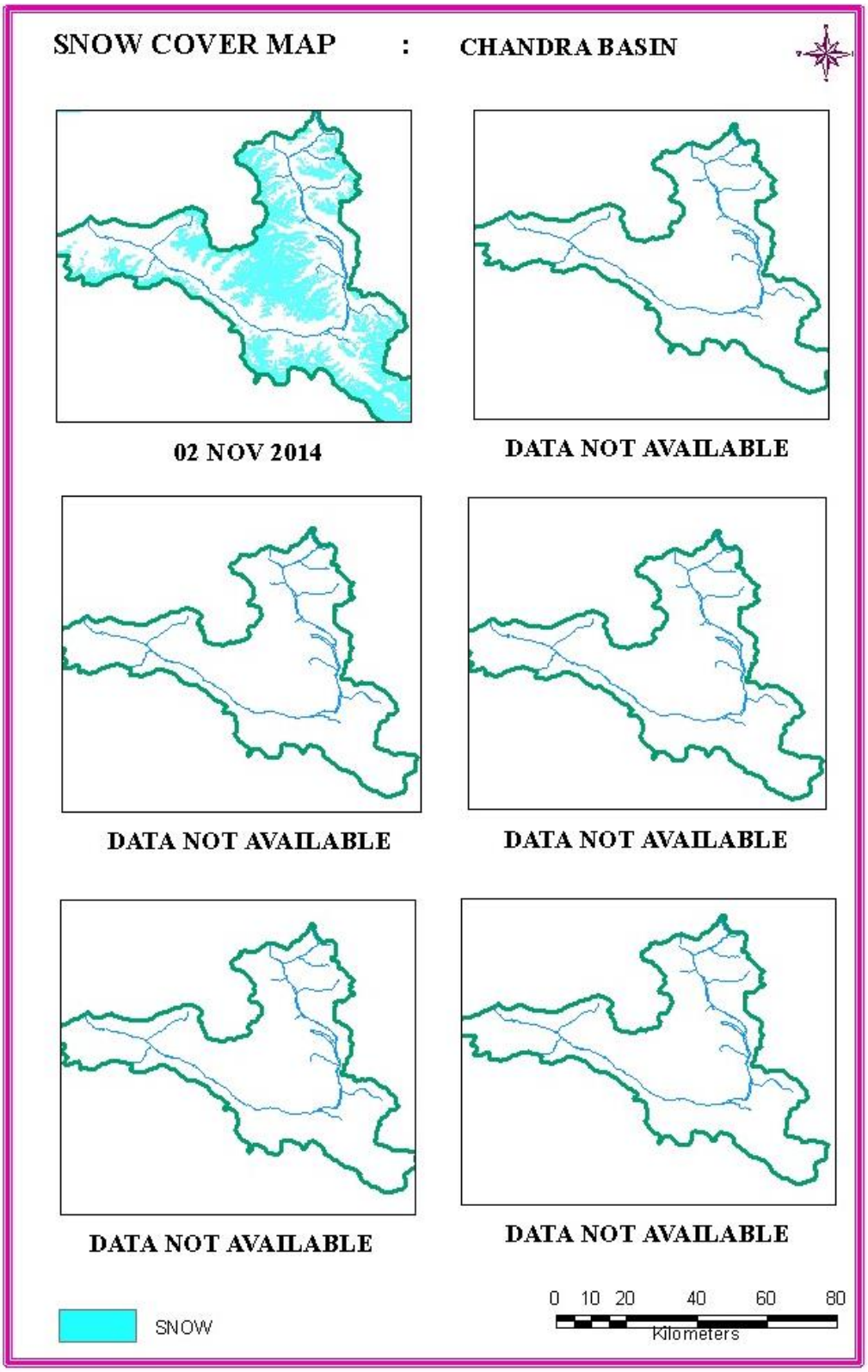


DATA USED

30 Oct 2014

SNOW

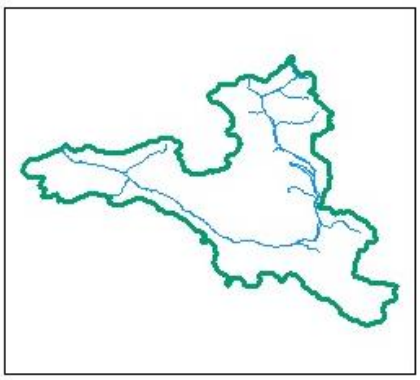
0 10 20 40 60 80
Kilometers


SNOW COVER MAP : CHANDRA BASIN
02 NOV 2014
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
SNOW
0 10 20 40 60 80
Kilometers

10 DAILY SNOW COVER MAP: CHANDRA BASIN

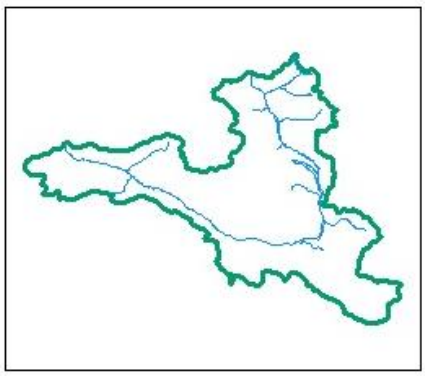
DATA USED

02 Nov 2014



DATA USED

DATA NOT AVAILABLE



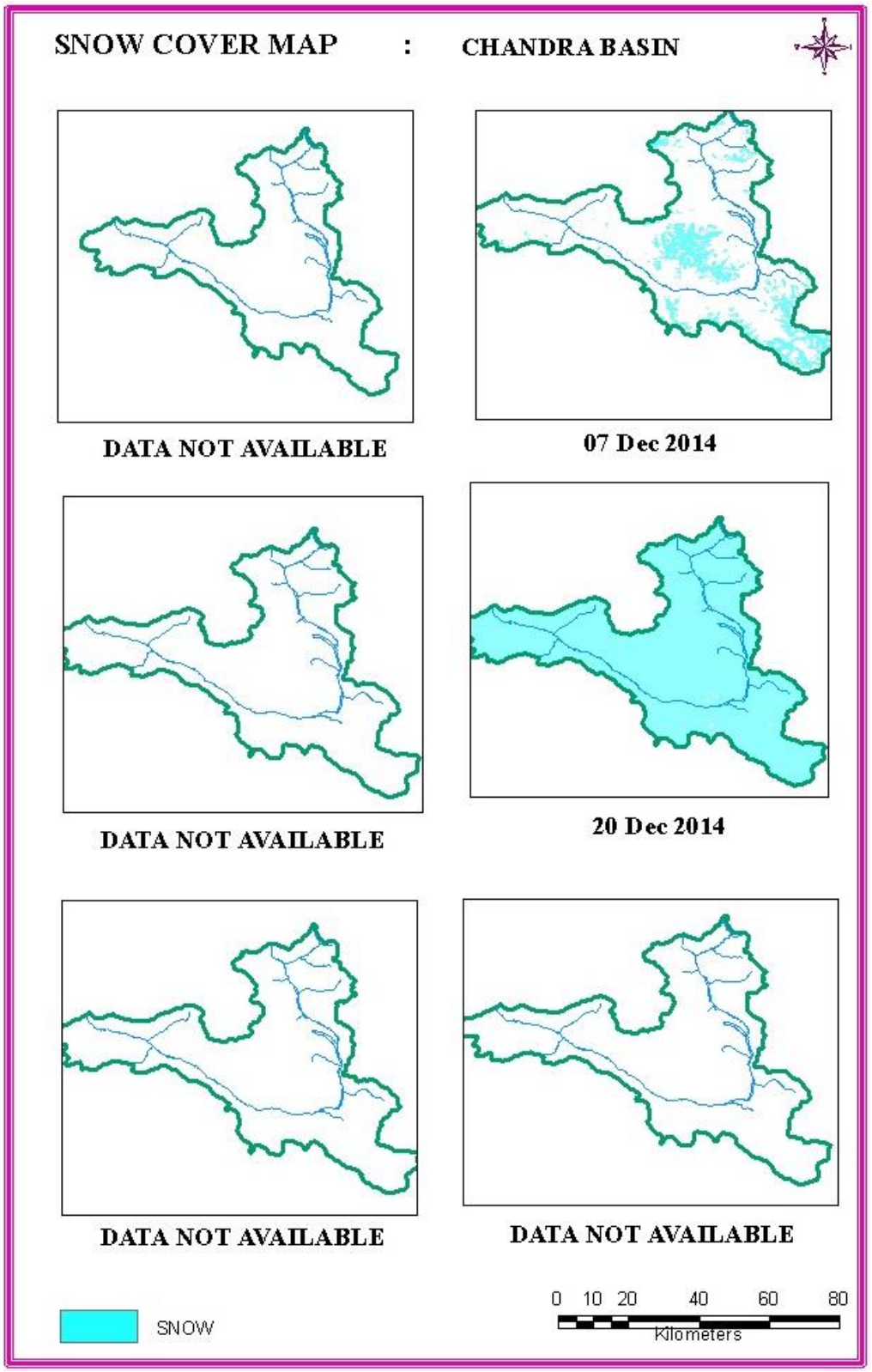
DATA USED

DATA NOT AVAILABLE

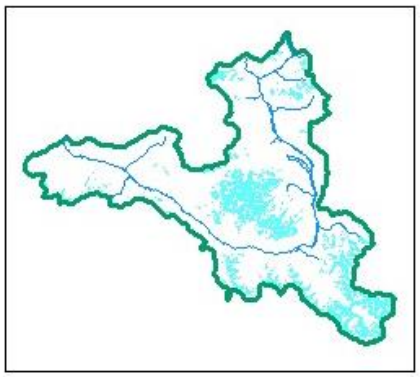
SNOW

0 10 20 40 60 80

Kilometers

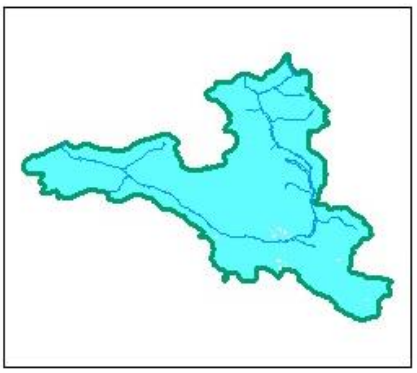

SNOW COVER MAP : CHANDRA BASIN
DATA NOT AVAILABLE
07 Dec 2014
DATA NOT AVAILABLE
20 Dec 2014
DATA NOT AVAILABLE
DATA NOT AVAILABLE
SNOW
0 10 20 40 60 80
Kilometers

10 DAILY SNOW COVER MAP: CHANDRA BASIN



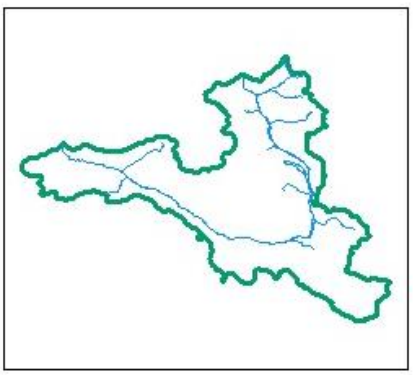
DATA USED

07 Dec 2014



DATA USED

20 Dec 2014



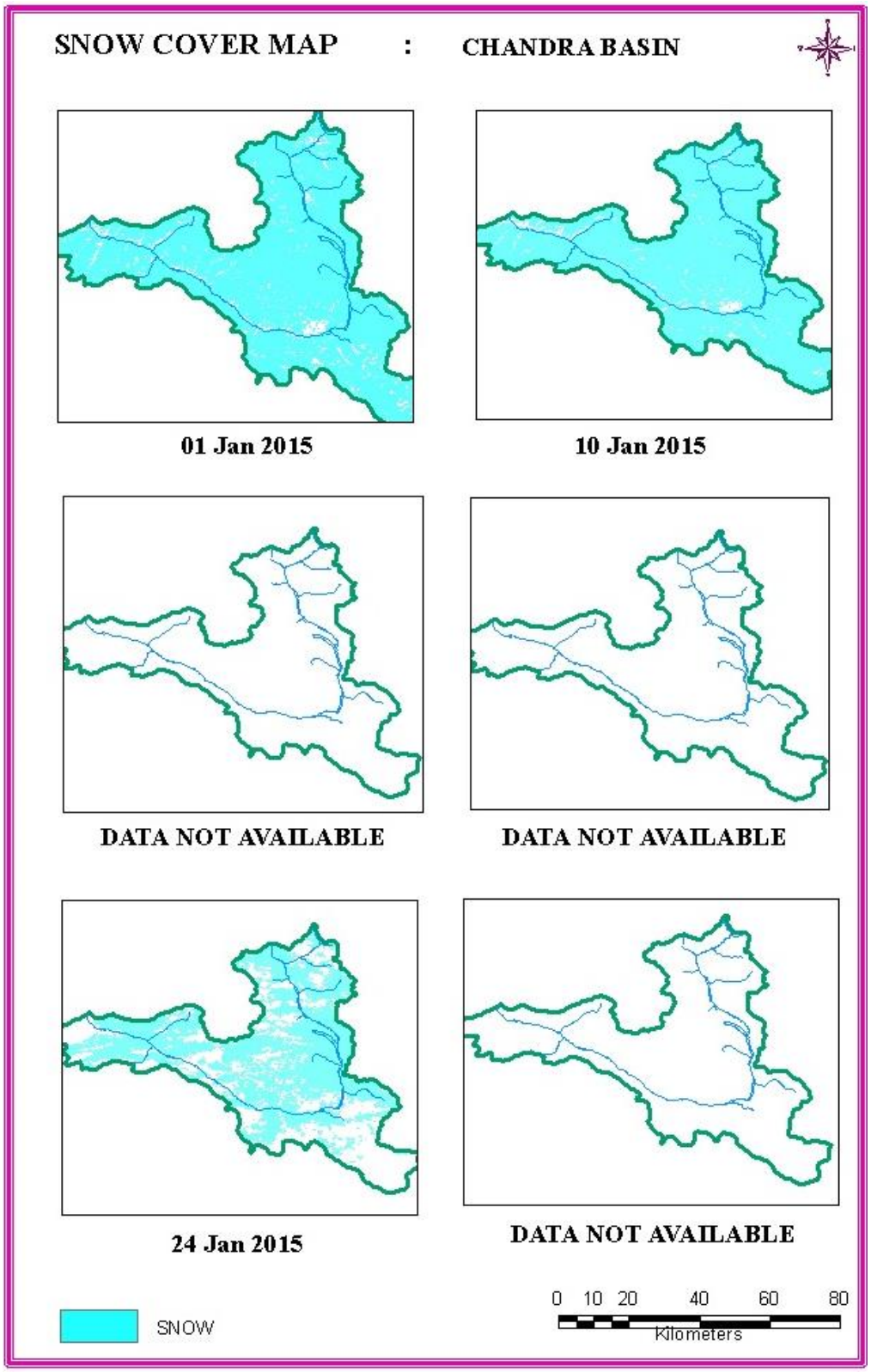
DATA USED

DATA NOT AVAILABLE

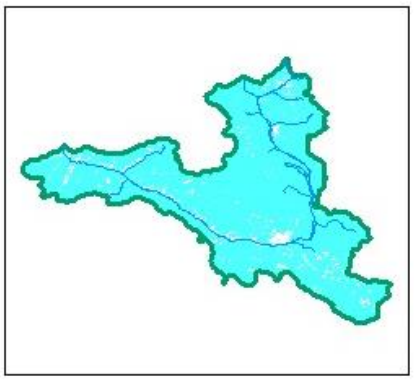
SNOW

0 10 20 40 60 80

Kilometers


SNOW COVER MAP : CHANDRA BASIN
01 Jan 2015
10 Jan 2015
DATA NOT AVAILABLE
DATA NOT AVAILABLE
24 Jan 2015
DATA NOT AVAILABLE
SNOW
0 10 20 40 60 80
Kilometers

10 DAILY SNOW COVER MAP: CHANDRA BASIN

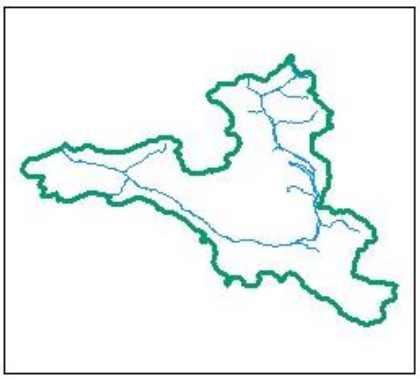


DATA USED

01Jan 2015

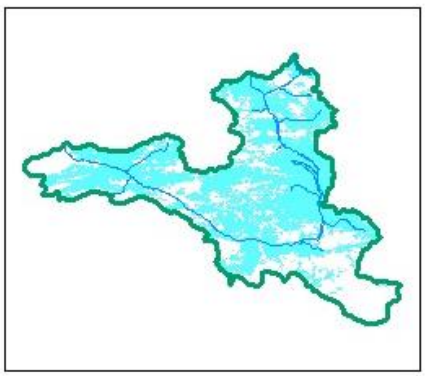
05 Jan 2015

10 Jan 2015



DATA USED

DATA NOT AVAILABLE



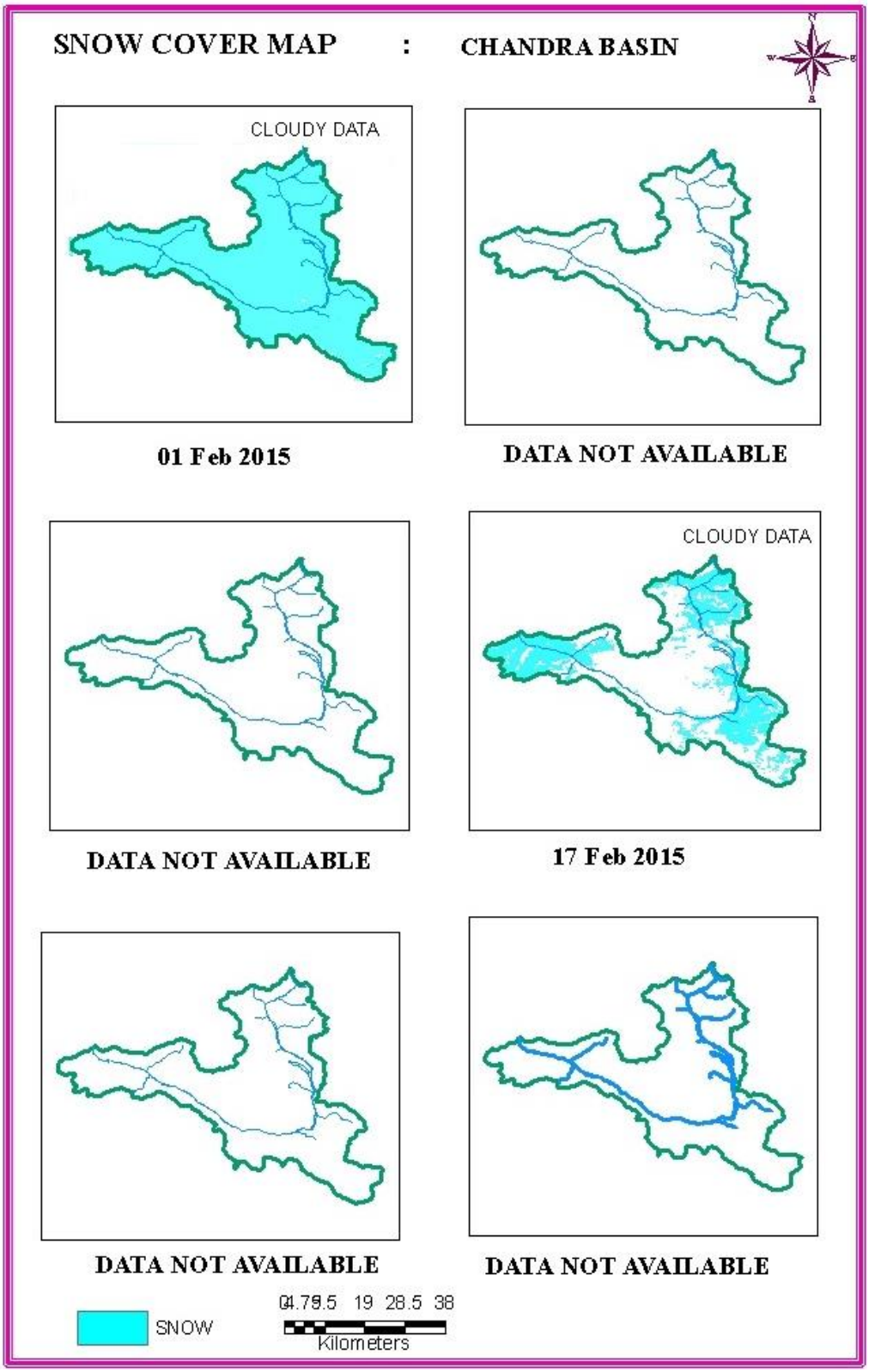
DATA USED

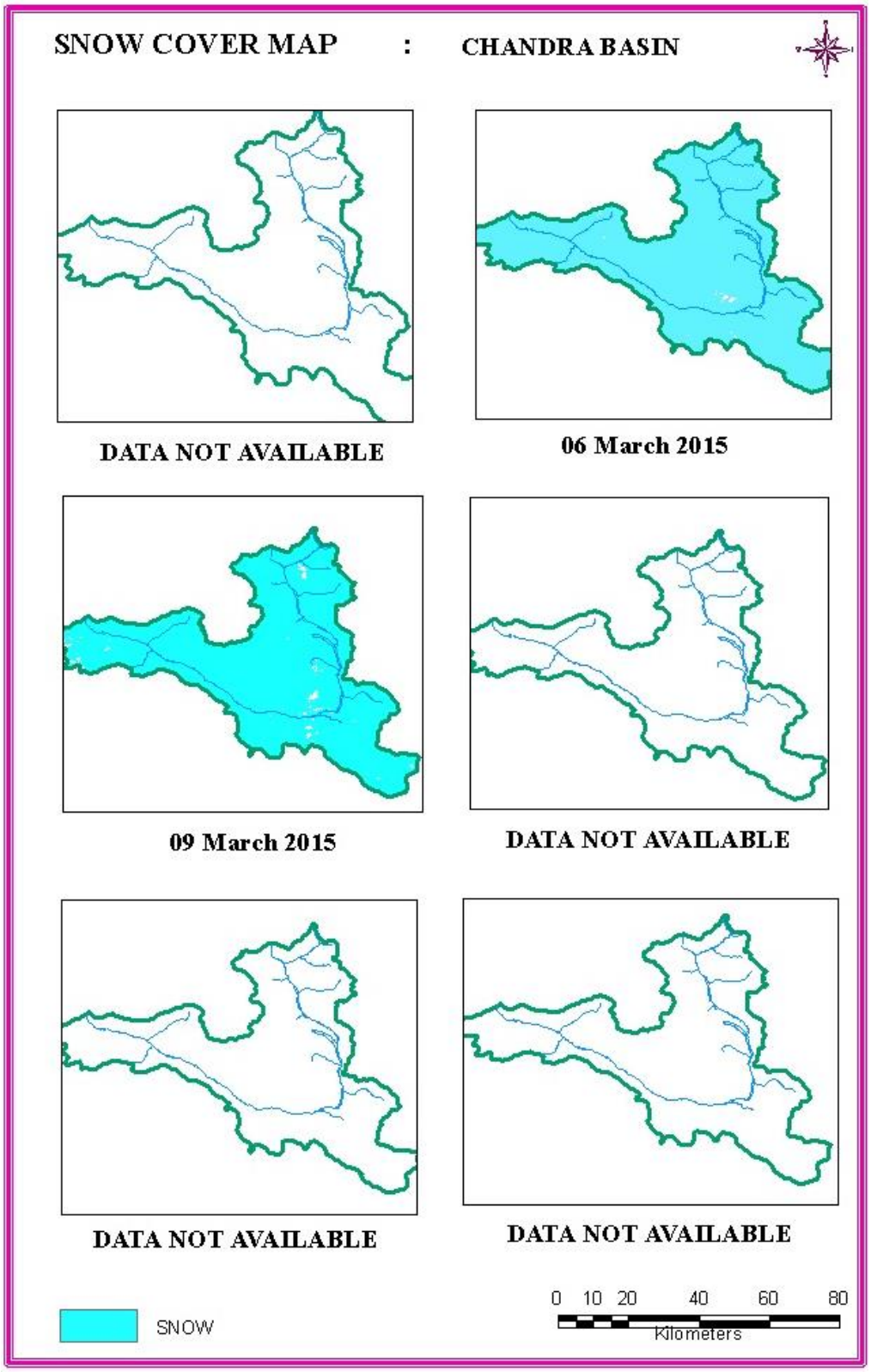
24 Jan 2015

SNOW

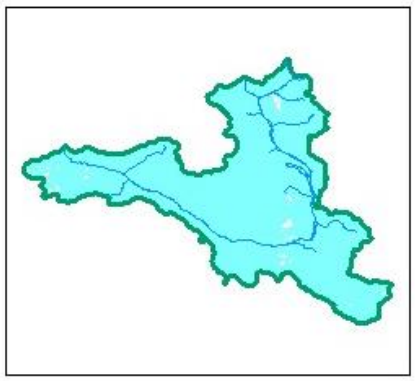
0 10 20 40 60 80

Kilometers


SNOW COVER MAP : CHANDRA BASIN
CLOUDY DATA
01 Feb 2015
DATA NOT AVAILABLE
DATA NOT AVAILABLE
CLOUDY DATA
17 Feb 2015
DATA NOT AVAILABLE
DATA NOT AVAILABLE
SNOW
0 4.75 9.5 19 28.5 38
Kilometers

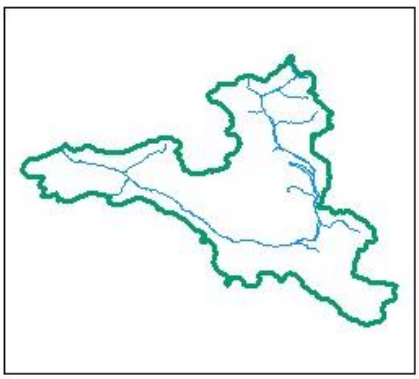

SNOW COVER MAP : CHANDRA BASIN
DATA NOT AVAILABLE
06 March 2015
09 March 2015
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
SNOW
0 10 20 40 60 80
Kilometers

10 DAILY SNOW COVER MAP: CHANDRA BASIN



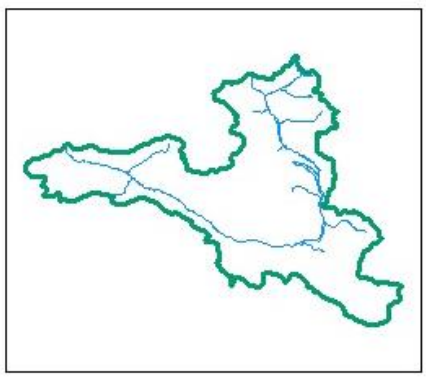
DATA USED

04 March 2015
06 March 2015
09 March 2015



DATA USED

DATA NOT AVAILABLE

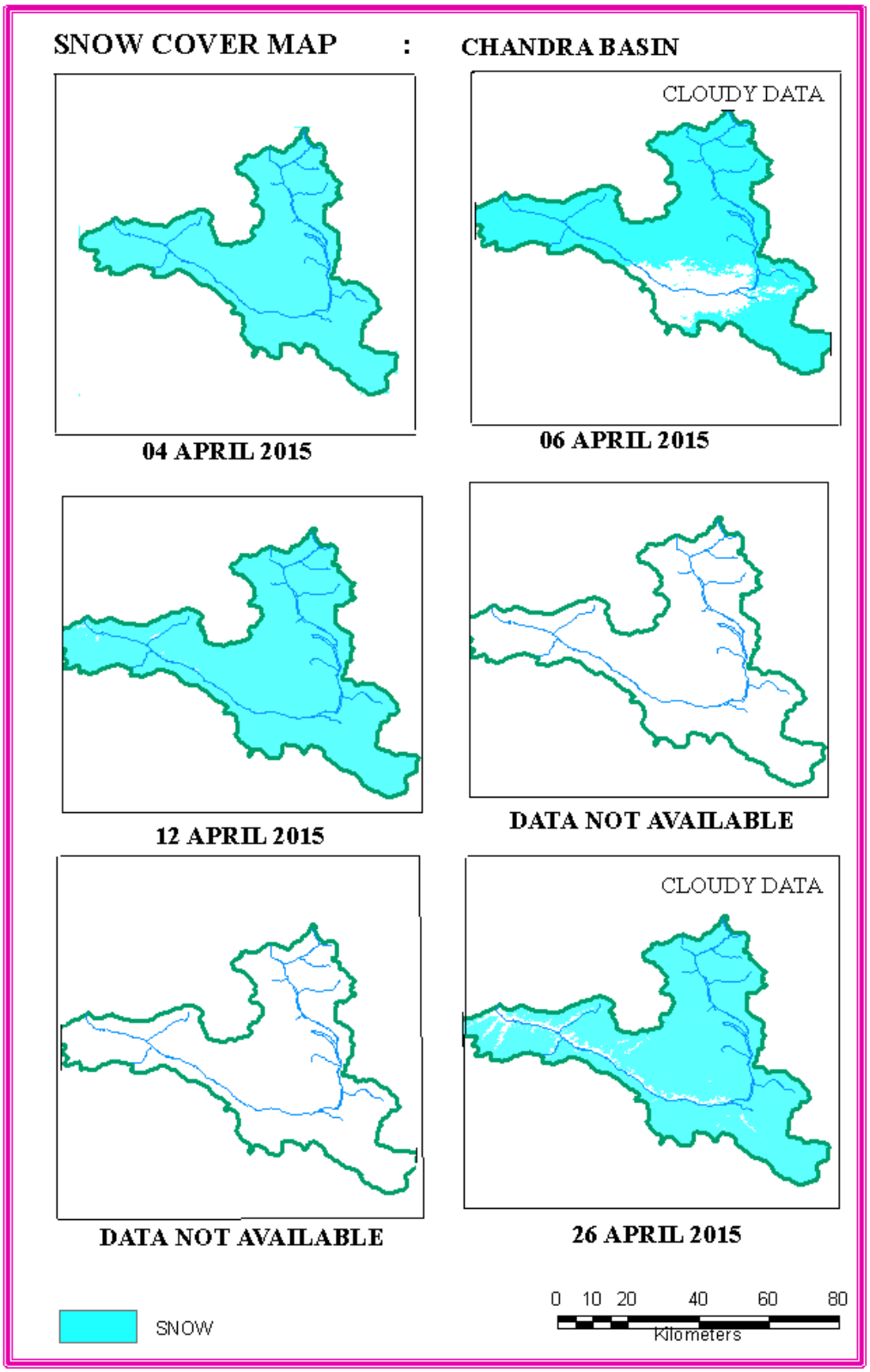


DATA USED

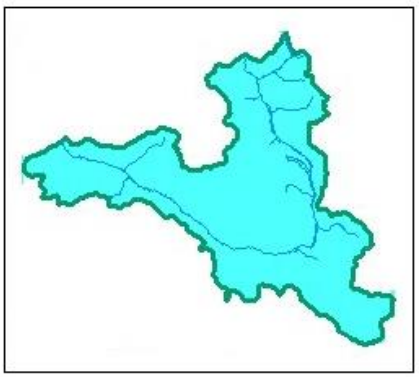
DATA NOT AVAILABLE

SNOW

0 10 20 40 60 80
Kilometers

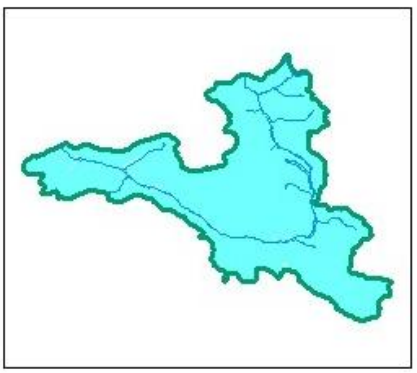

SNOW COVER MAP : CHANDRA BASIN
CLOUDY DATA
04 APRIL 2015
06 APRIL 2015
12 APRIL 2015
DATA NOT AVAILABLE
DATA NOT AVAILABLE
CLOUDY DATA
26 APRIL 2015
SNOW
0 10 20 40 60 80
Kilometers

10 DAILY SNOW COVER MAP: CHANDRA BASIN



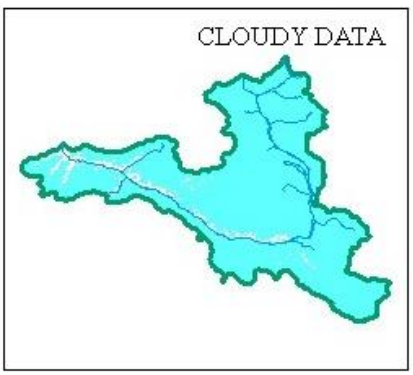
DATA USED

04 April 2015
06April 2015
07 April 2015



DATA USED

11 April 2015
12 April 2015

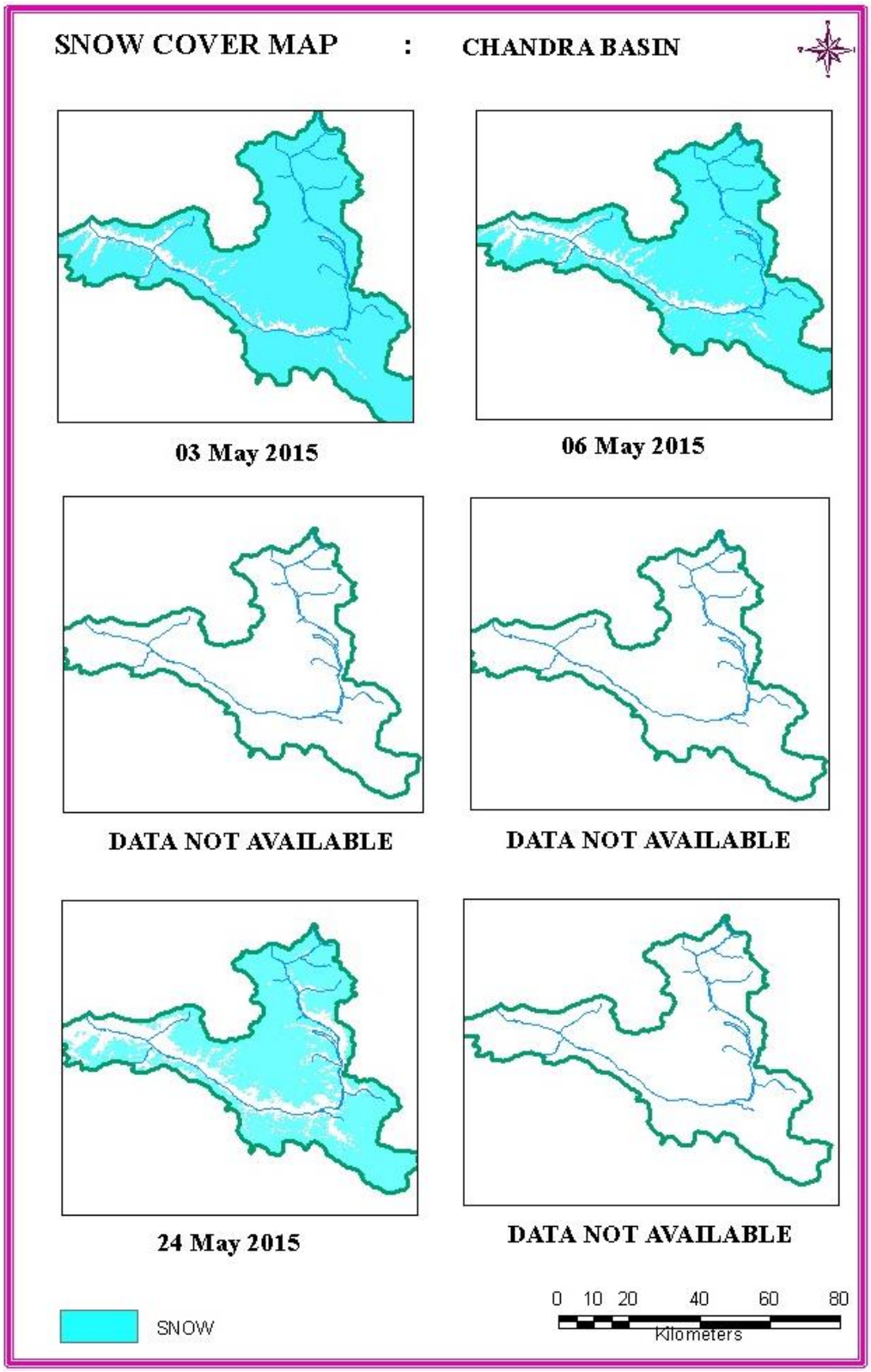


DATA USED

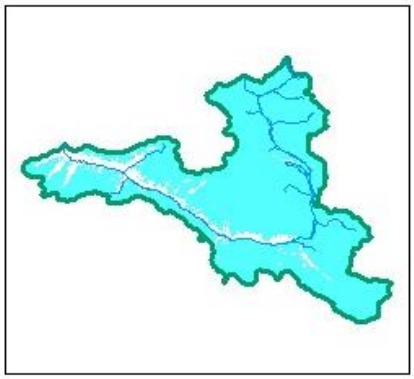
26 April 2015

SNOW

0 10 20 40 60 80
Kilometers


SNOW COVER MAP : CHANDRA BASIN
03 May 2015
06 May 2015
DATA NOT AVAILABLE
DATA NOT AVAILABLE
24 May 2015
DATA NOT AVAILABLE
SNOW
0 10 20 40 60 80
Kilometers

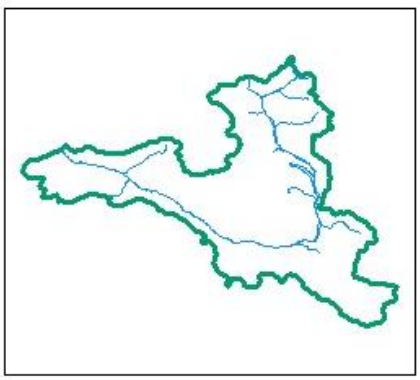
10 DAILY SNOW COVER MAP: CHANDRA BASIN



DATA USED

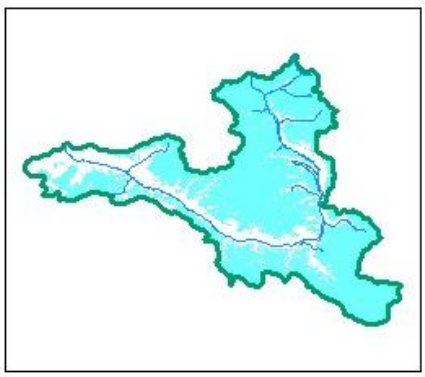
03 May 2015

06 May2015



DATA USED

DATA NOT AVAILABLE



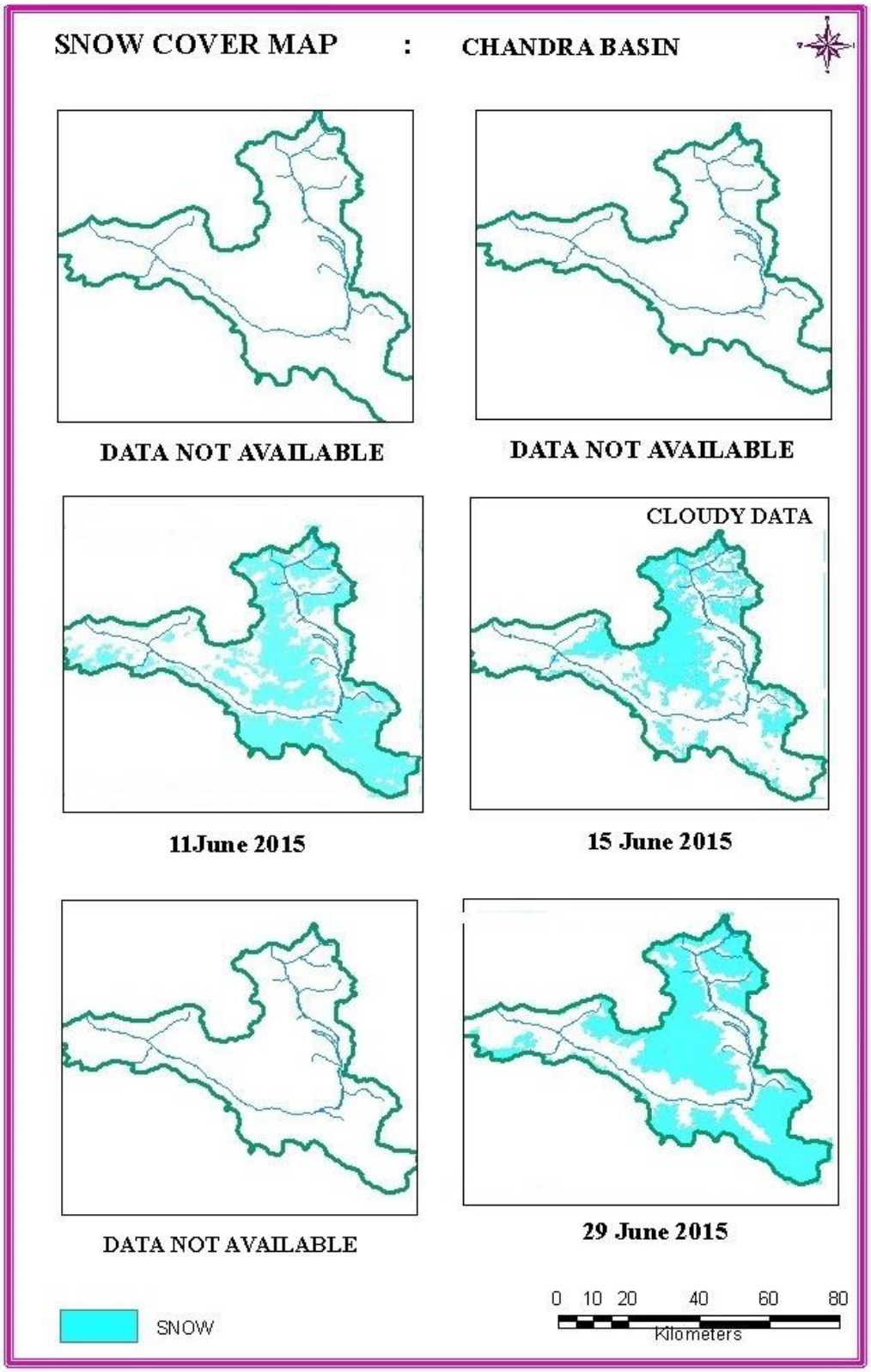
DATA USED

24 May 2015

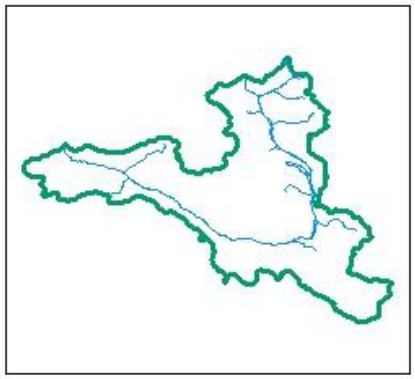
SNOW

0 10 20 40 60 80

Kilometers

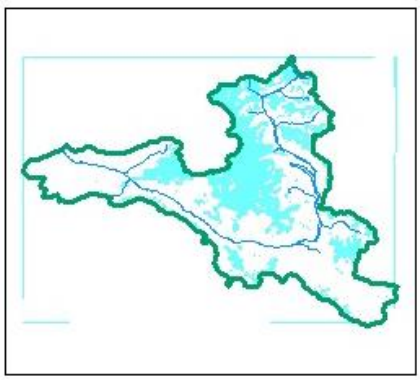

SNOW COVER MAP : CHANDRA BASIN
DATA NOT AVAILABLE
DATA NOT AVAILABLE
CLOUDY DATA
11June 2015
15 June 2015
DATA NOT AVAILABLE
29 June 2015
SNOW
0 10 20 40 60 80
Kilometers

10 DAILY SNOW COVER MAP: CHANDRA BASIN



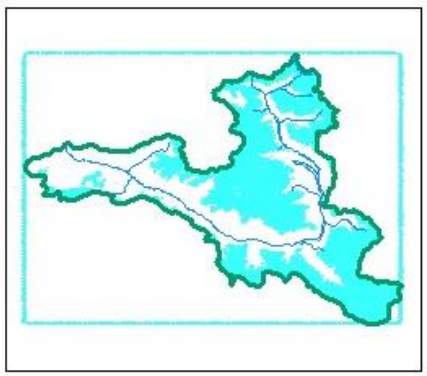
DATA USED

DATA NOT AVAILABLE



DATA USED

11 June 2015
15 June 2015
20 June 2015



DATA USED

29 June 2015

SNOW

0 10 20 40 60 80
Kilometers

BHAGA SUB-BASIN

AREAL EXTENT OF SNOW (05 DAILY)

BASIN NAME: BHAGA **BASIN AREA: 1680 Sq km**

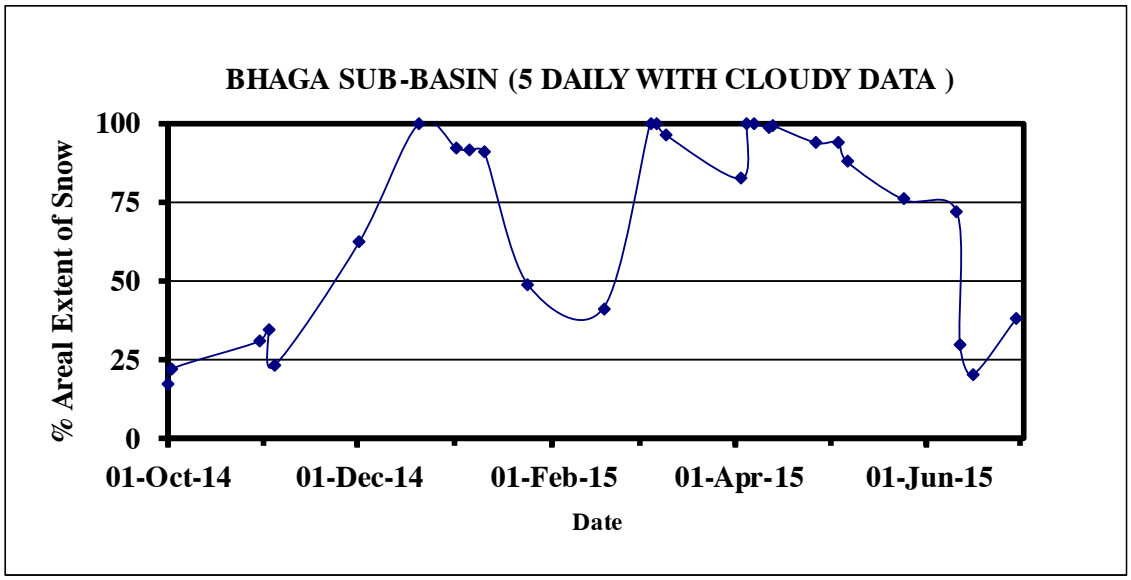
S. No	Date	Snow cover (sq. km)	Snow cover (%)	S. No	Date	Snow cover (sq. km)	Snow cover (%)
October 2014							
1.	01 Oct 2014	290	17	3	30 Oct 2014	517	31
2.	02 Oct 2014	370	22				
November 2014							
4.	02 Nov 14	586	35	5	04 Nov 2014	388	23 ©
December 2014							
6	01 Dec 14	1047	62	7	20 Dec 14	1680	100
January 2015							
8	01 Jan 2015	1555	93	10	10 Jan 2015	1531	91
9	05 Jan 2015	1538	92	11	24 Jan 2015	821	49©
February 2015							
12.	01 Feb 2015	1680	100©	13	17 Feb 2015	694	41©
March 2015							
14.	04 Mar 2015	1680	100	16	09 Mar 2015	1622	97
15.	06 Mar 2015	1680	100				
April 2015							
17.	02 Apr2015	1388	83 ©	21	11 Apr 2015	1662	99
18.	04 Apr 2015	1680	100	22	12 Apr 2015	1673	100©
19.	06 Apr 2015	1679	100	23	26 Apr 2015	1579	94
20	07 Apr 2015	1660	99 ©				
May 2015							
24.	03 May 2015	1582	94	26	24 May 2015	1275	76
25.	06 May 2015	1478	88				
June 2015							
27.	10 June 2015	1209	72©	29.	15 June 2015	339	20(c)
28.	11 June 2015	505	30©	30.	29 June 2015	638	38©

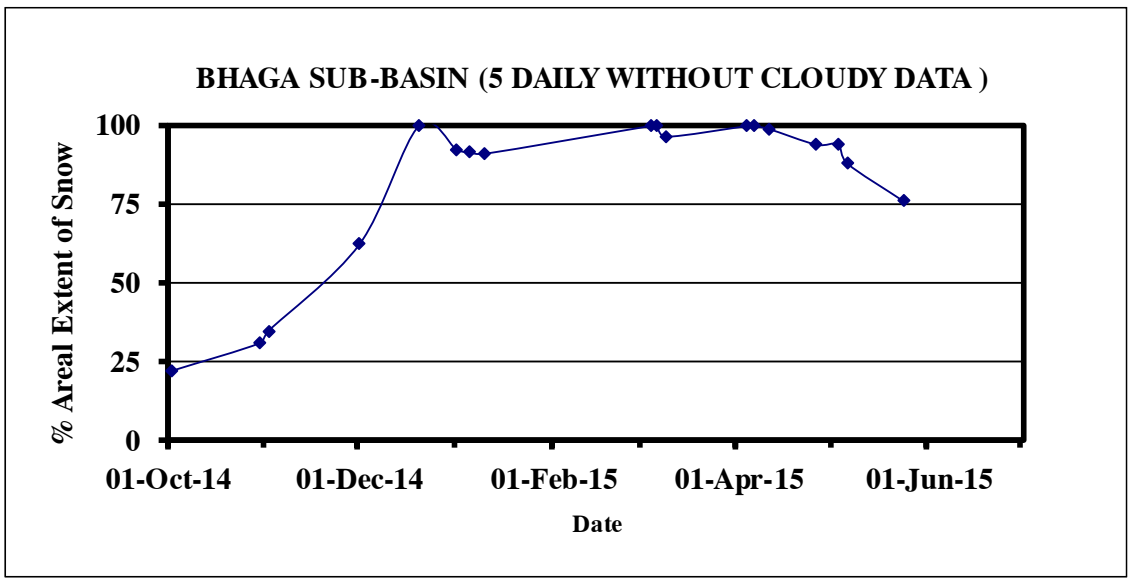
AREAL EXTENT OF SNOW (10 DAILY)

BASIN NAME: BHAGA **BASIN AREA: 1680 sq km**

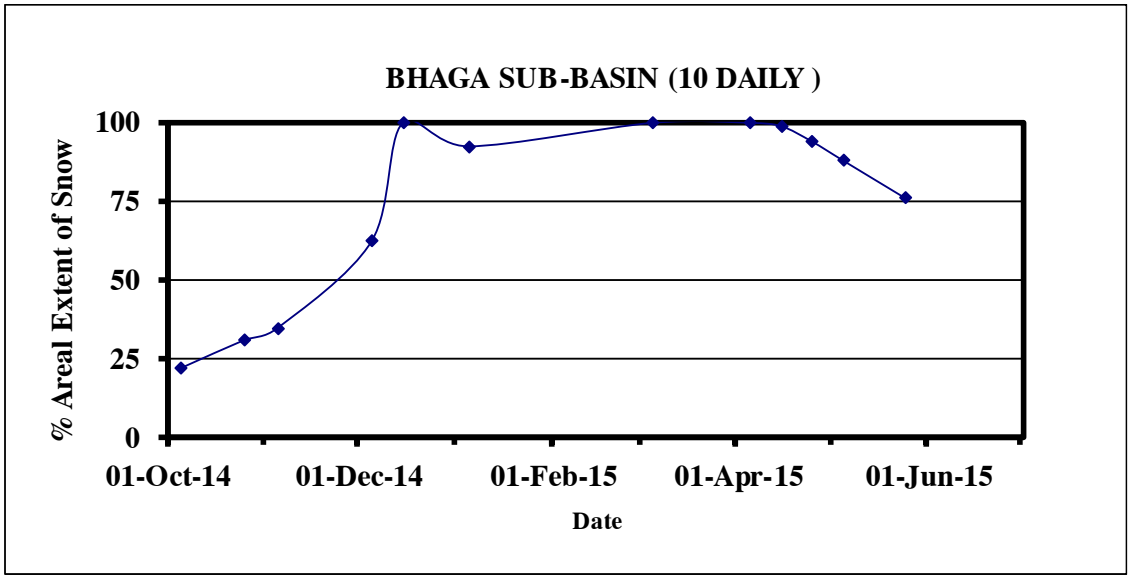
S. No	Date	Snow cover (sq. km)	Snow cover (%)	S. No	Date	Snow cover (sq. km)	Snow cover (%)
October 2014							
1.	01 Oct 2014	370	22	2	30 Oct 2014	517	31
2.	02 Oct 2014						
November 2014							
3.	02 Nov 2014	584	35				
3	04 Nov 2014						
December 2014							
4.	05 Dec 2014	1047	62	5.	15 Dec 2014	1680	100
January 2015							
6.	01 Jan 2015	1555	93				
6.	05 Jan 2015						
6	10 Jan 2015						
February 2015							
March 2015							
7.	05 Mar 2015	1680	100				
April 2015							
8	05 April 2015	1680	100	10	25 April 2015	1580	94
9	15 April 2015	1663	99				
May 2015							
11	05 May 2015	1478	88				
June 2015							

SNOW COVER DEPLETION CURVE



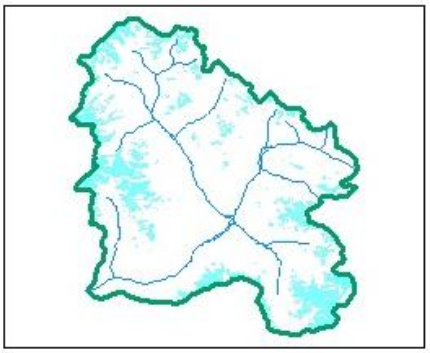


SNOW COVER DEPLETION CURVE

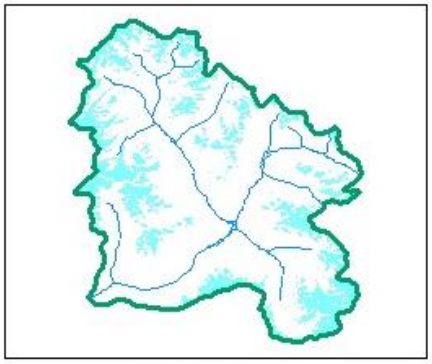


SNOW COVER MAP

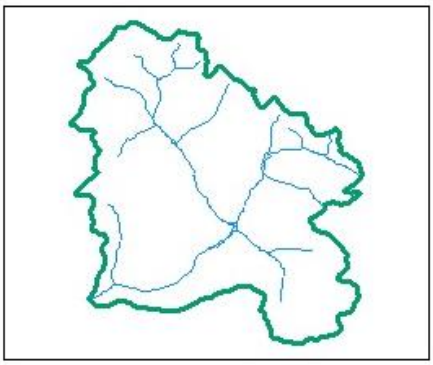
SNOW COVER MAP : BHAGA BASIN



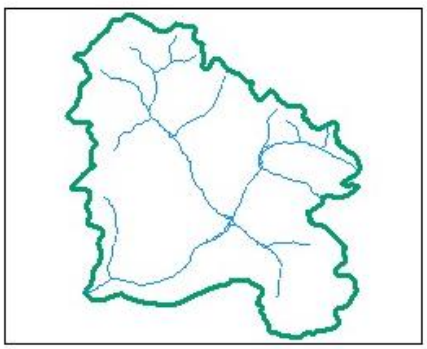
01Oct 2014



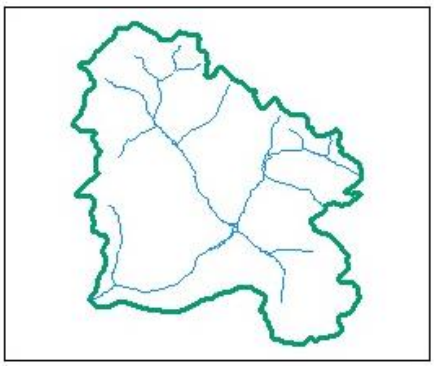
02 Oct 2014



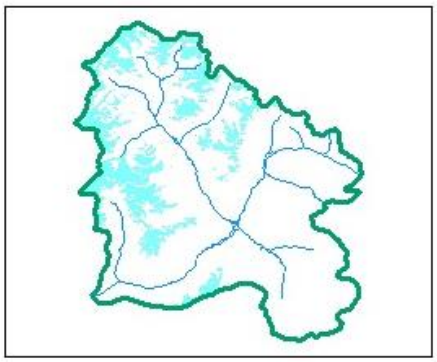
DATA NOT AVAILABLE



DATA NOT AVAILABLE



DATA NOT AVAILABLE



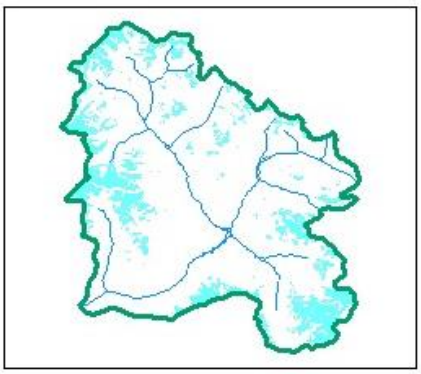
30Oct 2014

SNOW

0 5 10 20 30 40

Kilometers

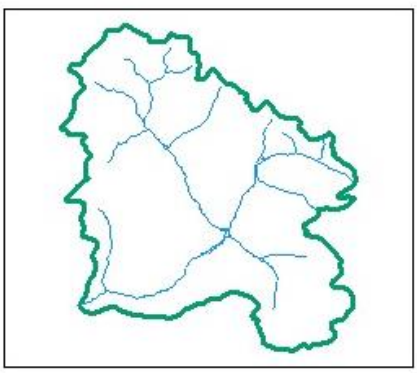
10 DAILY SNOW COVER MAP: **BHAGA BASIN**



DATA USED

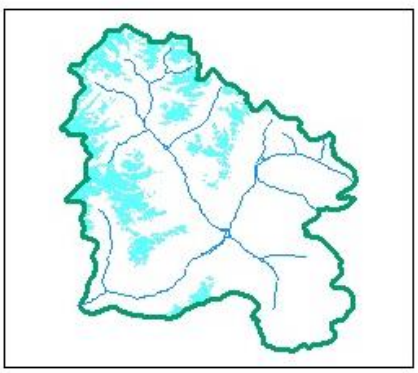
01Oct 2014

02 Oct 2014



DATA USED

DATA NOT AVAILABLE



DATA USED

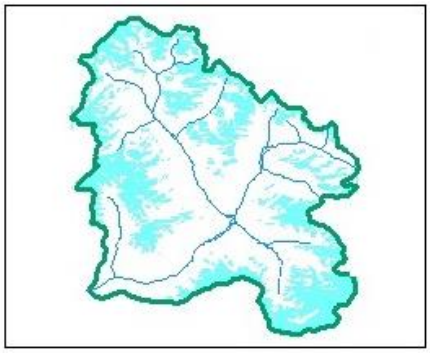
30 Oct 2014

SNOW

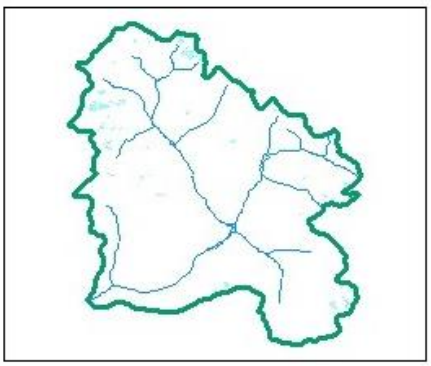
0 5 10 20 30 40

Kilometers

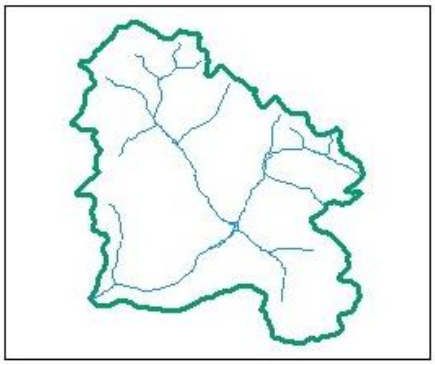
SNOW COVER MAP : BHAGA BASIN



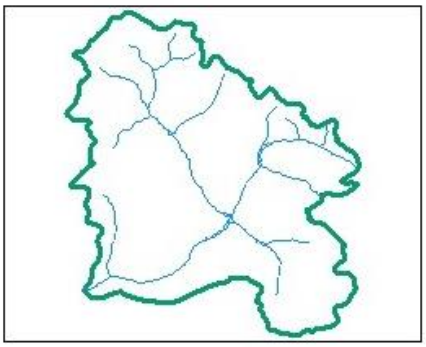
02Nov 2014



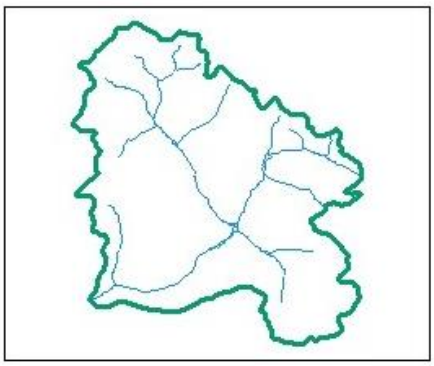
04Nov2014



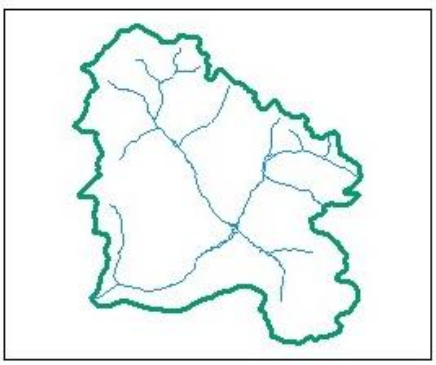
DATA NOT AVAILABLE



DATA NOT AVAILABLE



DATA NOT AVAILABLE



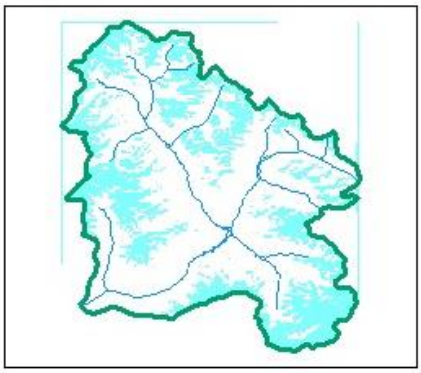
DATA NOT AVAILABLE

SNOW

0 5 10 20 30 40

Kilometers

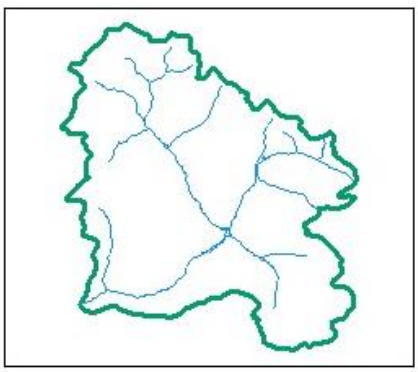
10 DAILY SNOW COVER MAP: **BHAGA BASIN**



DATA USED

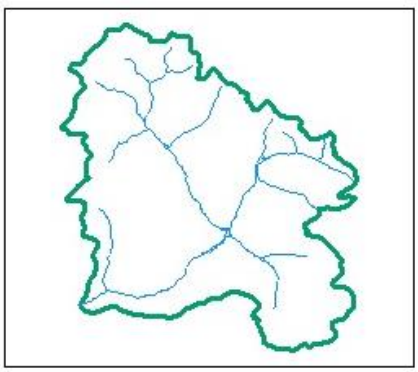
02 Nov 2014

04 Nov 2014



DATA USED

DATA NOT AVAILABLE



DATA USED

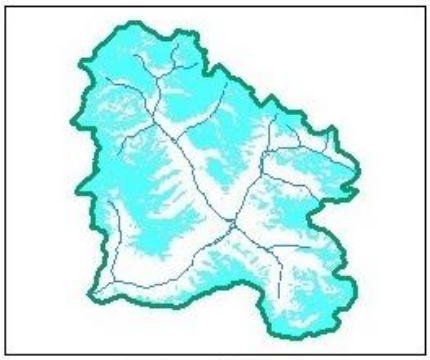
DATA NOT AVAILABLE

SNOW

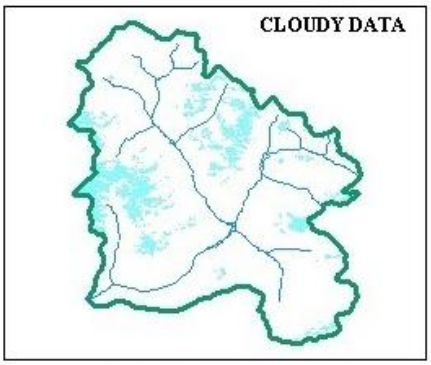
0 5 10 20 30 40

Kilometers

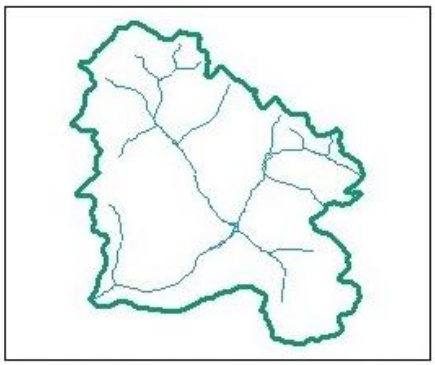
SNOW COVER MAP : BHAGA BASIN



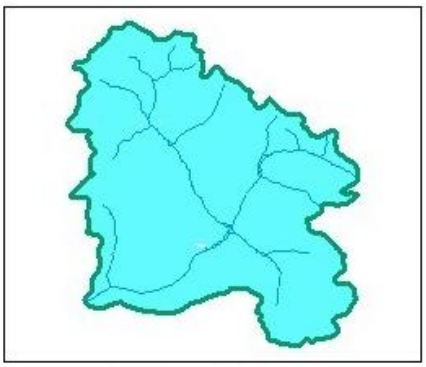
01Dec 2014



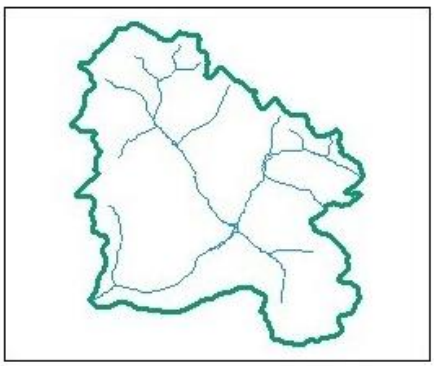
07 Dec 2014



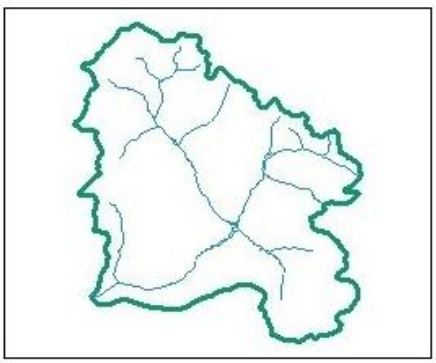
DATA NOT AVAILABLE



20 Dec 2014



DATA NOT AVAILABLE

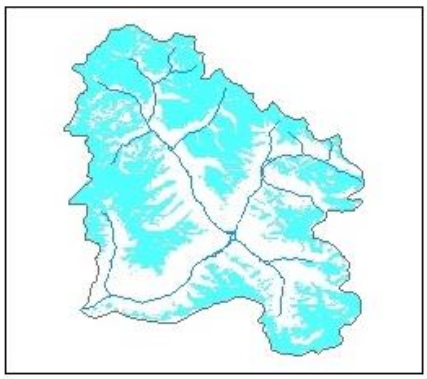


DATA NOT AVAILABLE

SNOW

0 10 20 40 60 80
Kilometers

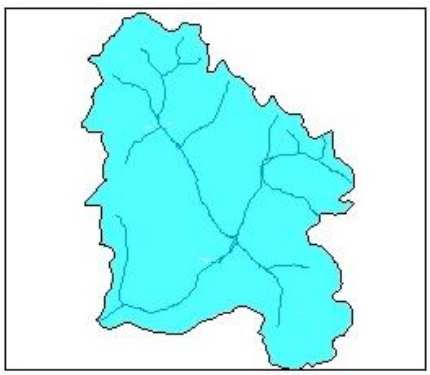
10 DAILY SNOW COVER MAP: BHAGA BASIN



DATA USED

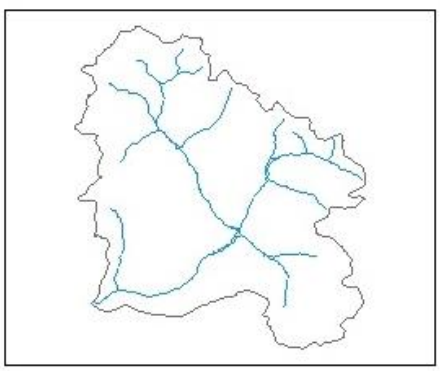
01 Dec 2014

07 Dec 2014



DATA USED

20 Dec 2014



DATA USED

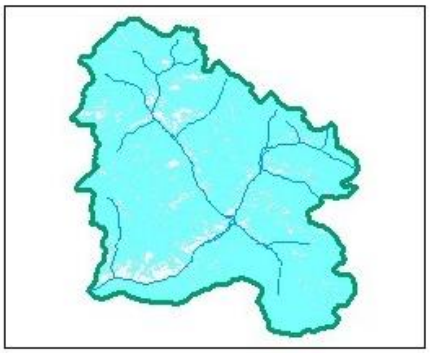
DATA NOT AVAILABLE

SNOW

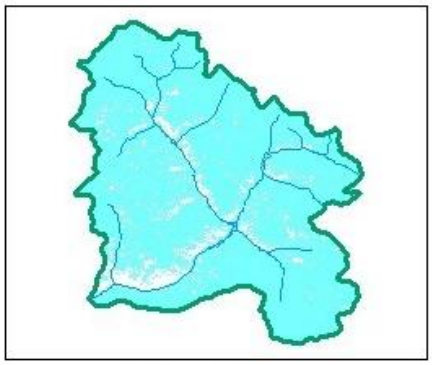
0 4.75 9.5 19 28.5 38

Kilometers

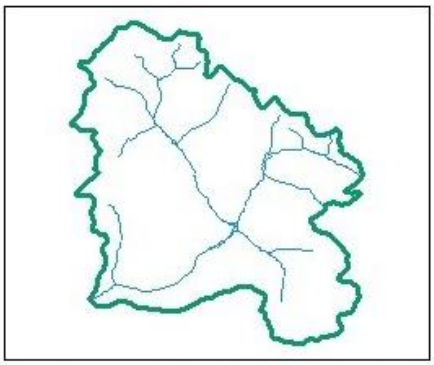
SNOW COVER MAP : BHAGA BASIN



05Jan 2015



10Jan 2015



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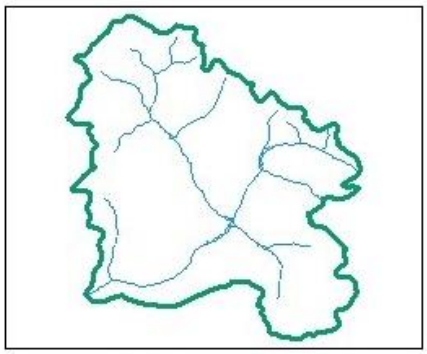
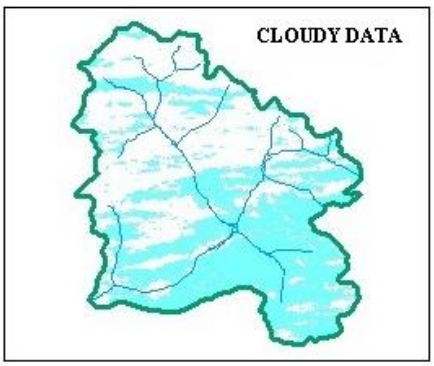
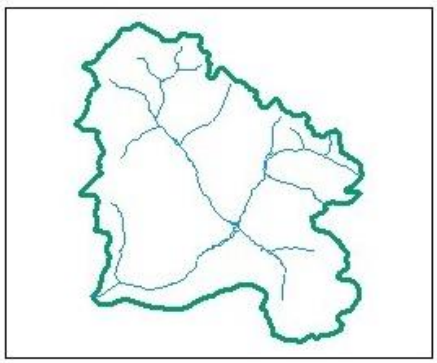


DATA NOT AVAILABLE



24 Jan 2015



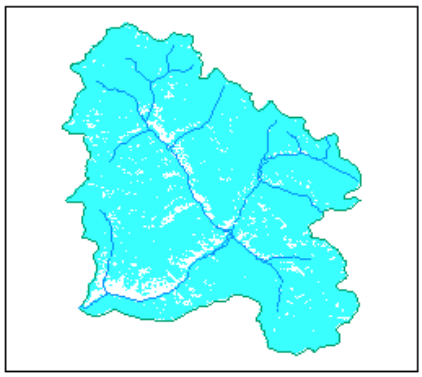
DATA NOT AVAILABLE

SNOW

0 4.75 9.5 19 28.5 38

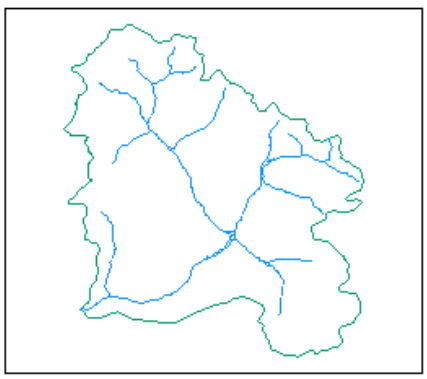
Kilometers

10 DAILY SNOW COVER MAP: BHAGA BASIN



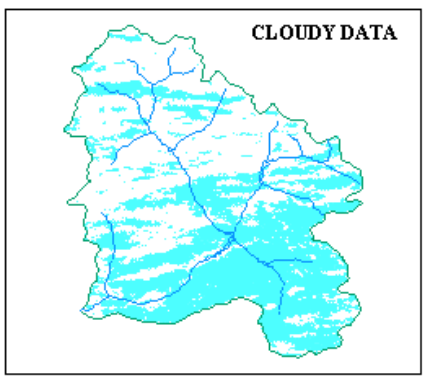
DATA USED

01 Jan 2015
05 Jan 2015
10 Jan 2015



DATA USED

DATA NOT AVAILABLE

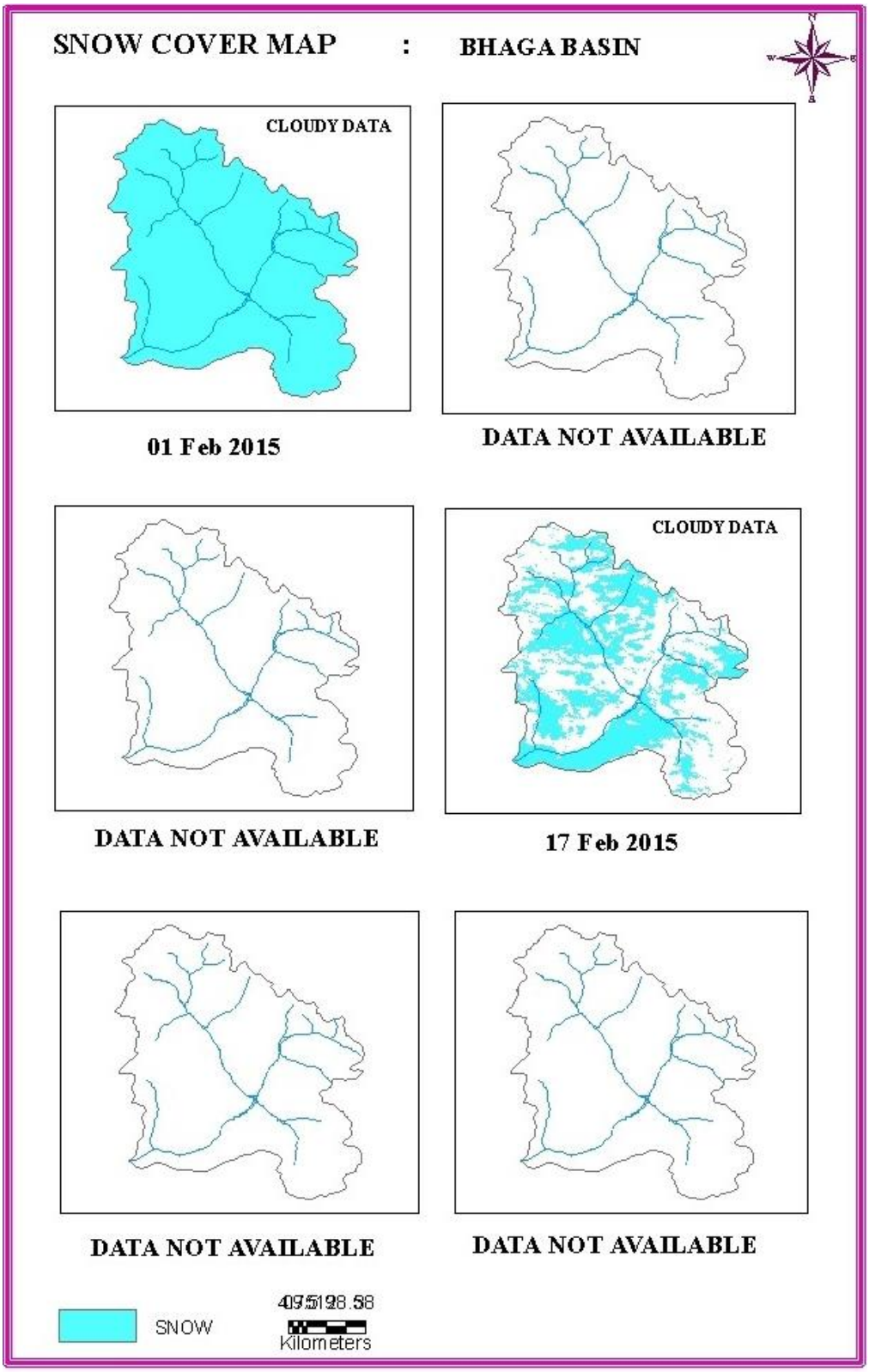


DATA USED

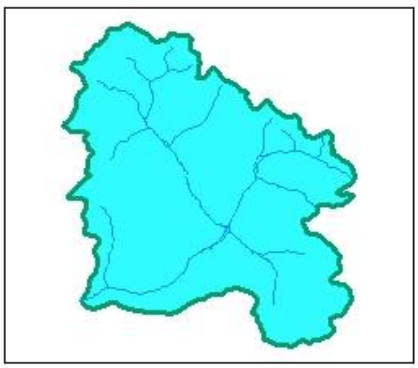
24 Jan 2015

SNOW

0 5 10 20 30 40
Kilometers

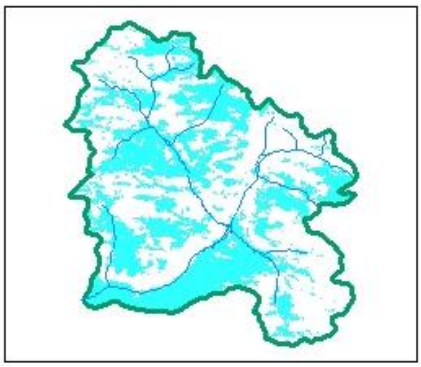

SNOW COVER MAP : BHAGA BASIN
CLOUDY DATA
01 Feb 2015
DATA NOT AVAILABLE
DATA NOT AVAILABLE
CLOUDY DATA
17 Feb 2015
DATA NOT AVAILABLE
DATA NOT AVAILABLE
SNOW
Kilometers

10 DAILY SNOW COVER MAP: BHAGA BASIN



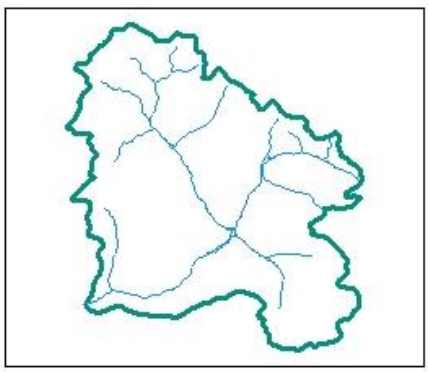
DATA USED

01Feb 2014



DATA USED

17 Feb 2014



DATA USED

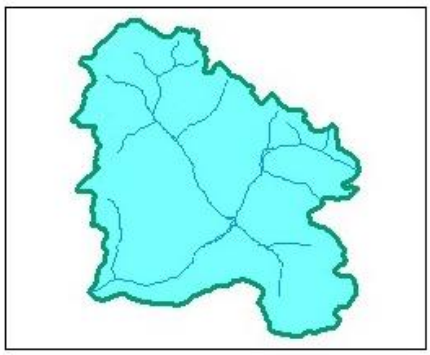
DATA NOT AVAVILABLE

SNOW

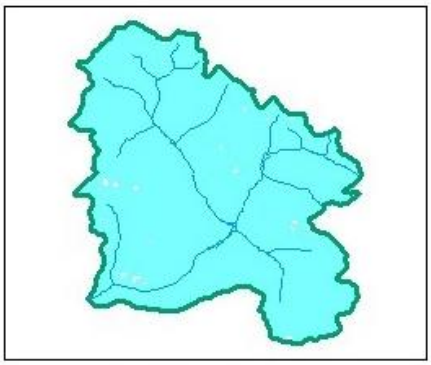
0 4.75 9.5 19 28.5 38

Kilometers

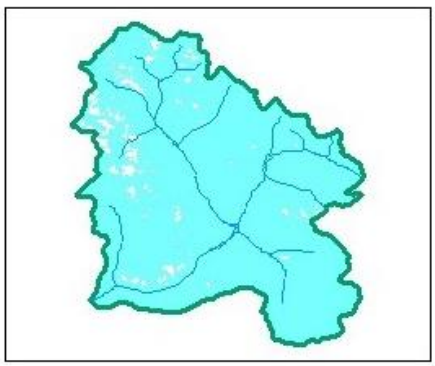
SNOW COVER MAP : BHAGA BASIN



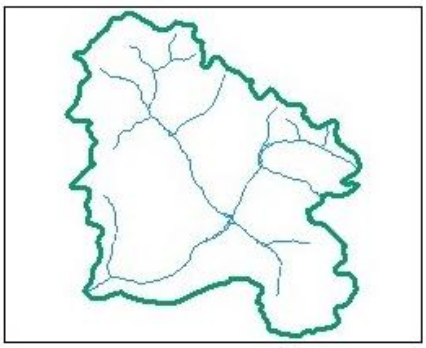
04 Mar 2015



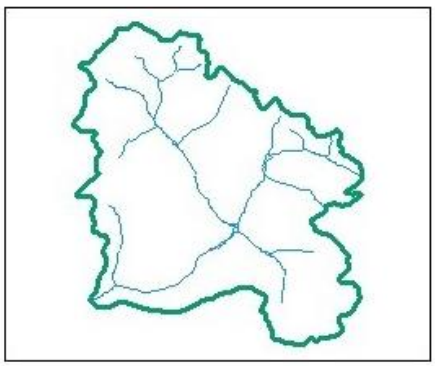
06 Mar 2015



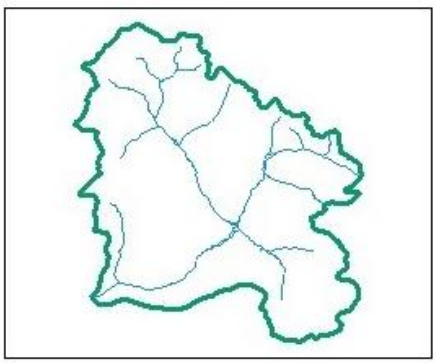
09 Mar 2015



DATA NOT AVAILABLE



DATA NOT AVAILABLE



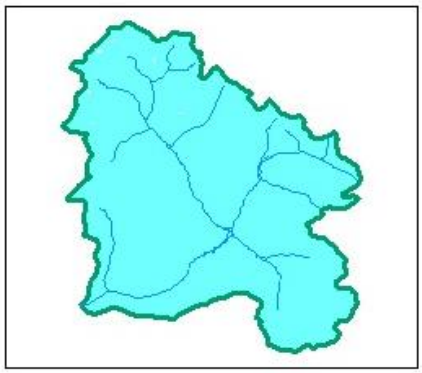
DATA NOT AVAILABLE

SNOW

0 5 10 20 30 40

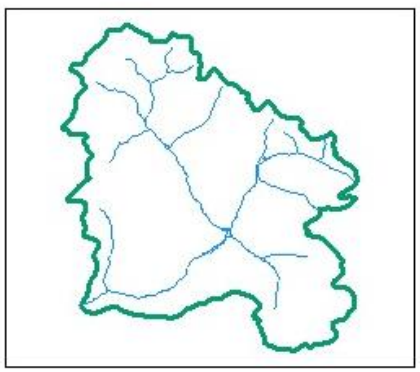
Kilometers

10 DAILY SNOW COVER MAP: **BHAGA BASIN**



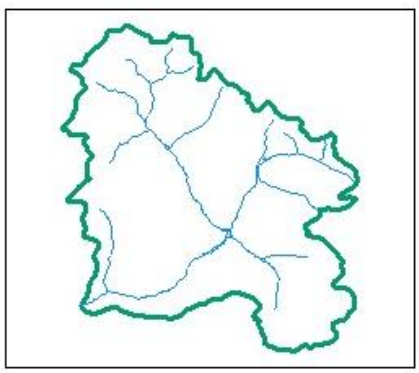
DATA USED

04 March 2015
06 March 2015
09 March 2015



DATA USED

DATA NOT AVAILABLE



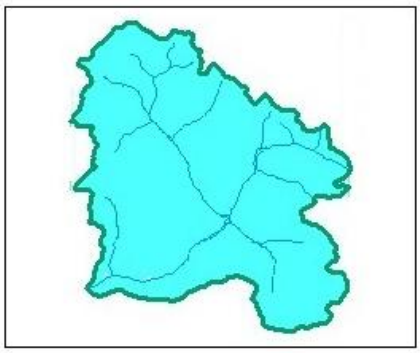
DATA USED

DATA NOT AVAILABLE

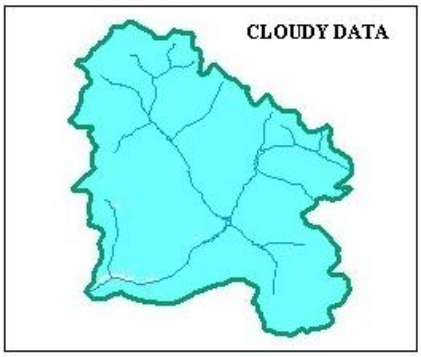
SNOW

0 5 10 20 30 40
Kilometers

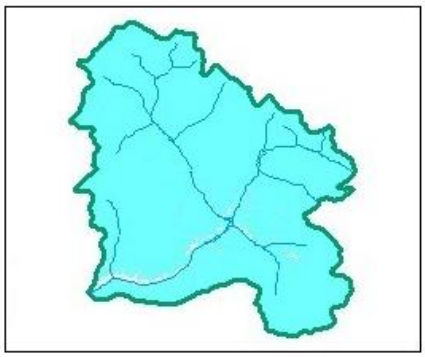
SNOW COVER MAP : BHAGA BASIN



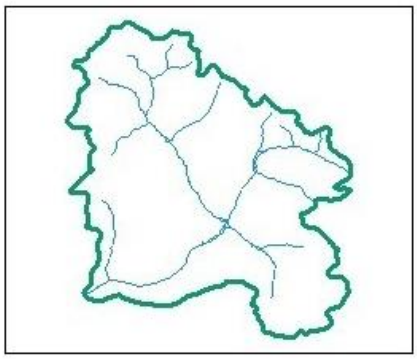
04 April 2015



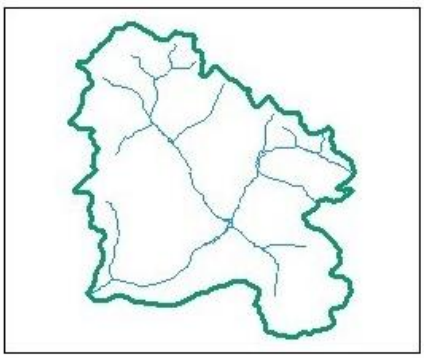
06 April 2015



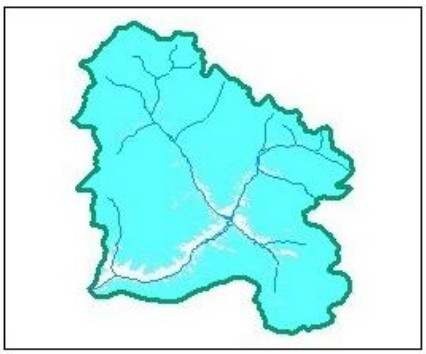
11 April 2015



DATA NOT AVAILABLE



DATA NOT AVAILABLE



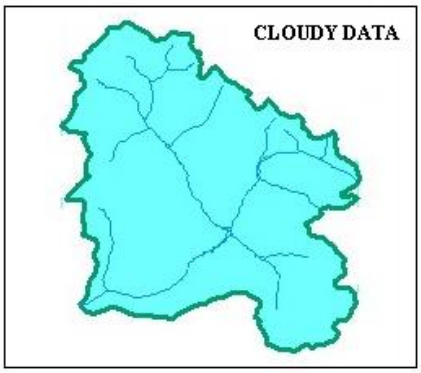
26 April 2015

SNOW

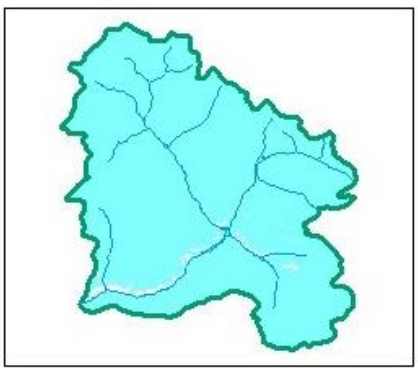
0 4 8 16 24 32

Kilometers

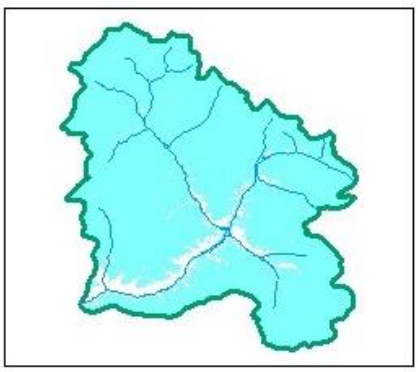
10 DAILY SNOW COVER MAP: BHAGA BASIN



DATA USED
02 Apr 2015
04 Apr 2015
07Apr 2015



DATA USED
11 Apr 2015
12 Apr 2015

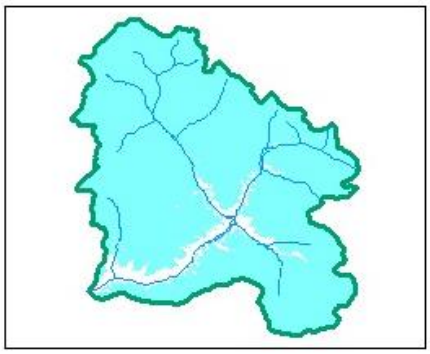


DATA USED
26 Apr 2015

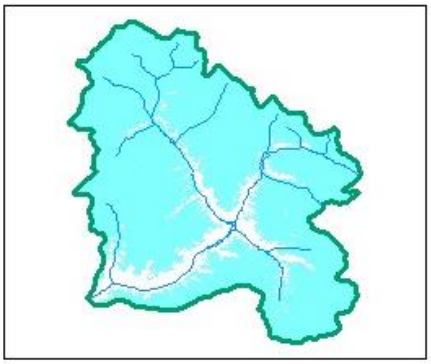
SNOW

0 4 8 16 24 32
Kilometers

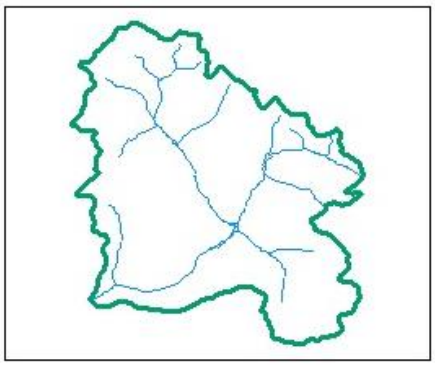
SNOW COVER MAP : BHAGA BASIN



03 May 2015



06 May2015



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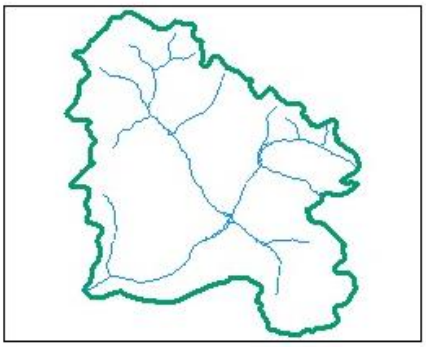
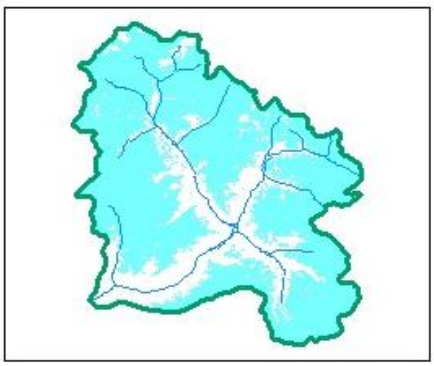
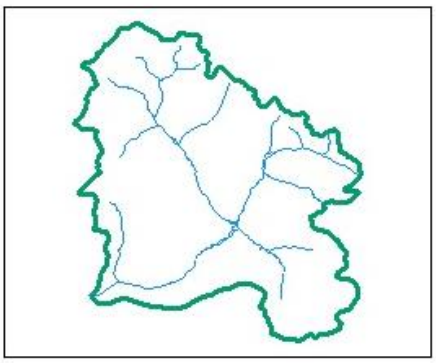


DATA NOT AVAILABLE



24May 2015



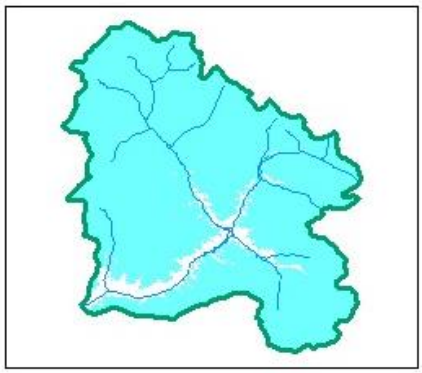
DATA NOT AVAILABLE

SNOW

0 5 10 20 30 40

Kilometers

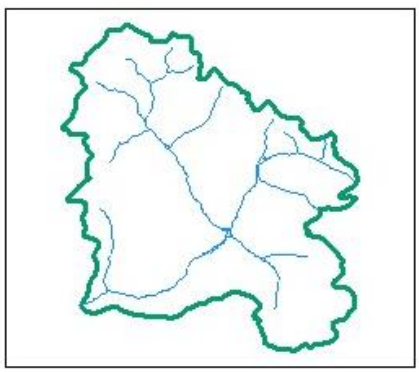
10 DAILY SNOW COVER MAP: **BHAGA BASIN**



DATA USED

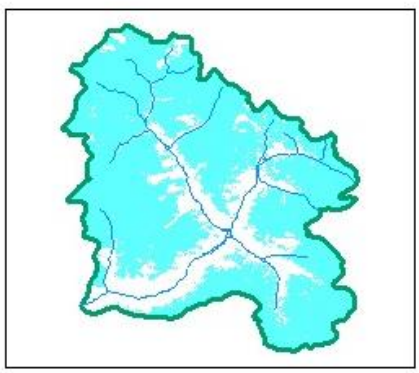
03 May 2015

06 May 2015



DATA USED

DATA NOT AVAILABLE



DATA USED

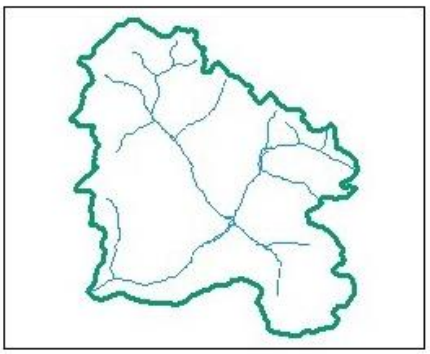
24 May 2015

SNOW

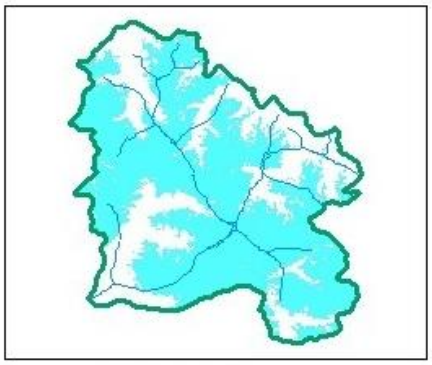
0 5 10 20 30 40

Kilometers

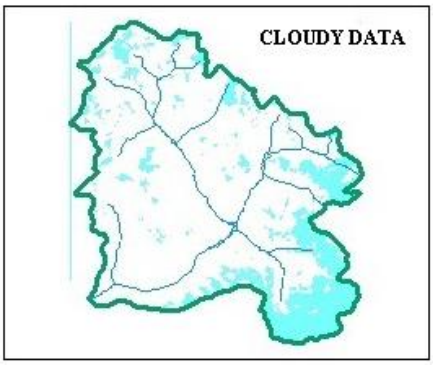
SNOW COVER MAP : BHAGA BASIN



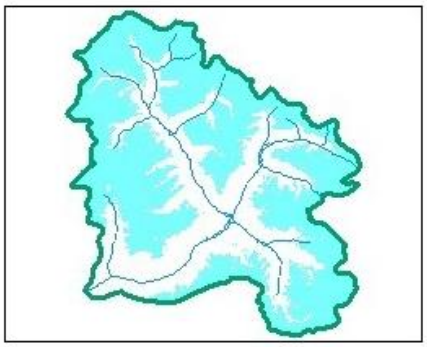
DATA NOT AVAILABLE



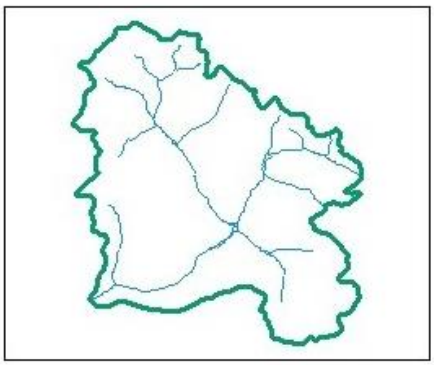
10June2015



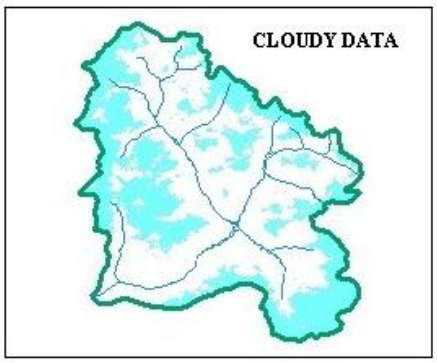
15 June 2014



20June 2015



DATA NOT AVAILABLE



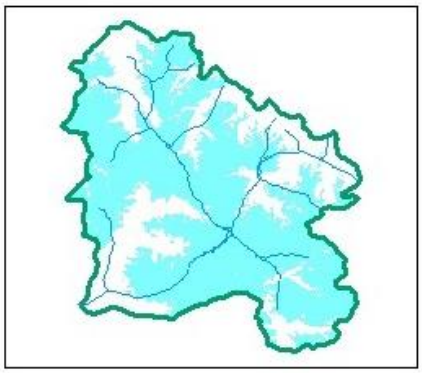
29June 2015

SNOW

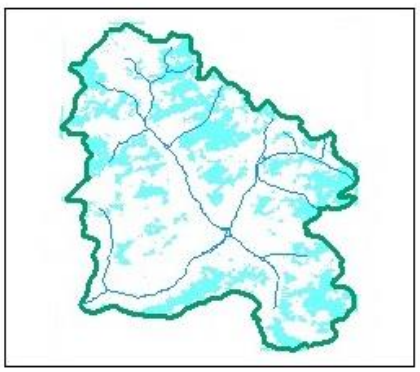
0 5 10 20 30 40

Kilometers

10 DAILY SNOW COVER MAP: **BHAGA BASIN**

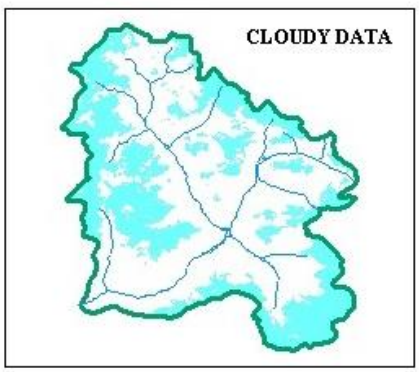


DATA USED
10 Jun 2015



DATA USED

11 Jun 2015
15 Jun 2015
20 Jun 2015



DATA USED
29 Jun 2015

SNOW

0 4 8 16 24 32
Kilometers

MIYAR SUB-BASIN

AREAL EXTENT OF SNOW (5 DAILY)

BASIN NAME: MIYAR **BASIN AREA: 4449 Sq km**

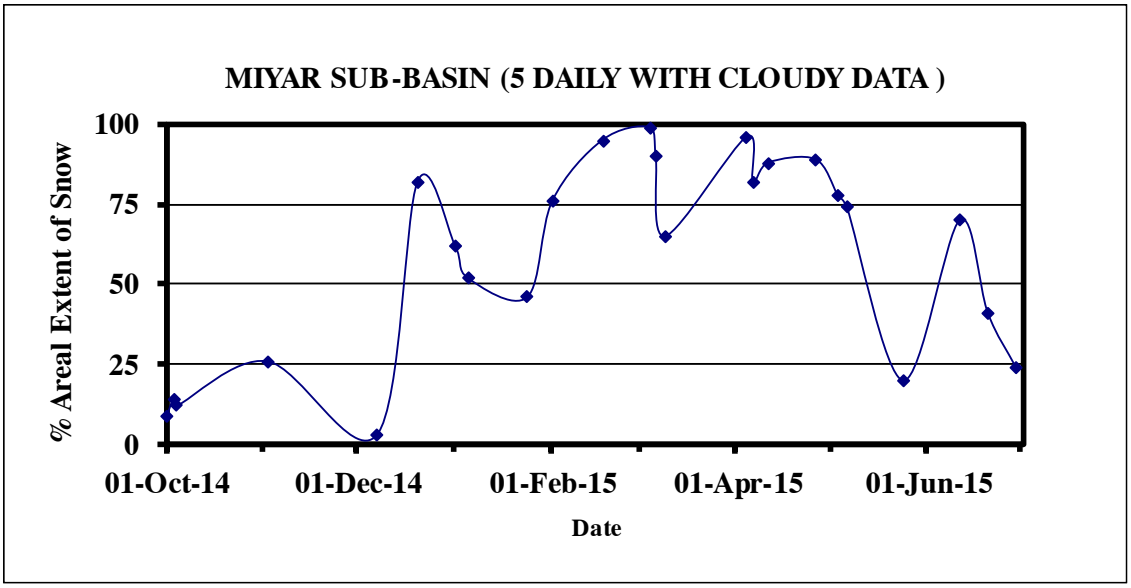
S. No	Date	Snow cover (sq. km)	Snow cover (%)	S. No	Date	Snow cover (sq. km)	Snow cover (%)
October 2014							
1.	01 Oct 2014	400	9	3.	04 Oct 2014	534	12
2.	03 Oct 2014	630	14				
November 2014							
4.	02 Nov 2014	1157	26				
December 2014							
5.	07 Dec 2014	133	3©	6.	20 Dec 2014	3648	82
January 2015							
7.	01 Jan 2015	2758	62	9	24 Jan 2015	2047	46©
8.	05 Jan 2015	2313	52				
February 2015							
10.	01 Feb 2015	3381	76©	11.	17 Feb 2015	4227	95
March 2015							
12.	04 Mar 2015	4405	99	14.	09 Mar 2015	2892	65©
13.	06 Mar 2015	4004	90				
April 2015							
15.	04 April 2015	4271	96	17	11 April 2015	3915	88
16.	06 April 2015	3648	82 ©	18	26 April 2015	3960	89
May 2015							
19.	03 May 2015	3470	78	21	24 May 2015	890	20 ©
20.	06 May 2015	3292	74				
June 2015							
22.	11 June 2015	3114	70 ©	24.	20 June 2015	1824	41
23.	15 June 2015	817.85	11 ©	25.	29 June 2015	1068	24 ©

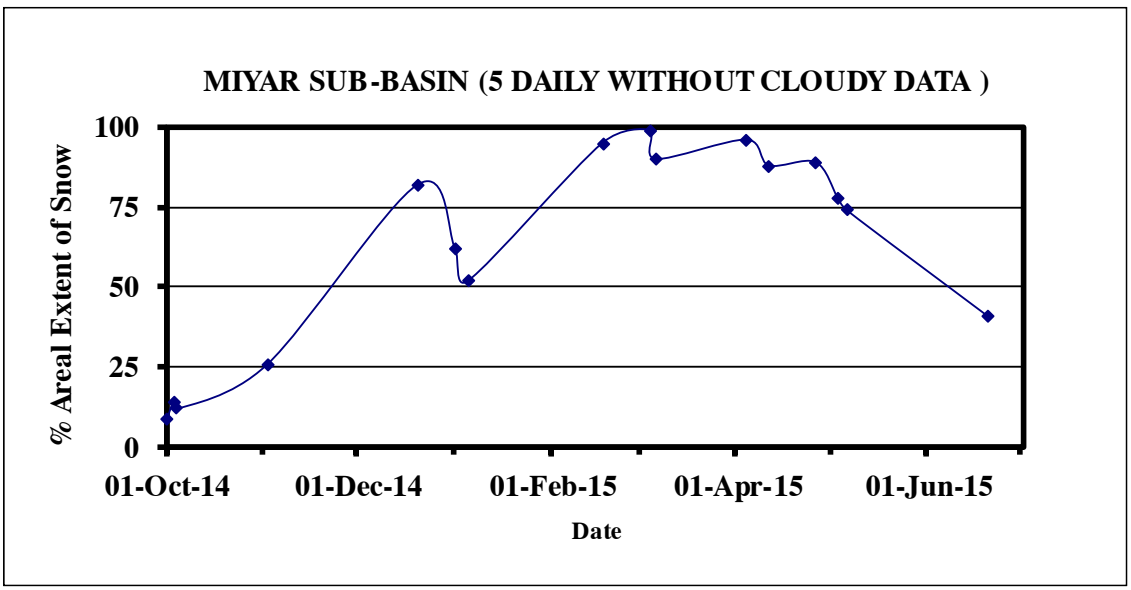
AREAL EXTENT OF SNOW (10 DAILY)

BASIN NAME: MIYAR **BASIN AREA: 4449sq km**

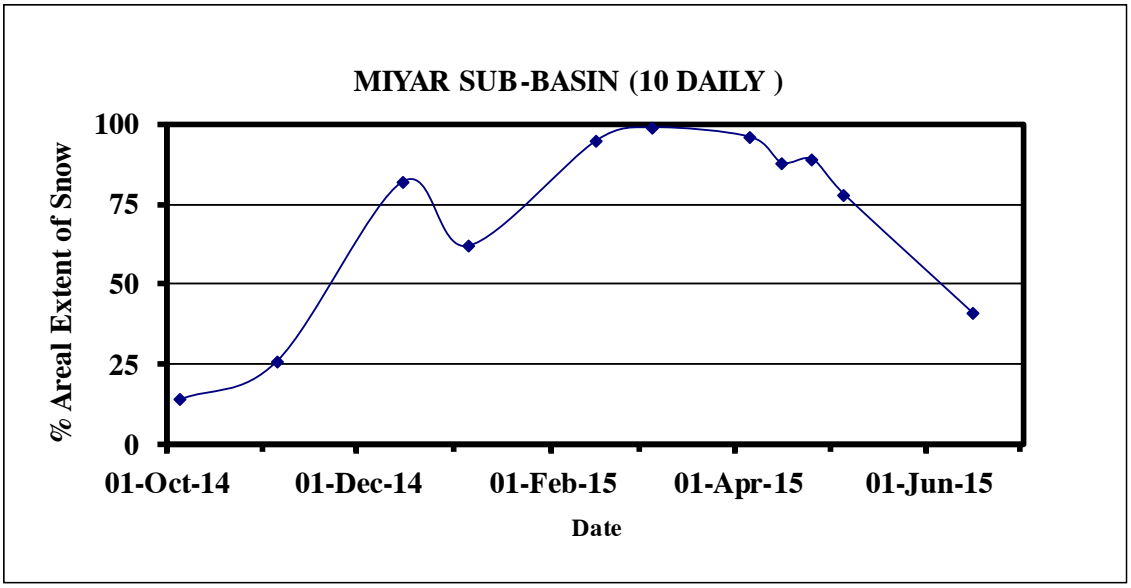
S. No	Date	Snow cover (sq. km)	Snow cover (%)	S. No	Date	Snow cover (sq. km)	Snow cover (%)
October 2014							
1.	01 Oct 2014	623	14				
1.	03 Oct 2014						
November 2014							
2.	05 Nov 2014	1157	26				
December 2014							
3.	15 Dec 2014	3648	82				
January 2015							
4.	01 Jan 2015	2758	62				
5.	05 Jan 2015						
February 2015							
6.	15 Feb 2015	4227	95				
March 2015							
7.	04 Mar 2015	4405	99				
7	06 Mar 2015						
7	09 Mar 2015						
April 2015							
8	04 April 2015	4271	96	9	15 April 2015	3915	88
8	06 April 2015			10	25 April 2015	3960	89
May 2015							
11	03 May 2015	3470	78				
11	07 May 2015						
June 2015							
12	15 June 2015	1824	41				

SNOW COVER DEPLETION CURVE

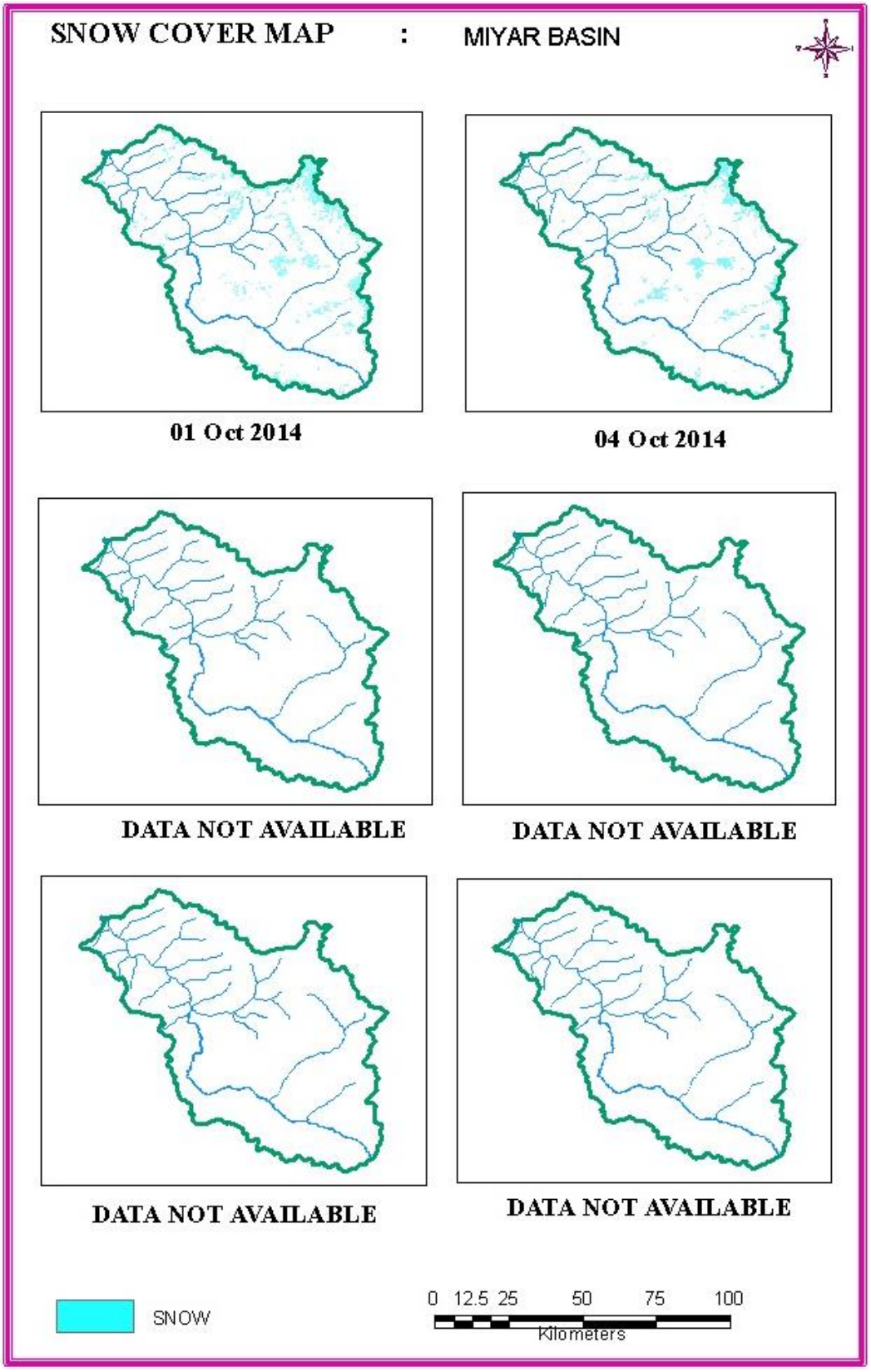




SNOW COVER DEPLETION CURVE



SNOW COVER MAP

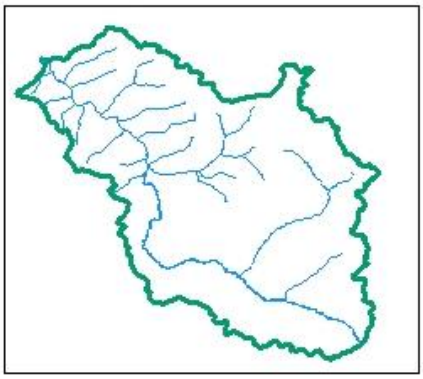

SNOW COVER MAP : MIYAR BASIN
01 Oct 2014
04 Oct 2014
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
SNOW
0 12.5 25 50 75 100
Kilometers

10 DAILY SNOW COVER MAP: MIYAR BASIN

DATA USED

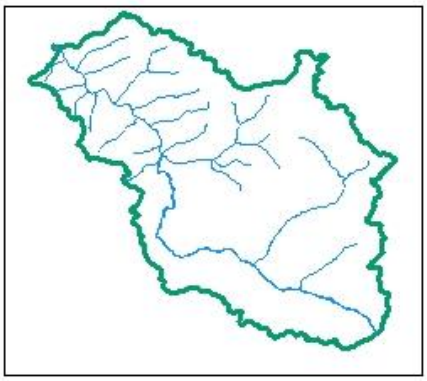
01 Oct 2014

03 Oct 2014



DATA USED

DATA NOT AVAILABLE



DATA USED

DATA NOT AVAILABLE

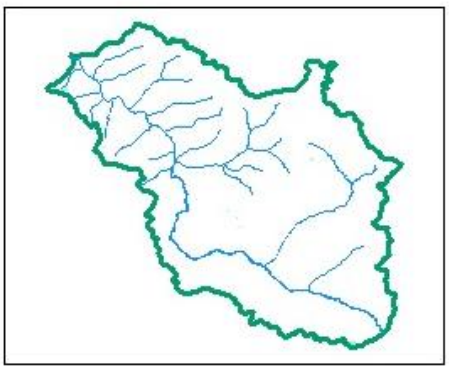
SNOW

0 10 20 40 60 80

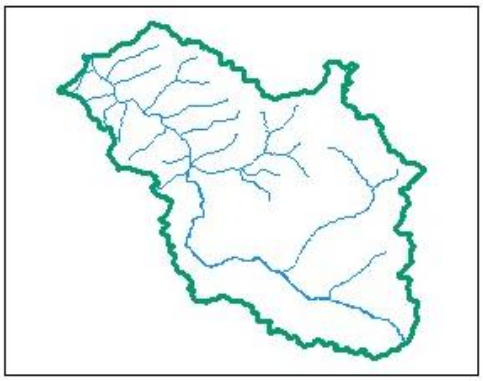
Kilometers

SNOW COVER MAP : MIYAR BASIN

02 Nov 2014

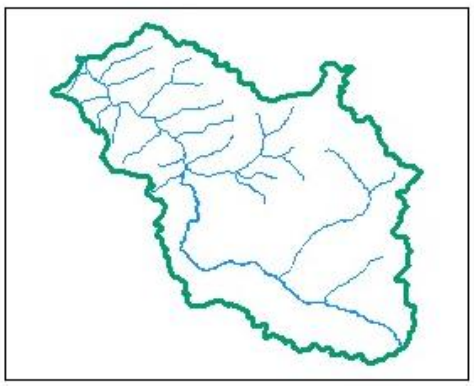


04 Nov 2014

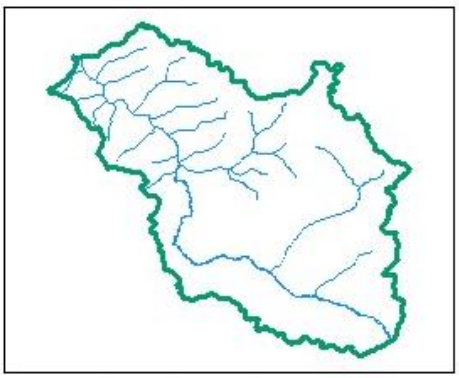


DATA NOT AVAILABLE

DATA NOT AVAILABLE



DATA NOT AVAILABLE



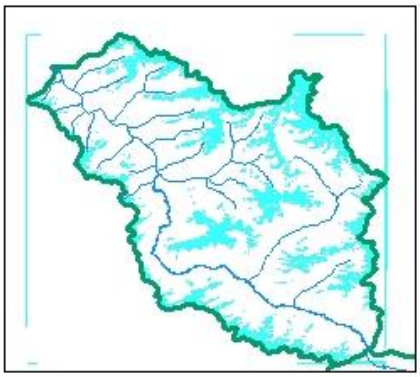
DATA NOT AVAILABLE

SNOW

0 12.5 25 50 75 100

Kilometers

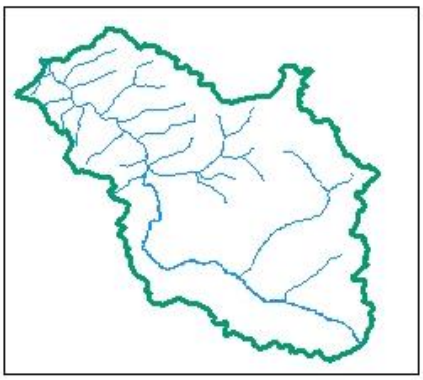
10 DAILY SNOW COVER MAP: MIYAR BASIN



DATA USED

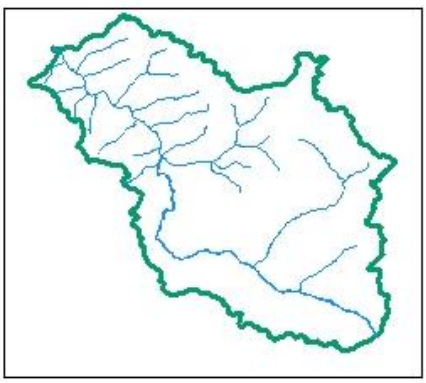
02 Nov 2014

04 Nov 2014



DATA USED

DATA NOT AVAILABLE



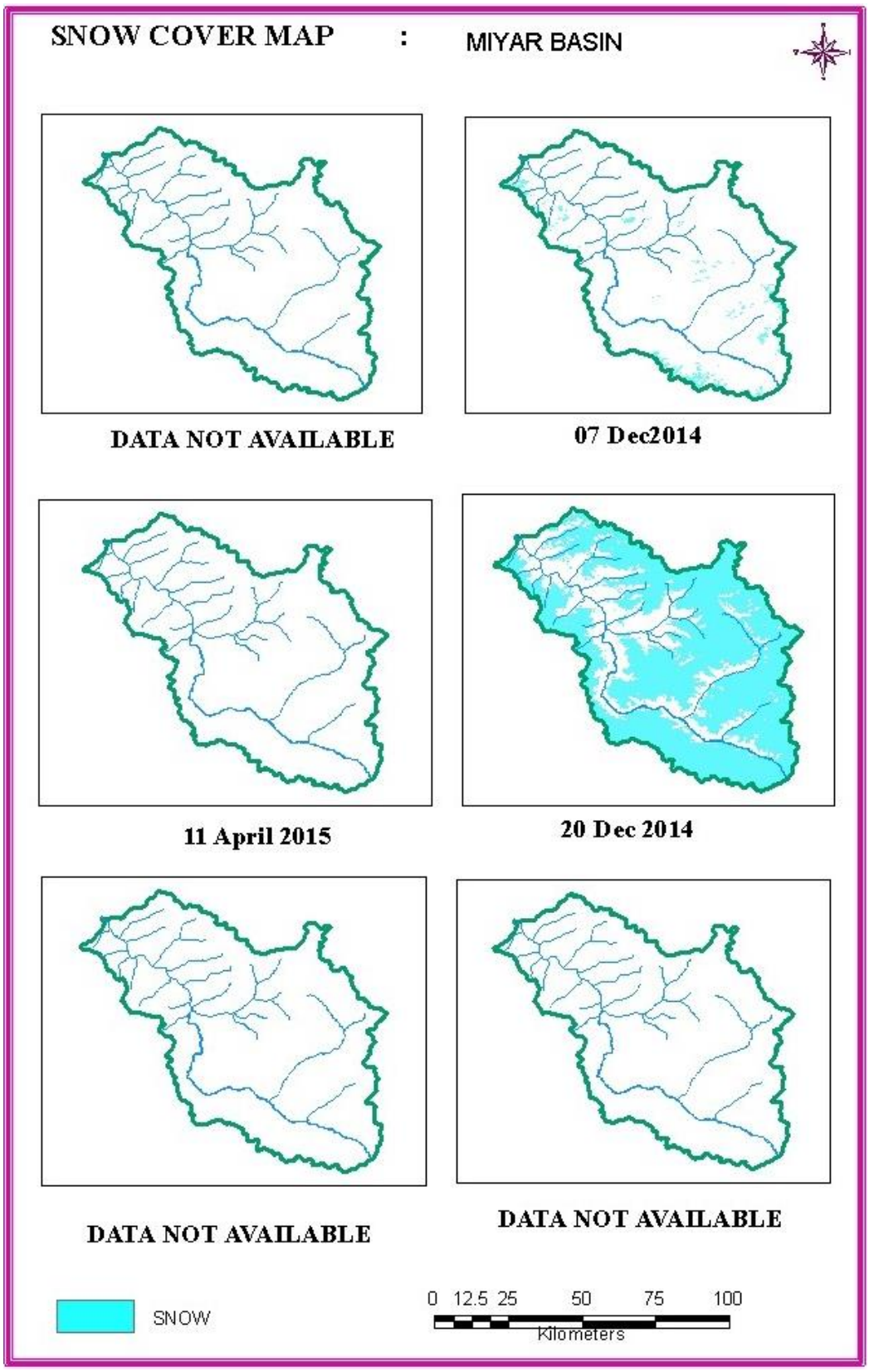
DATA USED

DATA NOT AVAILABLE

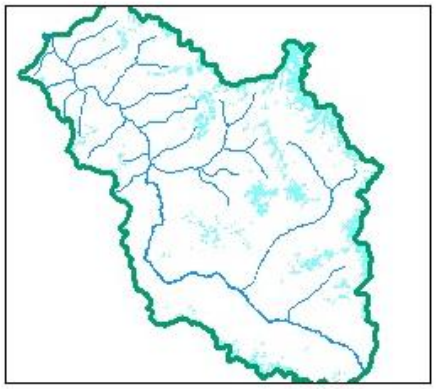
SNOW

0 10 20 40 60 80

Kilometers


SNOW COVER MAP : MIYAR BASIN
DATA NOT AVAILABLE
07 Dec2014
11 April 2015
20 Dec 2014
DATA NOT AVAILABLE
DATA NOT AVAILABLE
SNOW
0 12.5 25 50 75 100
Kilometers

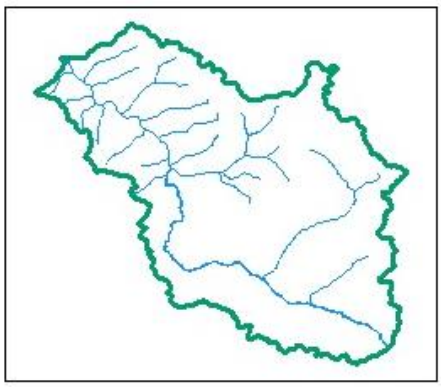
10 DAILY SNOW COVER MAP: MIYAR BASIN



DATA USED

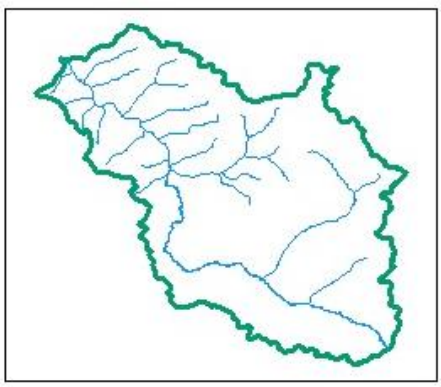
01 Oct 2014

03 Oct 2014



DATA USED

DATA NOT AVAILABLE



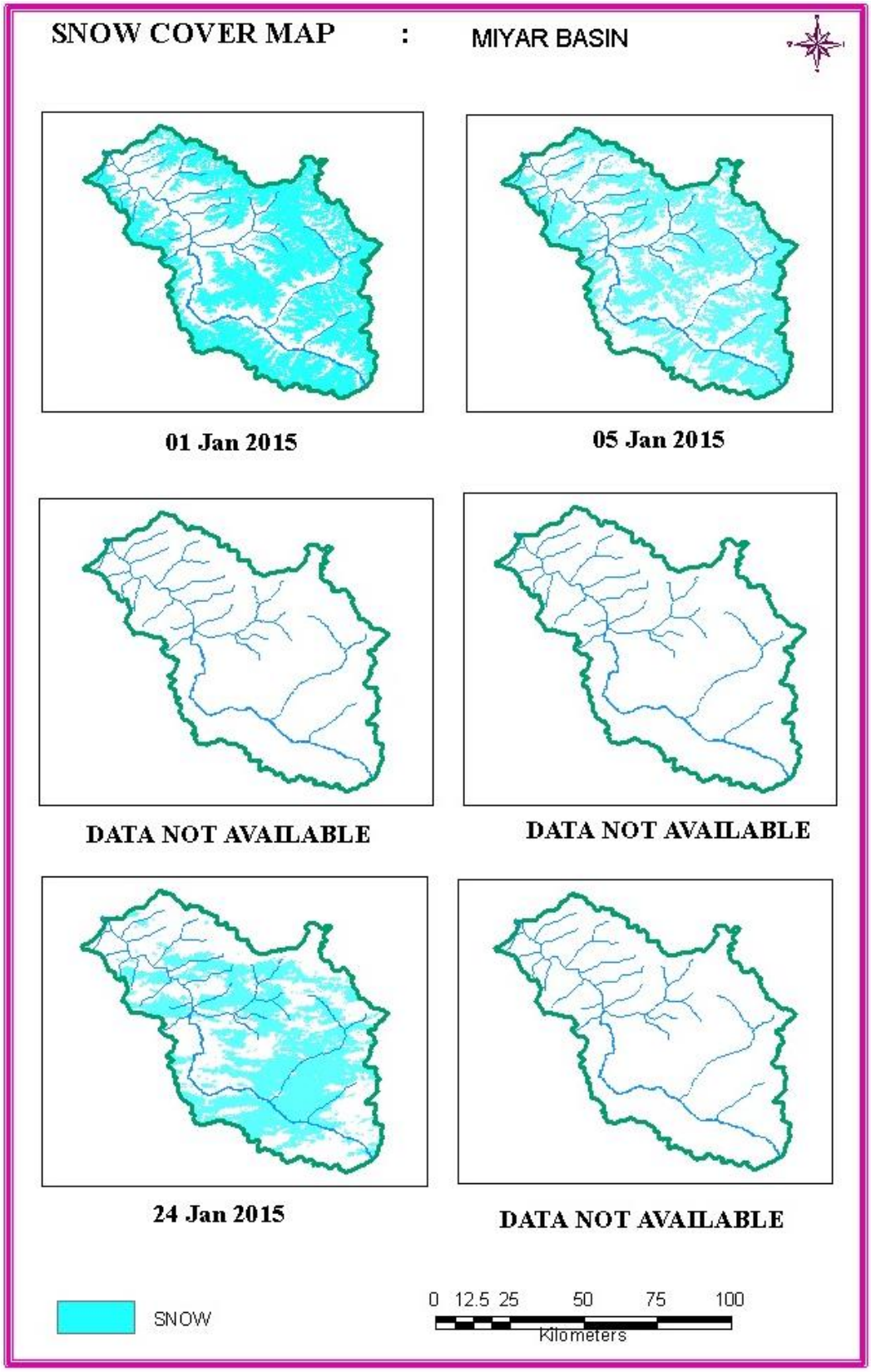
DATA USED

DATA NOT AVAILABLE

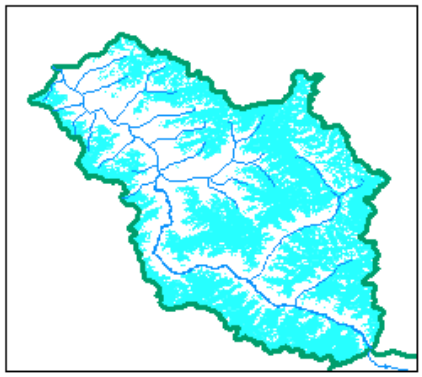
SNOW

0 5 10 20 30 40

Kilometers


SNOW COVER MAP : MIYAR BASIN
01 Jan 2015
05 Jan 2015
DATA NOT AVAILABLE
DATA NOT AVAILABLE
24 Jan 2015
DATA NOT AVAILABLE
SNOW
0 12.5 25 50 75 100
Kilometers

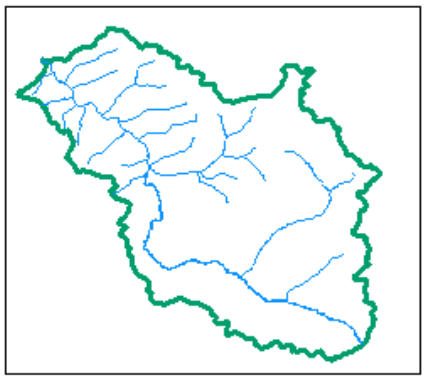
10 DAILY SNOW COVER MAP: MIYAR BASIN



DATA USED

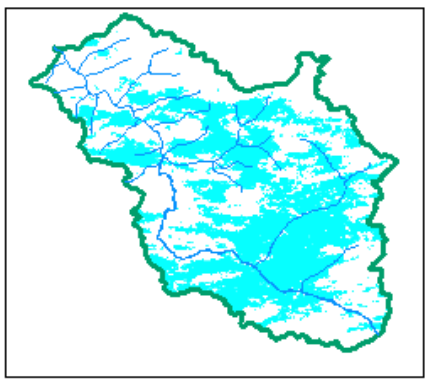
01 Jan 2015

05 Jan 2015



DATA USED

DATA NOT AVAILABLE



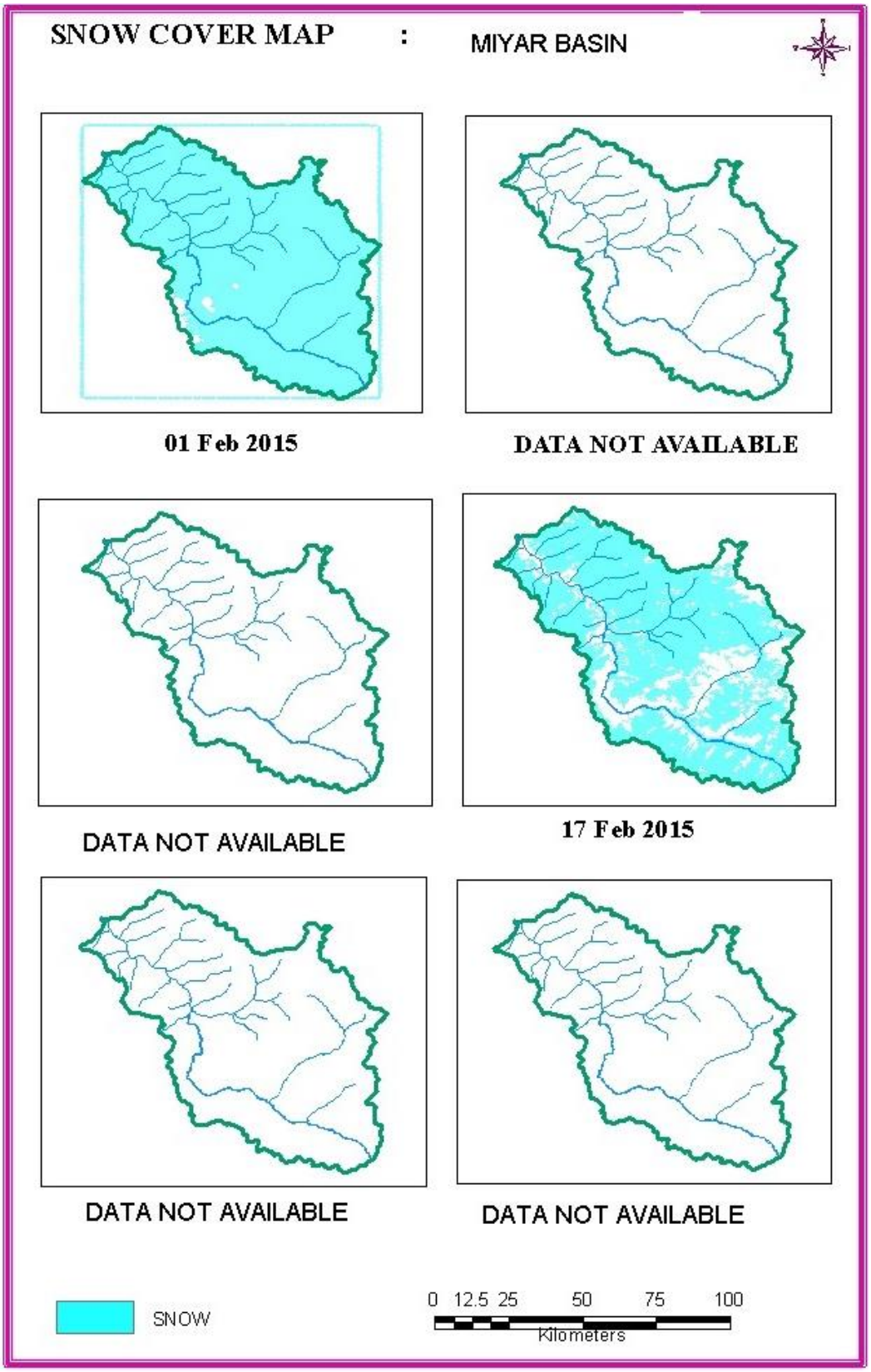
DATA USED

24 Jan 2015

SNOW

0 10 20 40 60 80

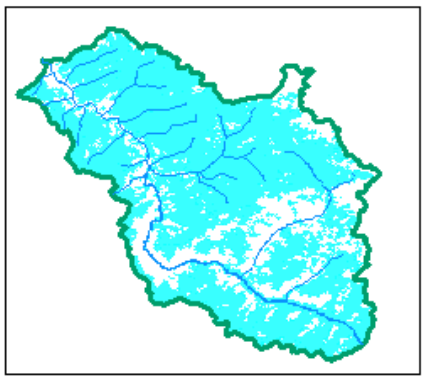
Kilometers


SNOW COVER MAP : MIYAR BASIN
01 Feb 2015
DATA NOT AVAILABLE
DATA NOT AVAILABLE
17 Feb 2015
DATA NOT AVAILABLE
DATA NOT AVAILABLE
SNOW
0 12.5 25 50 75 100
Kilometers

10 DAILY SNOW COVER MAP: MIYAR BASIN

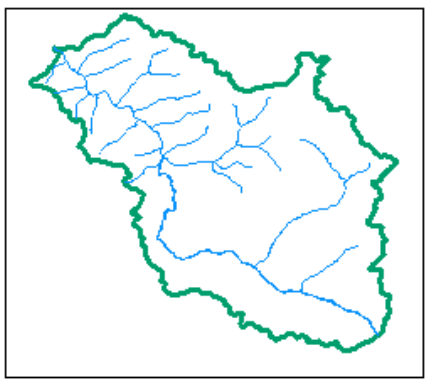
DATA USED

01 Feb 2015



DATA USED

17 Feb 2015



DATA USED

DATA NOT AVAILABLE

SNOW

0 10 20 40 60 80

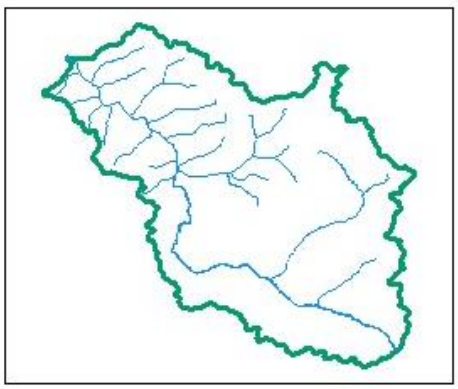
Kilometers

SNOW COVER MAP : MIYAR BASIN

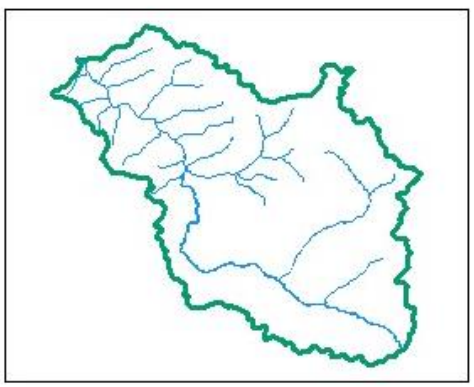
04 March 2015

06 march 2015

09 March 2015



DATA NOT AVAILABLE



DATA NOT AVAILABLE

DATA NOT AVAILABLE

SNOW

0 12.5 25 50 75 100

Kilometers

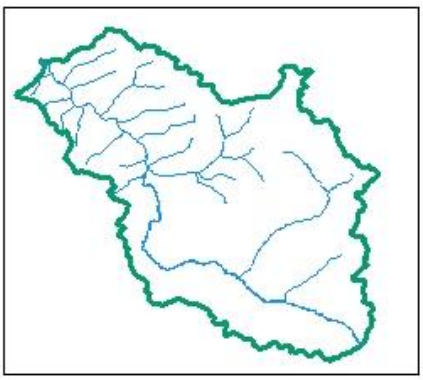
10 DAILY SNOW COVER MAP: MIYAR BASIN

DATA USED

04 March 2015

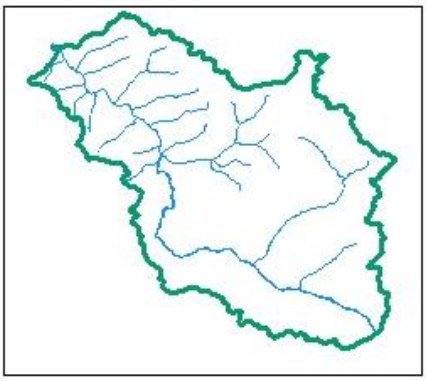
06 March 2015

09 March 2015



DATA USED

DATA NOT AVAILABLE



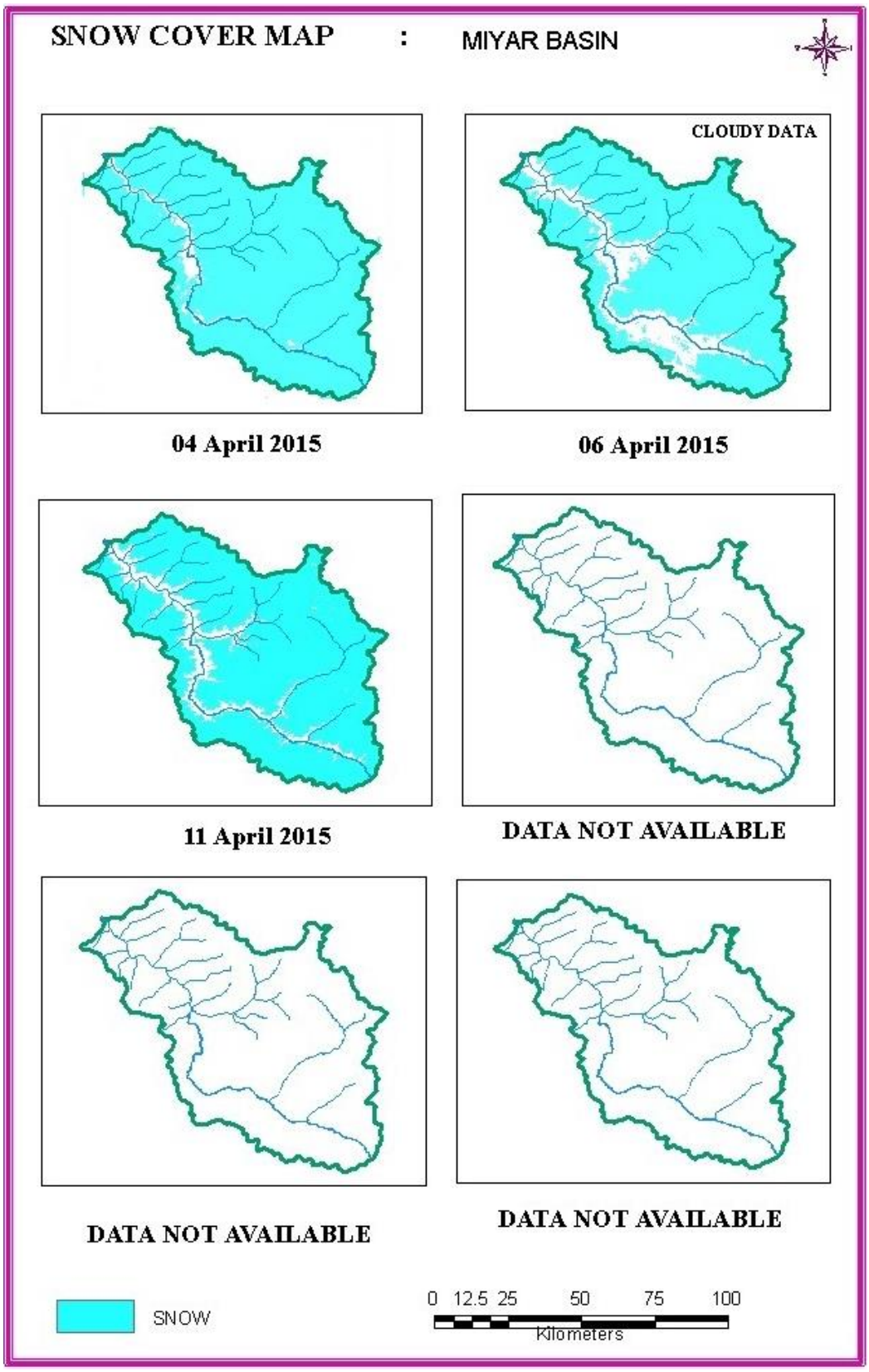
DATA USED

DATA NOT AVAILABLE

SNOW

0 10 20 40 60 80

Kilometers


SNOW COVER MAP : MIYAR BASIN
CLOUDY DATA
04 April 2015
06 April 2015
11 April 2015
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
SNOW
0 12.5 25 50 75 100
Kilometers

10 DAILY SNOW COVER MAP: MIYAR BASIN

DATA USED

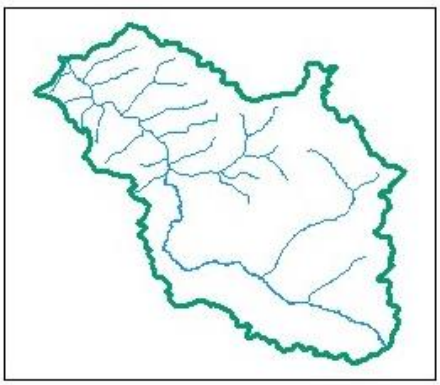
02 April 2015

04 April 2015

06 April 2015

DATA USED

11 April 2015



DATA USED

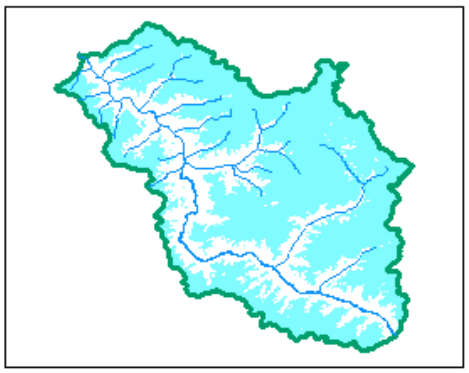
DATA NOT AVAILABLE

SNOW

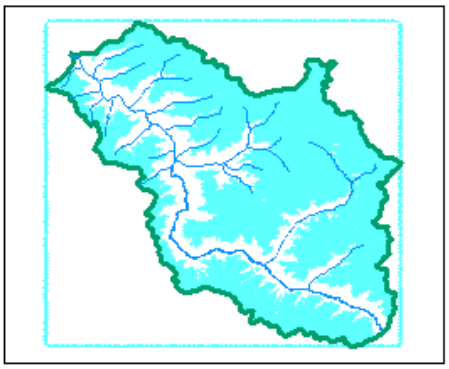
0 3.25 6.5 13 19.5 26

Kilometers

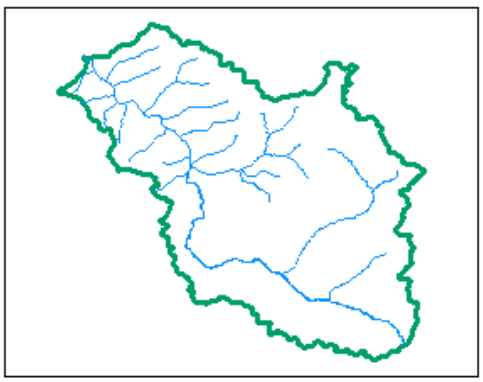
SNOW COVER MAP : CHANDRA BASIN



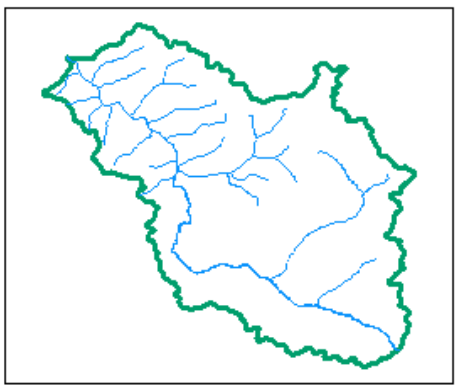
03 May 2015



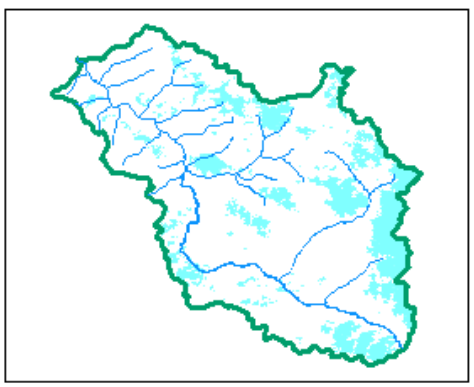
07 May 2015



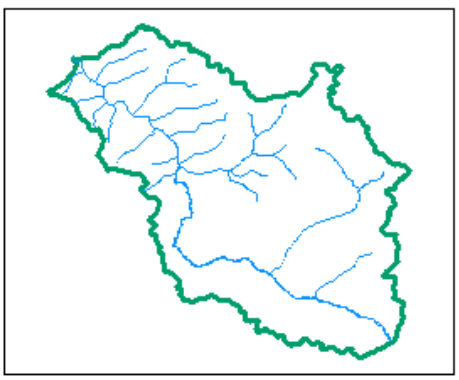
DATA NOT AVAILABLE



DATA NOT AVAILABLE



24 May 2015



DATA NOT AVAILABLE

SNOW

0 12.5 25 50 75 100

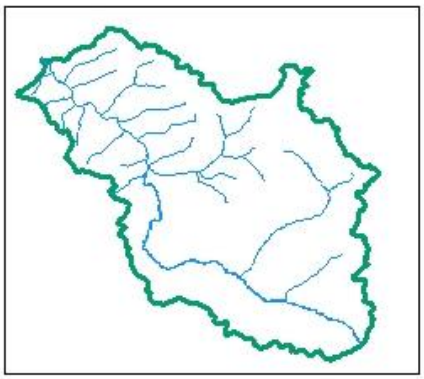
Kilometers

10 DAILY SNOW COVER MAP: MIYAR BASIN

DATA USED

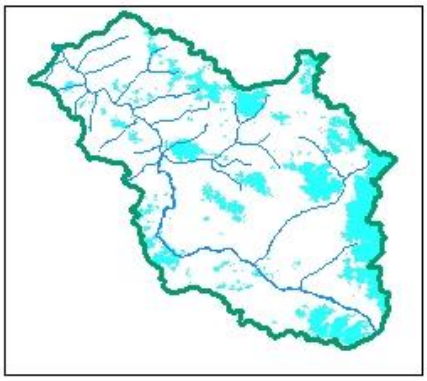
03 May 2015

07 May 2015



DATA USED

DATA NOT AVAILABLE



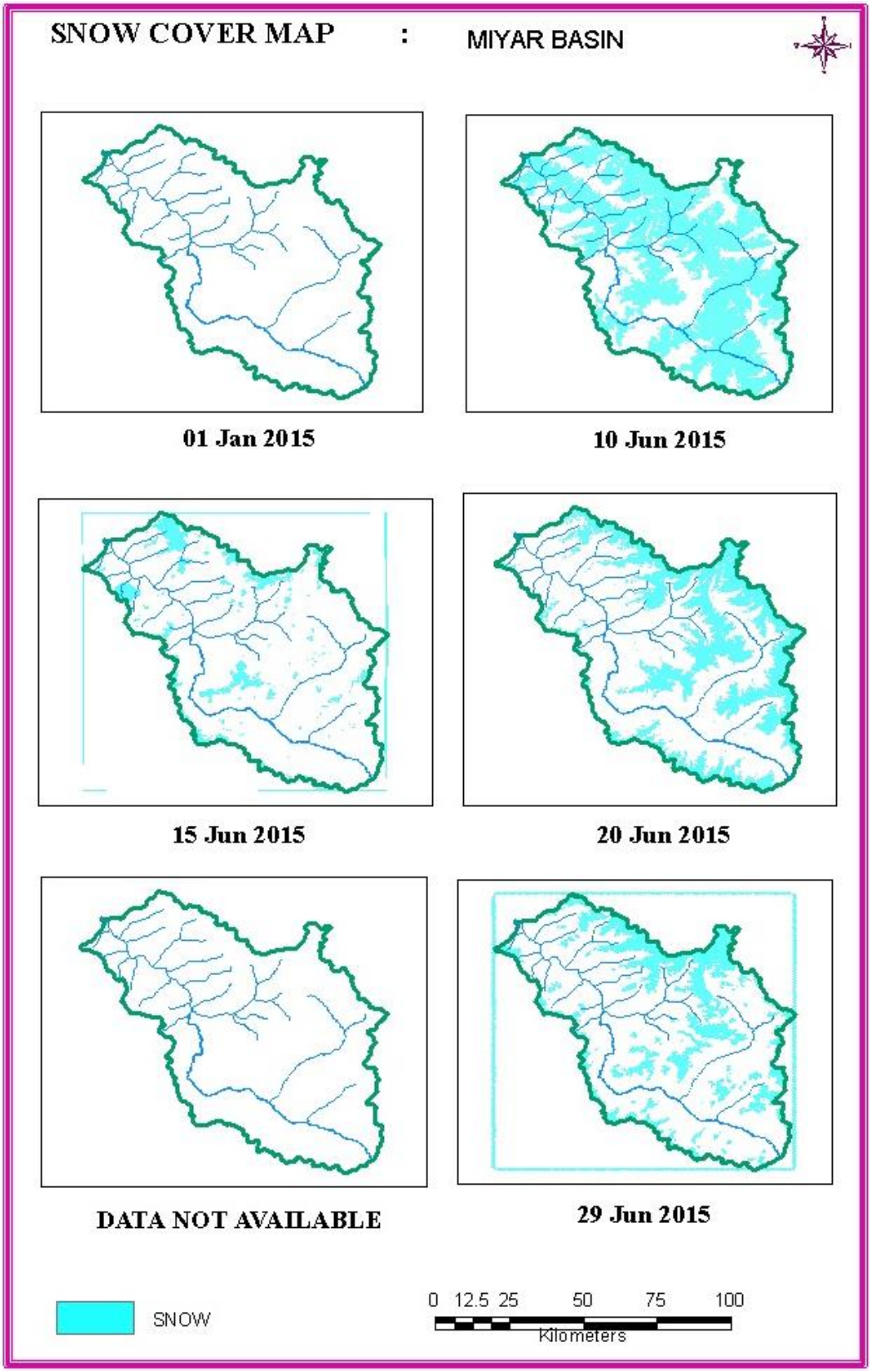
DATA USED

24 May 2015

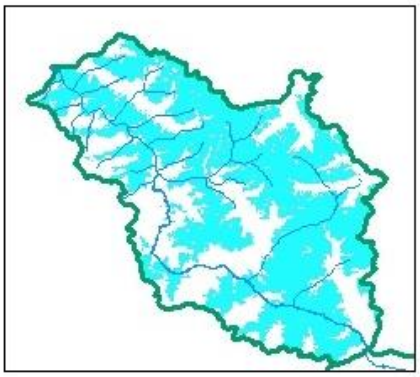
SNOW

0 10 20 40 60 80

Kilometers

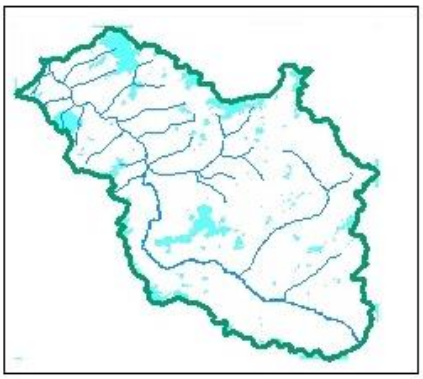

SNOW COVER MAP : MIYAR BASIN
01 Jan 2015
10 Jun 2015
15 Jun 2015
20 Jun 2015
DATA NOT AVAILABLE
29 Jun 2015
SNOW
0 12.5 25 50 75 100
Kilometers

10 DAILY SNOW COVER MAP: MIYAR BASIN



DATA USED

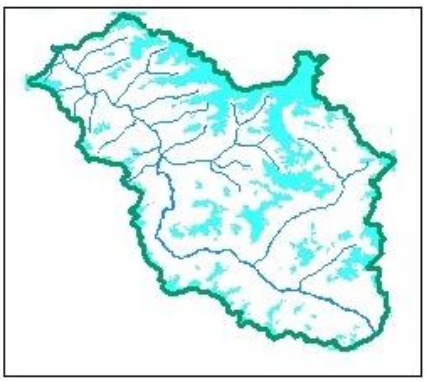
10 June 2015



DATA USED

15 June 2015

20 June 2015



DATA USED

29 June 2015

SNOW

0 10 20 40 60 80

Kilometers

BHUT SUB-BASIN

AREAL EXTENT OF SNOW (5 DAILY)

BASIN NAME: BHUT **BASIN AREA: 2218 Sq km**

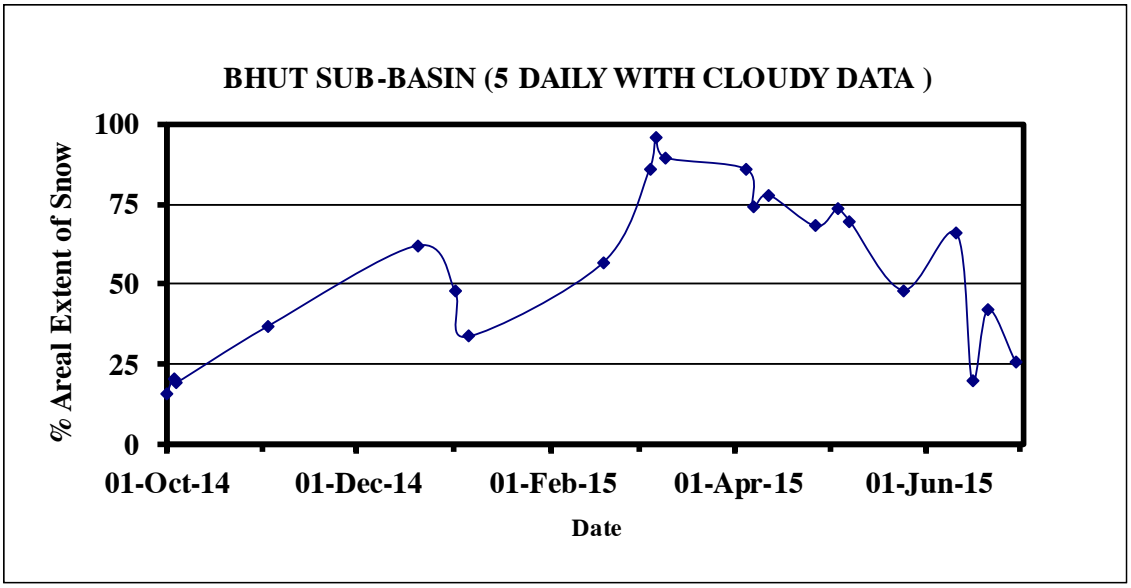
S. No	Date	Snow cover (sq. km)	Snow cover (%)	S. No	Date	Snow cover (sq. km)	Snow cover (%)
October 2014							
1.	01 Oct 2014	355	16	3.	04 Oct 2014	429	19
2.	03 Oct 2014	456	21				
November 2014							
4.	02 Nov 2014	817	37				
December 2014							
5.	20 Dec 2014	1378	62				
January 2015							
7.	01 Jan 2015	1060	48	9	05 Jan 2015	748	34 ©
February 2015							
10.	17 Feb 2015	1255	57 ©				
March 2015							
12.	04 Mar 2015	1902	86 ©	14.	09 Mar 2015	1986	90 ©
13.	06 Mar 2015	2127	96				
April 2015							
15.	04 April 2015	1903	86	17	11 April 2015	1728	78
16.	06 April 2015	1644	74 ©	18	26 April 2015	1512	68
May 2015							
19.	03 May 2015	1630	73	21	24 May 2015	1070	48 ©
20.	07 May 2015	1543	70				
June 2015							
22.	11 June 2015	1462	66 ©	24.	20 June 2015	936	42
23.	15 June 2015	440	20 ©	25.	29 June 2015	565	25 ©

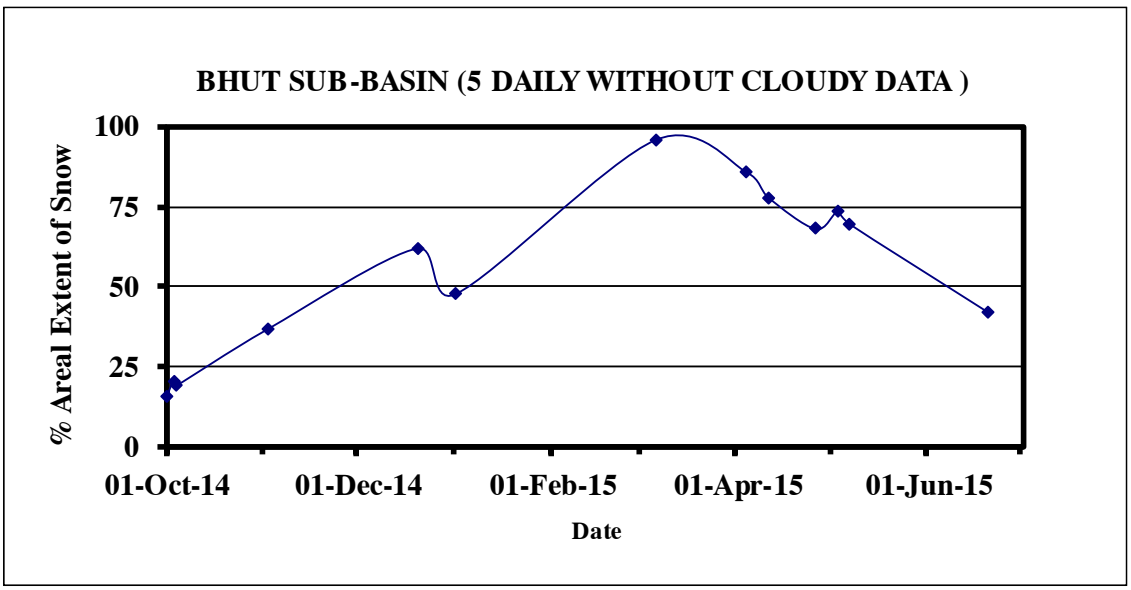
AREAL EXTENT OF SNOW (10 DAILY)

BASIN NAME: BHUT **BASIN AREA: 2218 sq km**

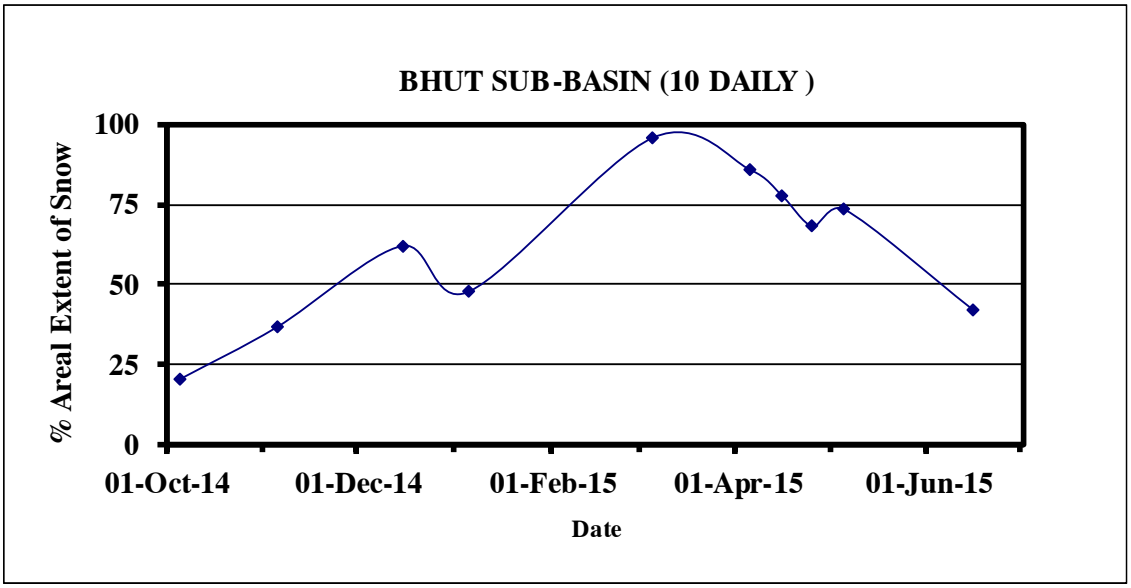
S. No	Date	Snow cover (sq. km)	Snow cover (%)	S. No	Date	Snow cover (sq. km)	Snow cover (%)
October 2014							
1.	01 Oct 2014	456	21				
1.	03 Oct 2014						
November 2014							
2.	05 Nov 2014	817	37				
December 2014							
3.	15 Dec 2014	1378	62				
January 2015							
4.	01 Jan 2015	1060	48				
5.	05 Jan 2015						
February 2015							
March 2015							
7.	04 Mar 2015	2127	96				
7	06 Mar 2015						
7	09 Mar 2015						
April 2015							
8	04 April 2015	1903	86	9	15 April 2015	1728	78
8	06 April 2015			10	25 April 2015	1512	68
May 2015							
11	03 May 2015	1630	73				
11	07 May 2015						
June 2015							
12	15 June 2015	936	42				

SNOW COVER DEPLETION CURVE



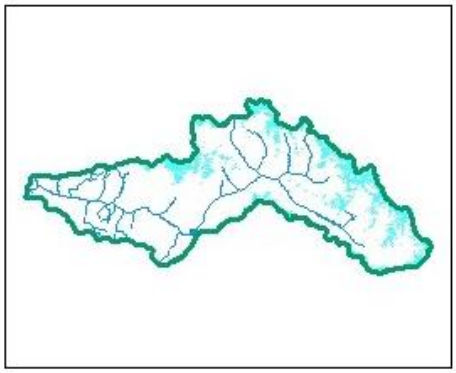


SNOW COVER DEPLETION CURVE

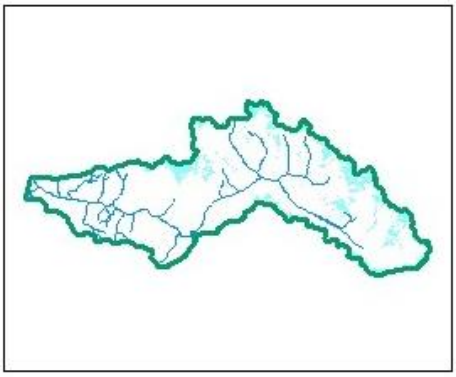


SNOW COVER MAP

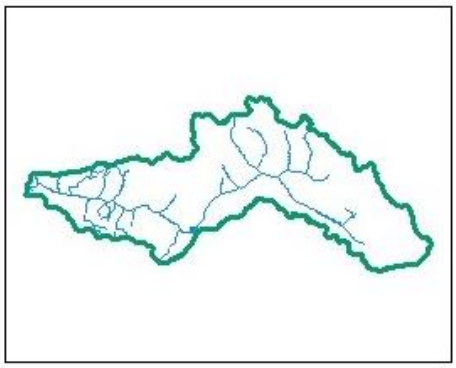
SNOW COVER MAP : BHUT BASIN



01 Oct 2014



03 Oct 2014



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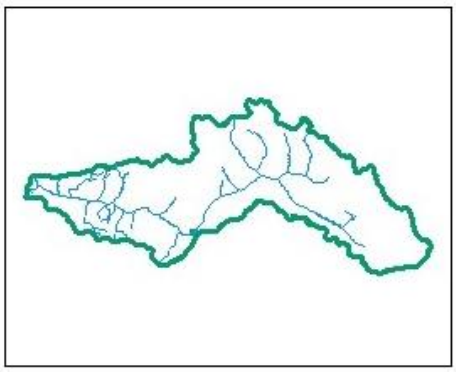

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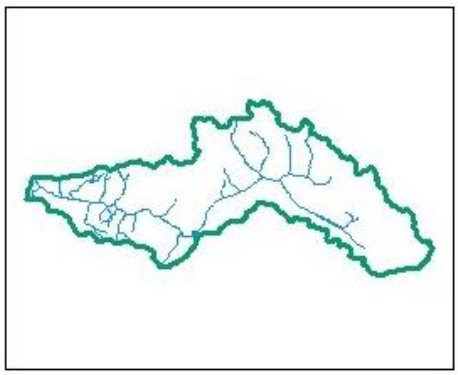

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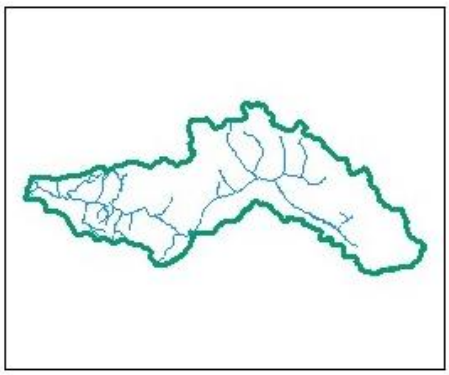


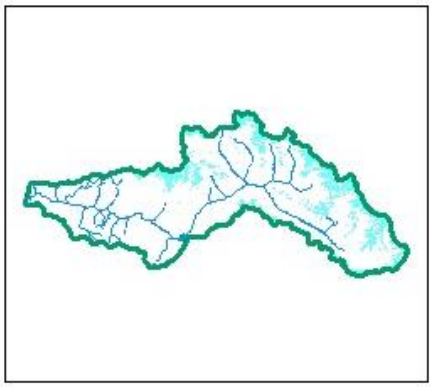
DATA NOT AVAILABLE

SNOW

0 10 20 40 60 80

Kilometers

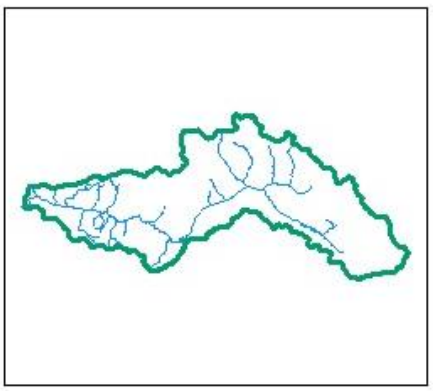
10 DAILY SNOW COVER MAP: **BHUT BASIN**



DATA USED

01Oct 2014

03 Oct 2014



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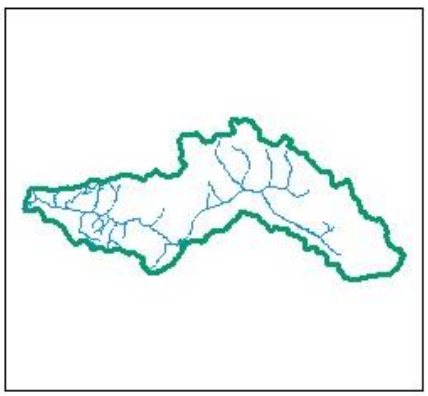


DATA USED

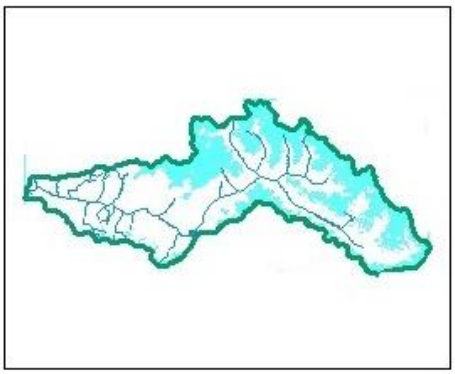
DATA NOT AVAILABLE

SNOW

0 10 20 40 60 80

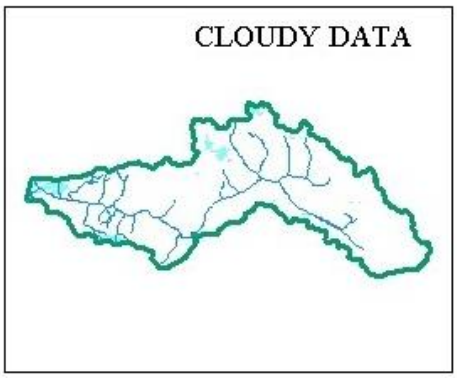
Kilometers

SNOW COVER MAP : BHUT BASIN

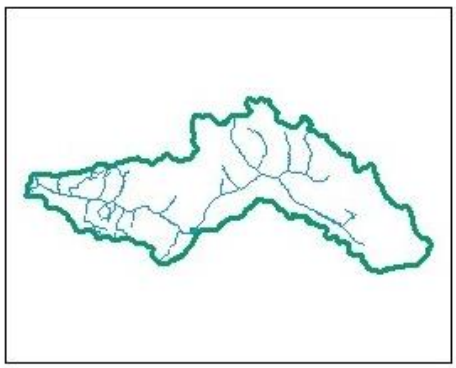


02 Nov 2014

CLOUDY DATA



04 Nov 2014



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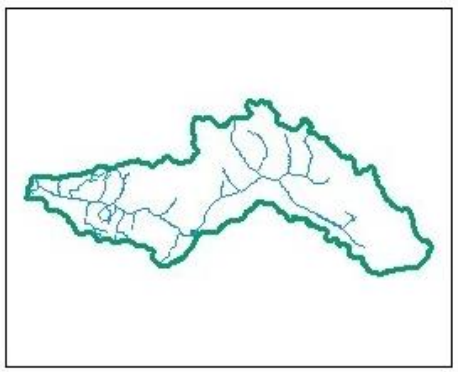

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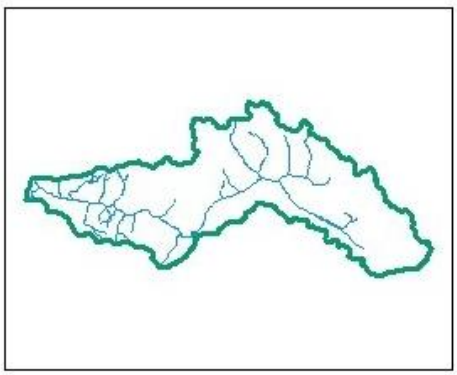

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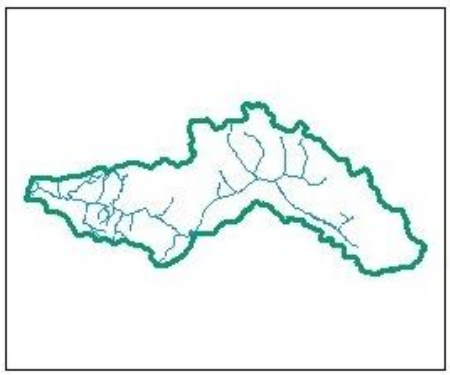


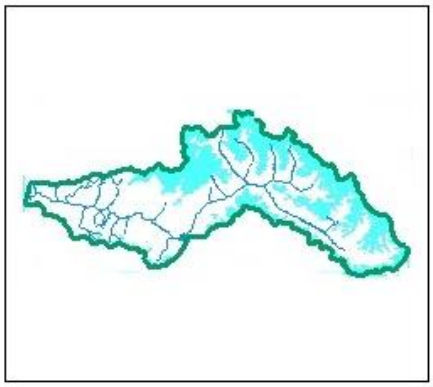
DATA NOT AVAILABLE

SNOW

0 10 20 40 60 80

Kilometers

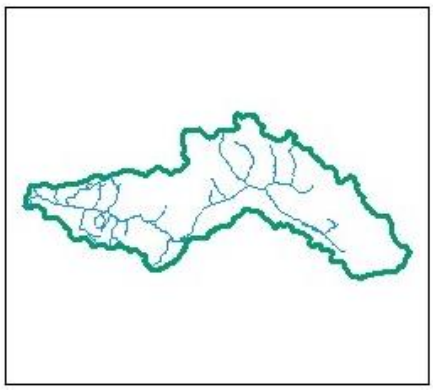
10 DAILY SNOW COVER MAP: **BHUT BASIN**



DATA USED

02 Nov 2014

04 Nov 2014



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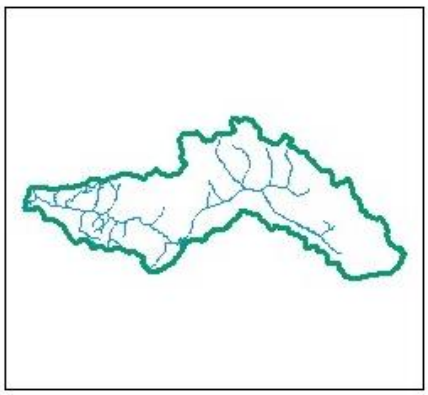


DATA USED

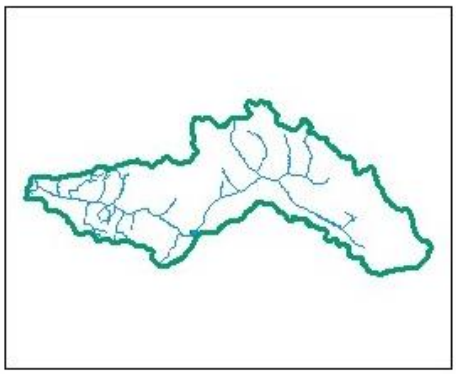
DATA NOT AVAILABLE

SNOW

0 10 20 40 60 80

Kilometers

SNOW COVER MAP : BHUT BASIN



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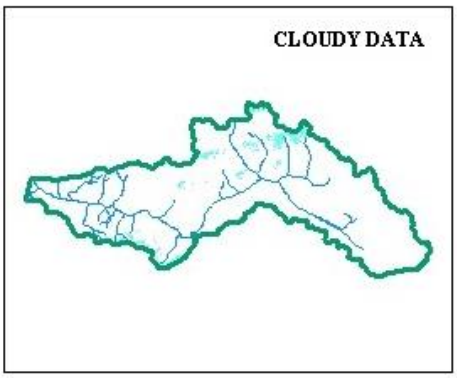
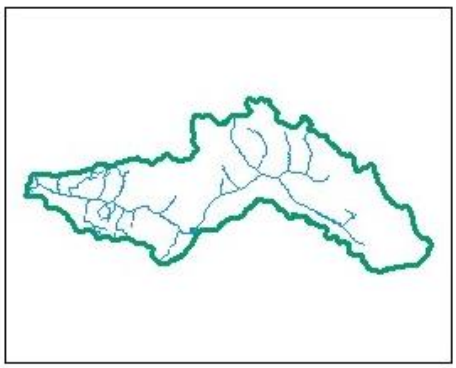


07 Dec 2014



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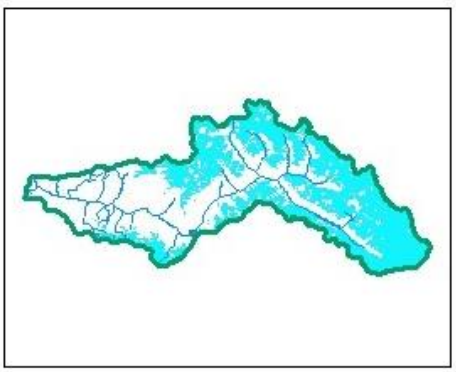

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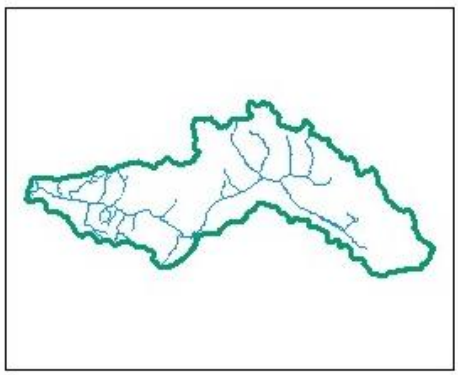

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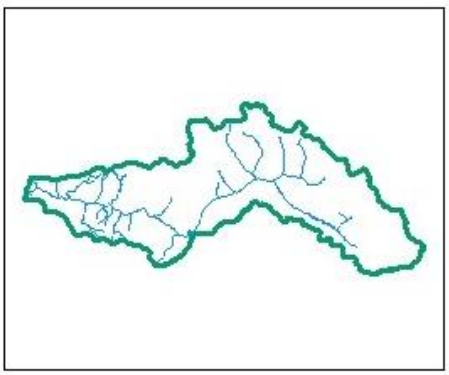


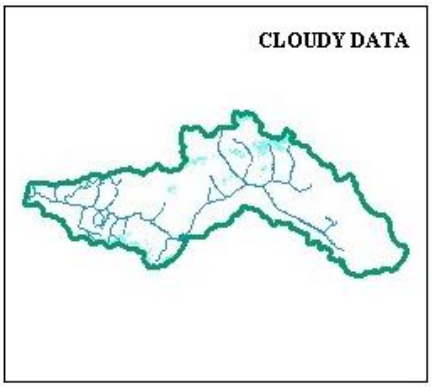
DATA NOT AVAILABLE

SNOW

0 10 20 40 60 80

Kilometers

10 DAILY SNOW COVER MAP: **BHUT BASIN**



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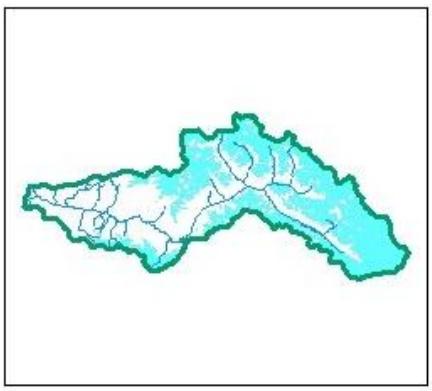

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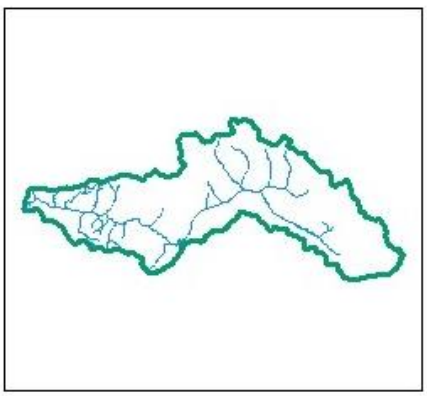


DATA USED

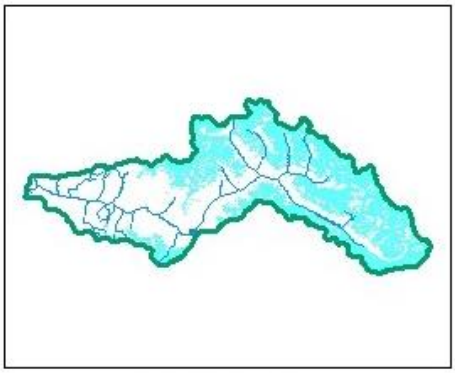
DATA NOT AVAILABLE

SNOW

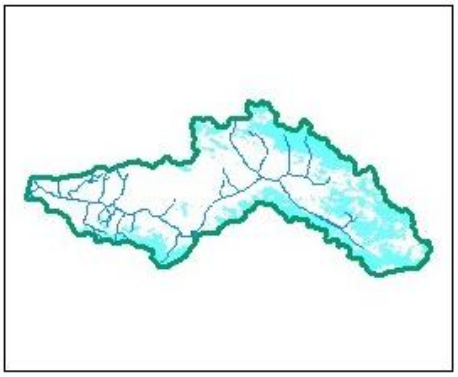
0 10 20 40 60 80

Kilometers

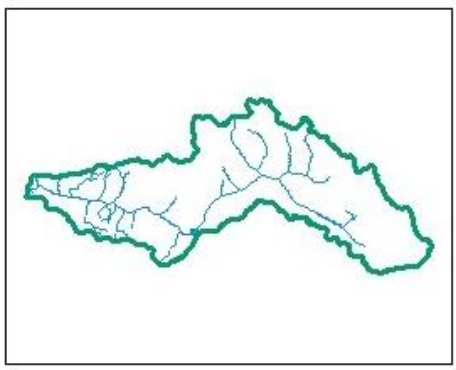
SNOW COVER MAP : BHUT BASIN



01Jan 2015



05 Jan 2015



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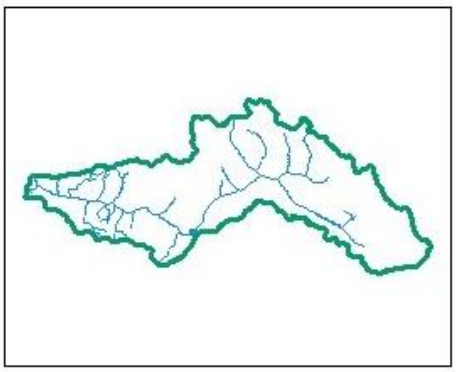

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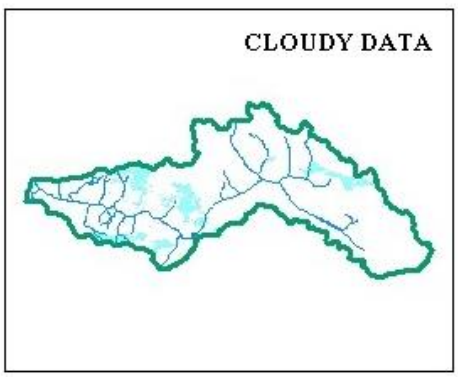
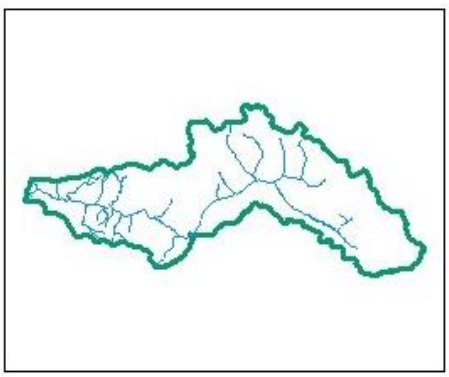


24 Jan 2015



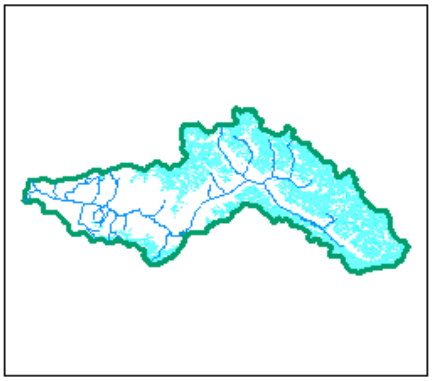
DATA NOT AVAILABLE

SNOW

0 10 20 40 60 80

Kilometers

10 DAILY SNOW COVER MAP: BHUT BASIN



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01 Jan 2015

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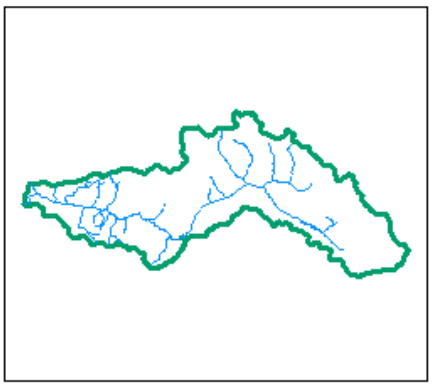

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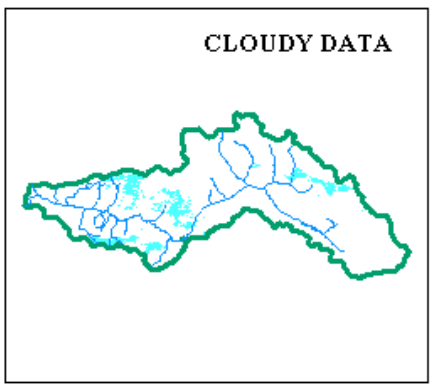

DATA USED

24 Jan 2015

SNOW

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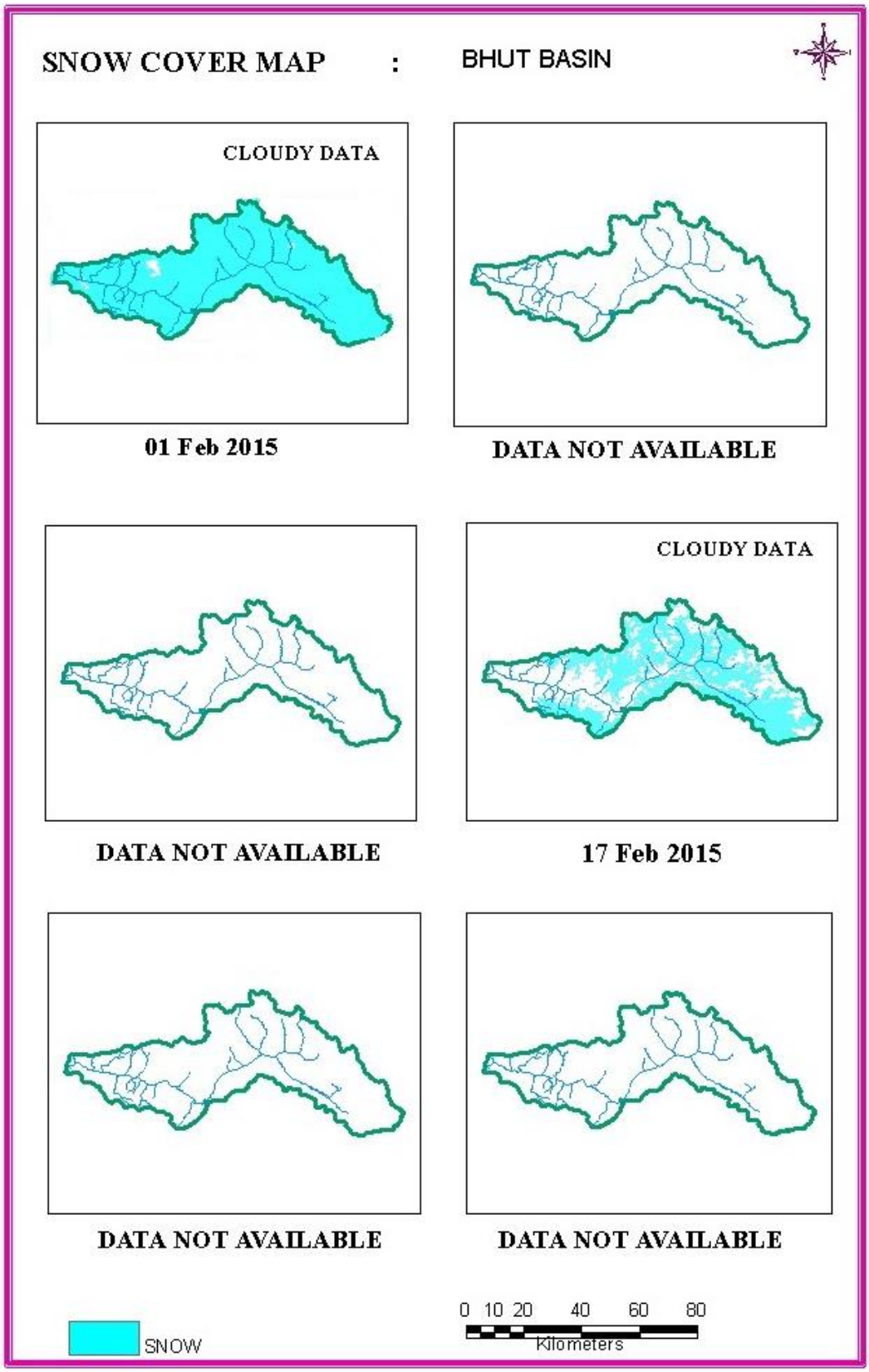
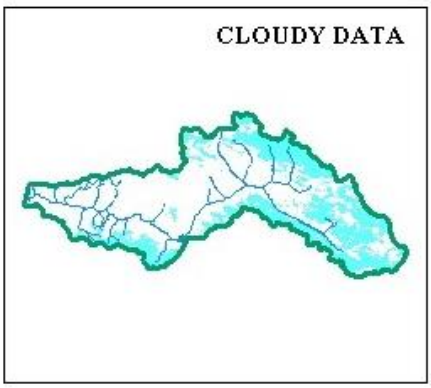
Kilometers


SNOW COVER MAP : BHUT BASIN
CLOUDY DATA
01 Feb 2015
DATA NOT AVAILABLE
DATA NOT AVAILABLE
CLOUDY DATA
17 Feb 2015
DATA NOT AVAILABLE
DATA NOT AVAILABLE
SNOW
0 10 20 40 60 80
Kilometers

10 DAILY SNOW COVER MAP: **BHUT BASIN**



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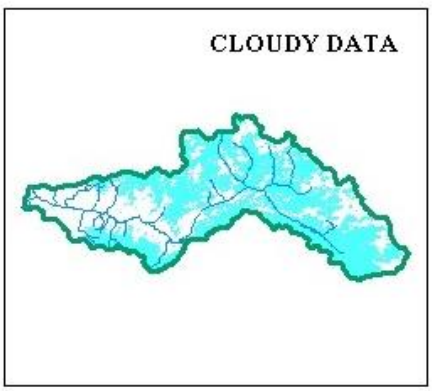
01 Feb 2015



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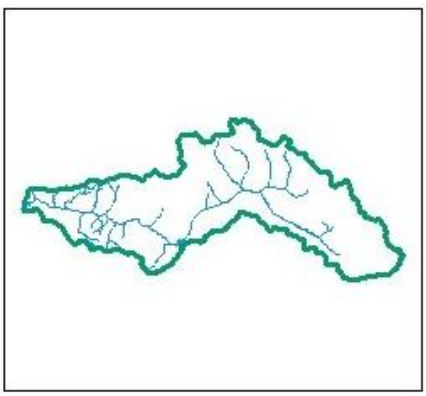

DATA USED

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SNOW

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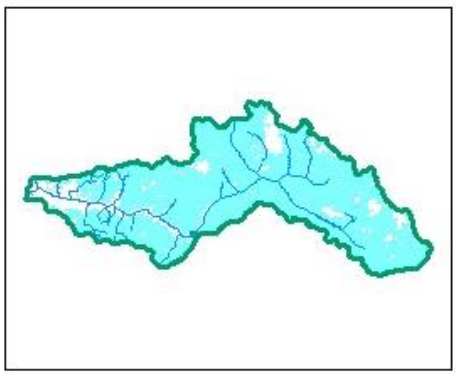
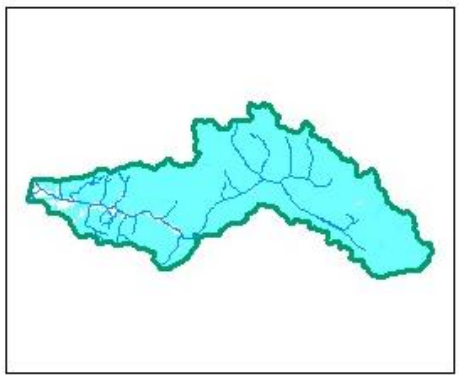
Kilometers

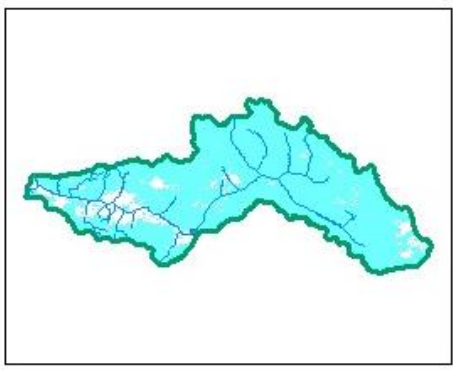
SNOW COVER MAP : BHUT BASIN



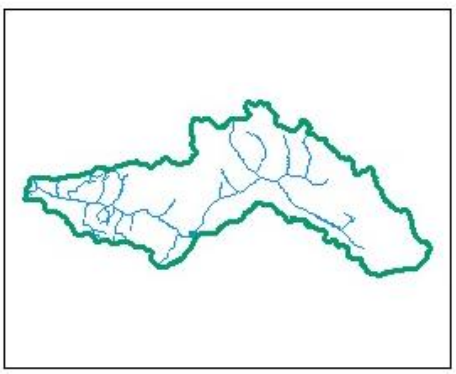
04 March 2015



06 March 2015



09 March 2015



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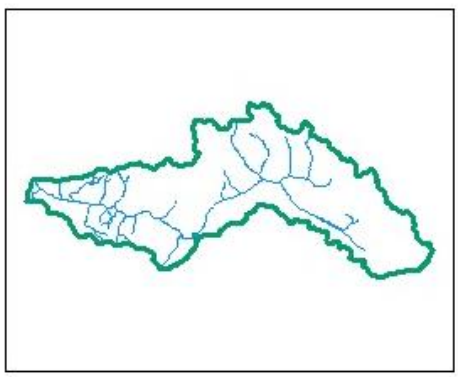

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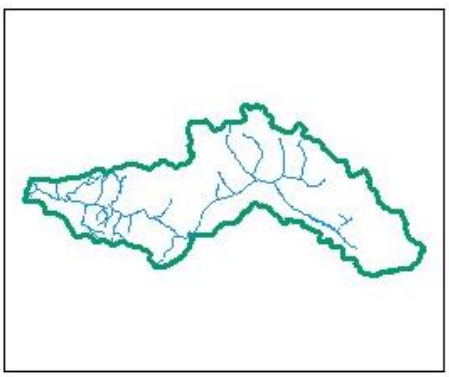


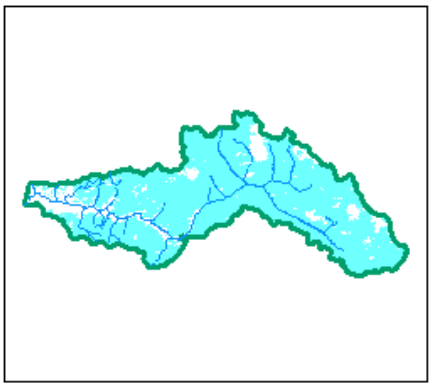
DATA NOT AVAILABLE

SNOW

0 10 20 40 60 80

Kilometers

10 DAILY SNOW COVER MAP: **BHUT BASIN**



DATA USED

04 March 2015

06 March 2015

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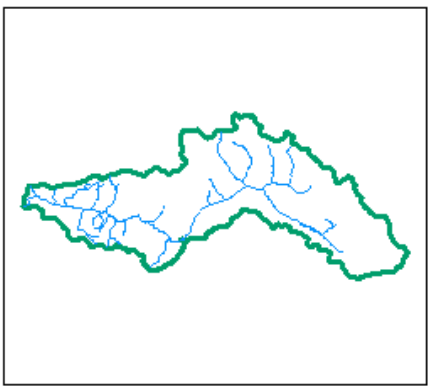

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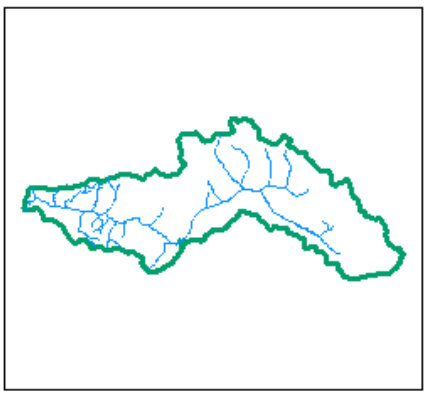


DATA USED

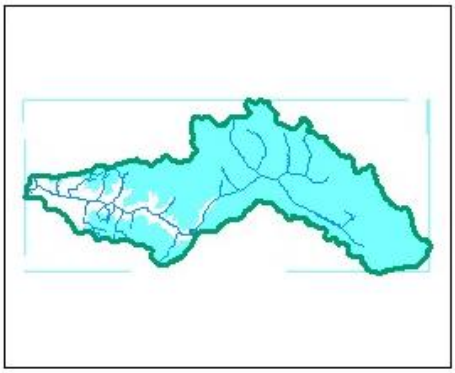
DATA NOT AVAILABLE

SNOW

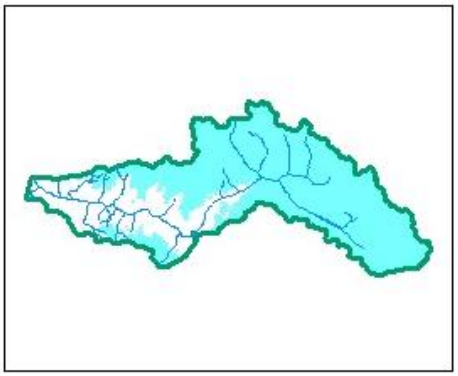
0 10 20 40 60 80

Kilometers

SNOW COVER MAP : BHUT BASIN



04 Apr 2015



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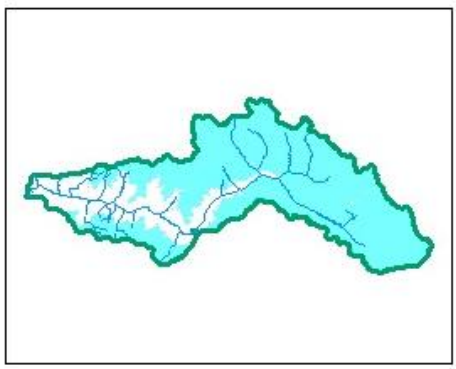
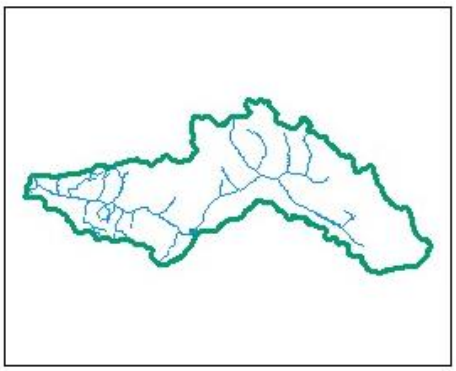


11 April 2015



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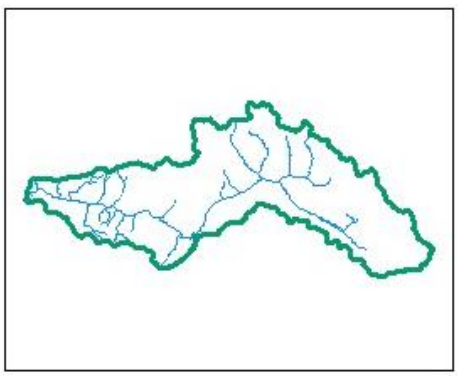

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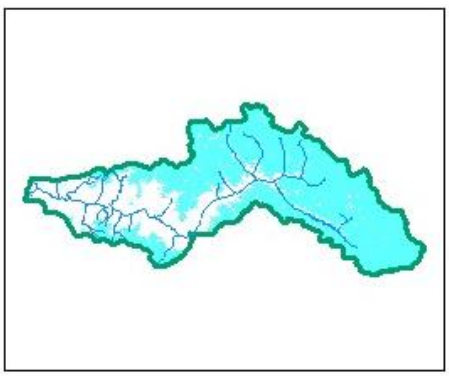


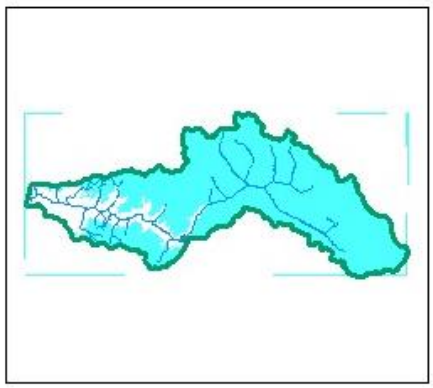
26Apr 2015

SNOW

0 10 20 40 60 80

Kilometers

10 DAILY SNOW COVER MAP: **BHUT BASIN**

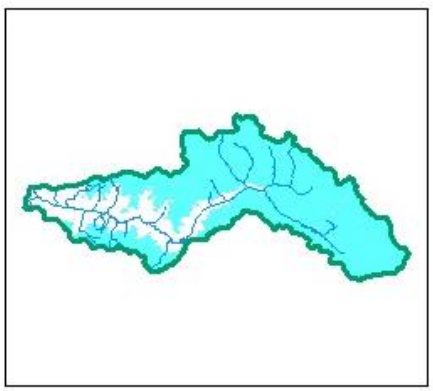


DATA USED

04 April 2015

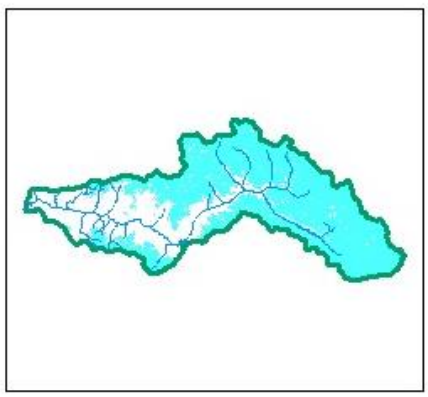
06 April 2015

07 April 2015



DATA USED

11 April 2015



DATA USED

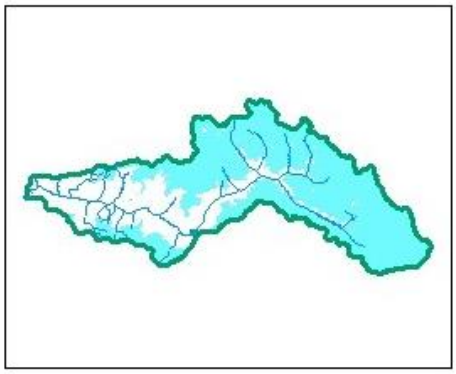
26 April 2015

SNOW

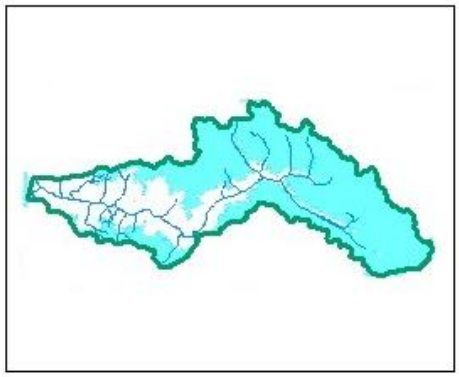
0 10 20 40 60 80

Kilometers

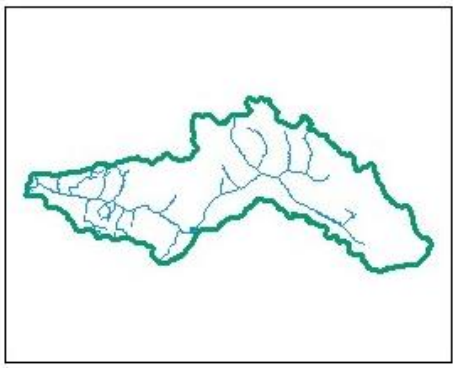
SNOW COVER MAP : BHUT BASIN



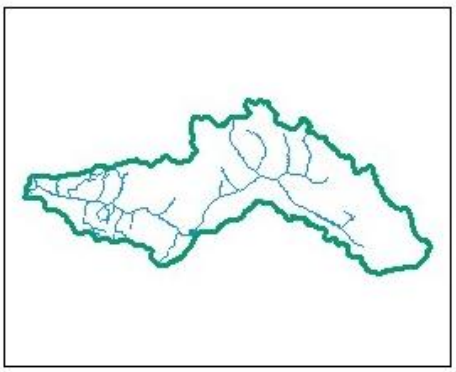
03 May 2015



07 May 2015



DATA NOT AVAILABLE



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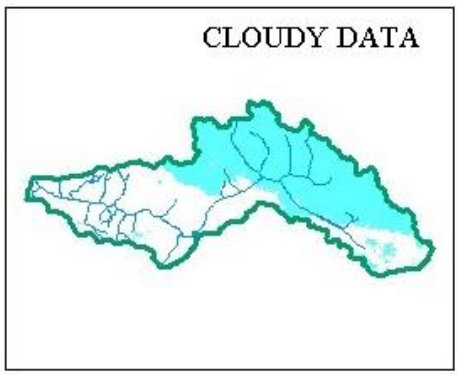
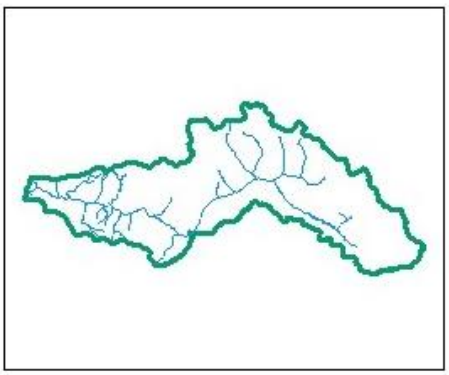


24 May 2015



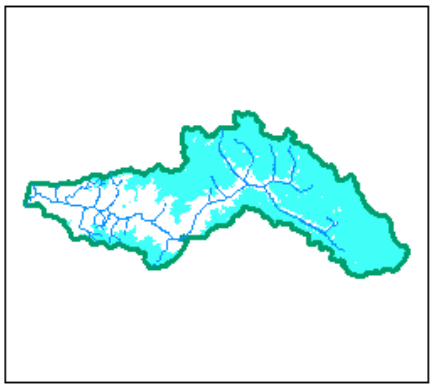
DATA NOT AVAILABLE

SNOW

0 10 20 40 60 80

Kilometers

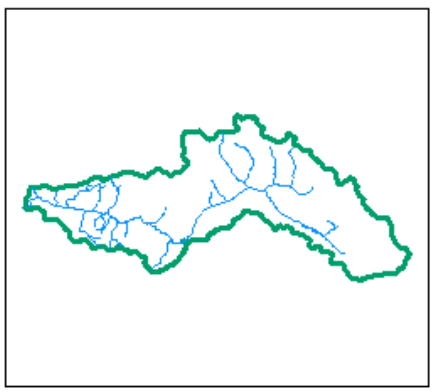
10 DAILY SNOW COVER MAP: **BHUT BASIN**



DATA USED

03 May 2015

07 May 2015



DATA USED

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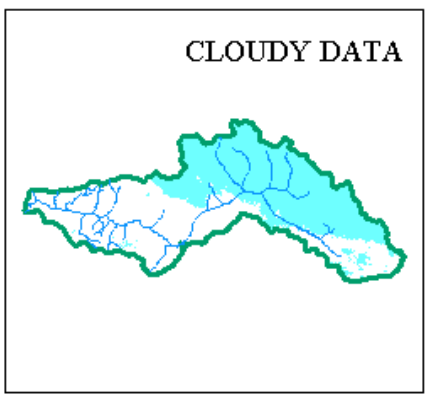


DATA USED

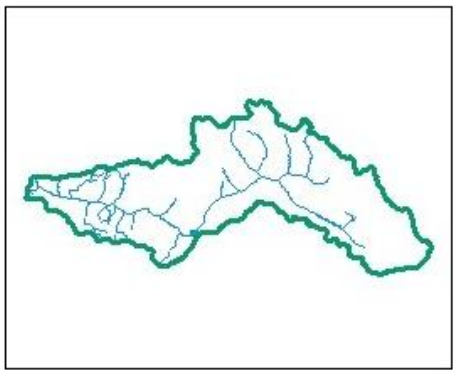
24 May 2015

SNOW

0 10 20 40 60 80

Kilometers

SNOW COVER MAP : BHUT BASIN



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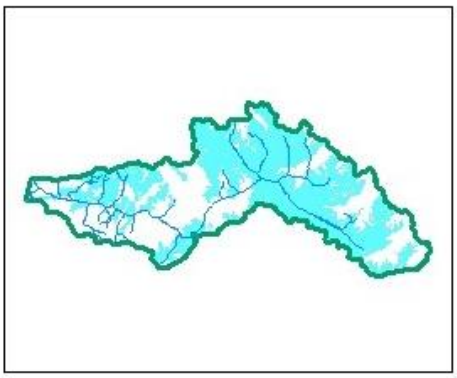
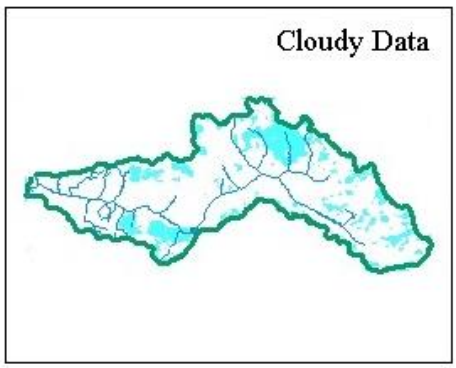
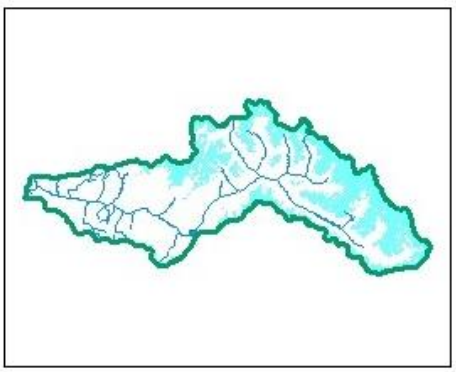


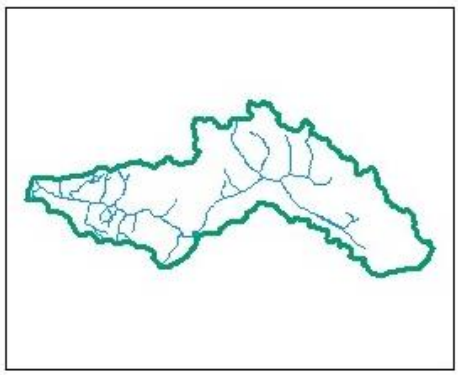
10June 2015



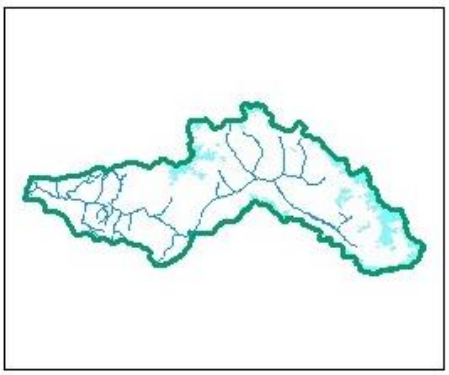
15 June 2015



20 June 2015



DATA NOT AVAILABLE



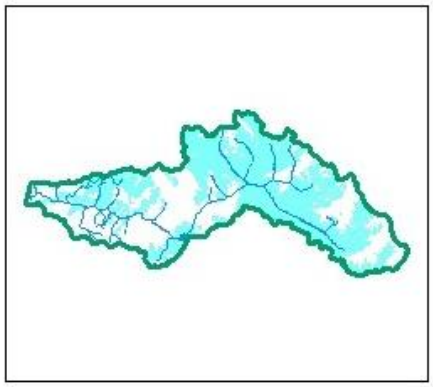
29 June 2015

SNOW

0 10 20 40 60 80

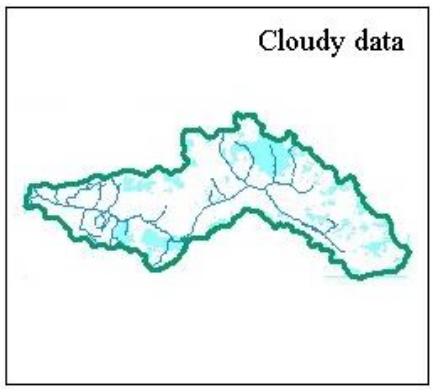
Kilometers

10 DAILY SNOW COVER MAP: BHUT BASIN



DATA USED

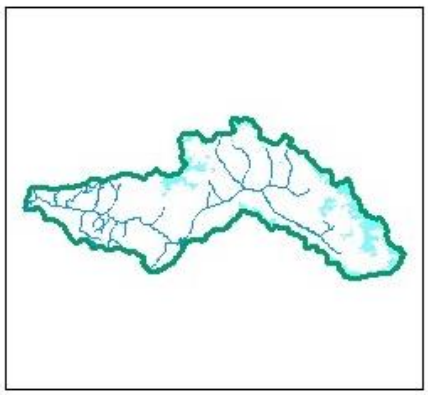
10Jun 2015



DATA USED

15 Jun 2015

20 Jun 2015



DATA USED

29 Jun 2015

SNOW

0 10 20 40 60 80

Kilometers

WARWAN SUB-BASIN

AREAL EXTENT OF SNOW (5 DAILY)

BASIN NAME: WARWAN **BASIN AREA: 4449 Sq km**

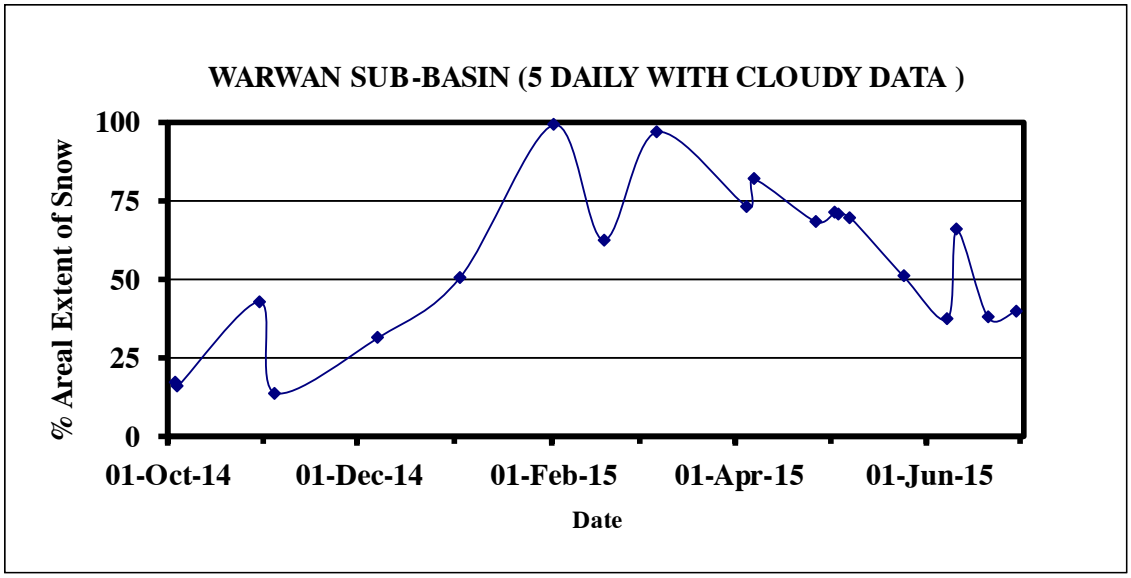
S. No	Date	Snow cover (sq. km)	Snow cover (%)	S. No	Date	Snow cover (sq. km)	Snow cover (%)
October 2014							
1.	03 Oct 2014	779	18	3.	30 Oct 2014	1915	43
2.	04 Oct 2014	725	16				
November 2014							
4.	04 Nov 2014	621	14				
December 2014							
5.	07 Dec 2014	1406	32				
January 2015							
7.	02 Jan 2015	2253	51				
February 2015							
10.	01 Feb 2015	4422	99 ©	11.	17 Feb 2015	2791	63 ©
March 2015							
12.	06 Mar 2015	4321	97				
April 2015							
15.	04 April 2015	3266 ©	73	17	26 April 2015	3047	68
16.	06 April 2015	3654	82				
May 2015							
19.	02 May 2015	3188	72	21	07 May 2015	3104	70
20.	03 May 2015	3165	71		24 May 2015	2273	51
June 2015							
22.	07 June 2015	1671	38 ©	24.	20 June 2015	1691	38 ©
23.	10 June 2015	2933	66 ©	25.	29 June 2015	1780	40 ©

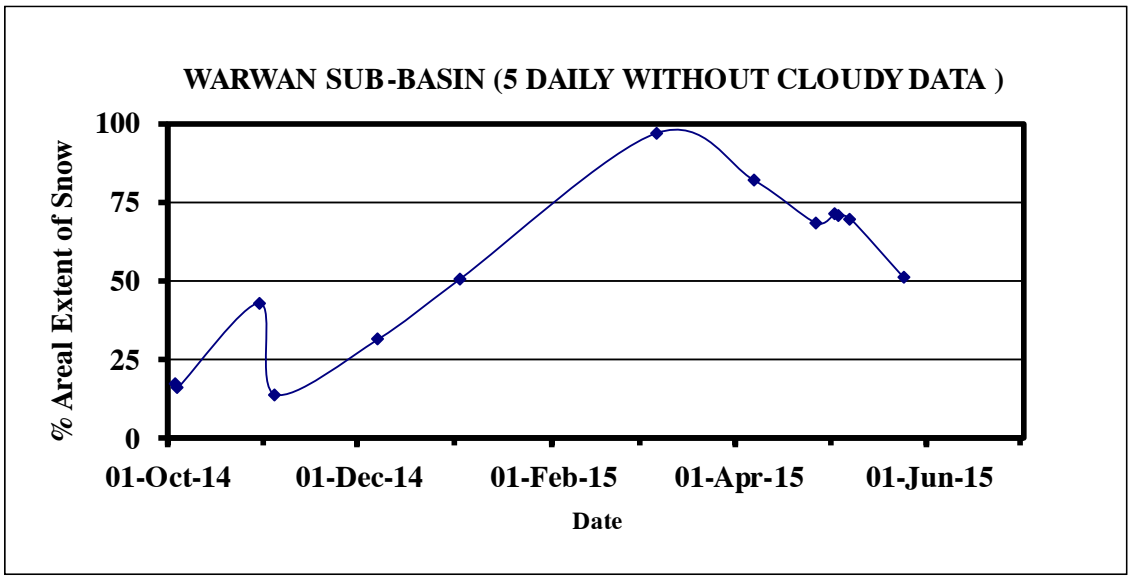
AREAL EXTENT OF SNOW (10 DAILY)

BASIN NAME: WARWAN **BASIN AREA: 4449sq km**

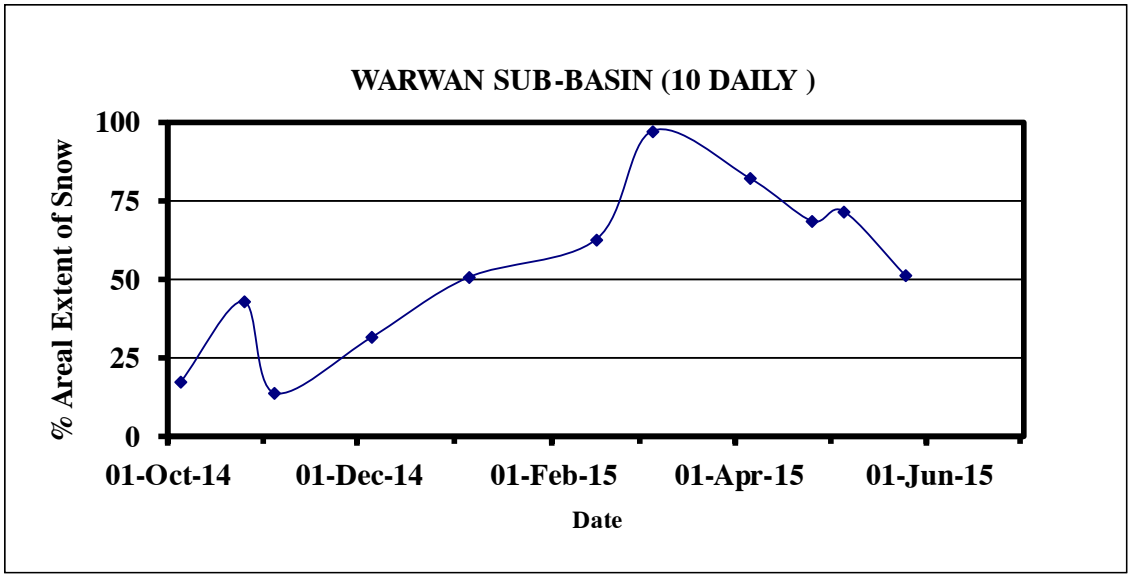
S. No	Date	Snow cover (sq. km)	Snow cover (%)	S. No	Date	Snow cover (sq. km)	Snow cover (%)
October 2014							
1.	01 Oct 2014	779	18	2.	25 Oct 2014	1915	43
1.	03 Oct 2014						
November 2014							
3.	05 Nov 2014	621	14				
December 2014							
4.	05 Dec 2014	1406	32				
January 2015							
5.	01 Jan 2015	2253	51				
5.	05 Jan 2015						
February 2015							
6.	15 Feb 2015	2791	63				
March 2015							
7.	04 Mar 2015	4320	97				
7	06 Mar 2015						
7	09 Mar 2015						
April 2015							
8	04 April 2015	3654	82	9	25 April 2015	3047	68
8	06 April 2015						
May 2015							
10	03 May 2015	3187	72	11	25 May 2015	2273	51
10	07 May 2015						
June 2015							

SNOW COVER DEPLETION CURVE





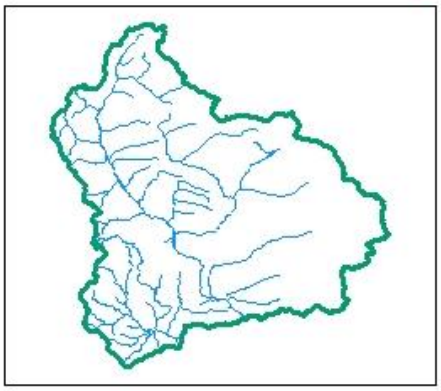
SNOW COVER DEPLETION CURVE



SNOW COVER MAP

SNOW COVER MAP : WARAN BASIN

03 Oct 2014



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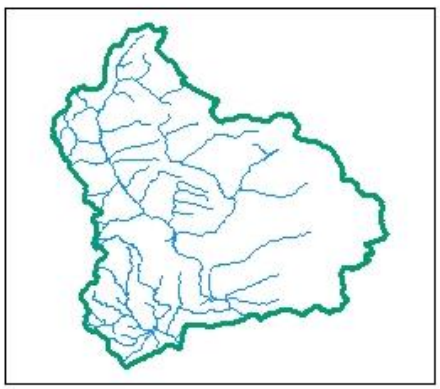

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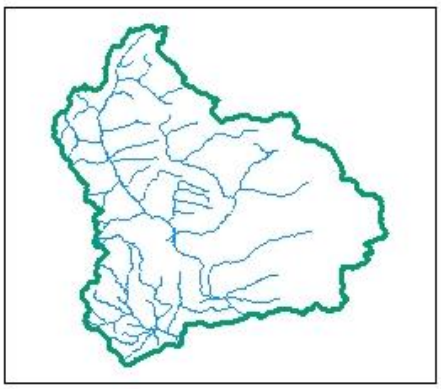

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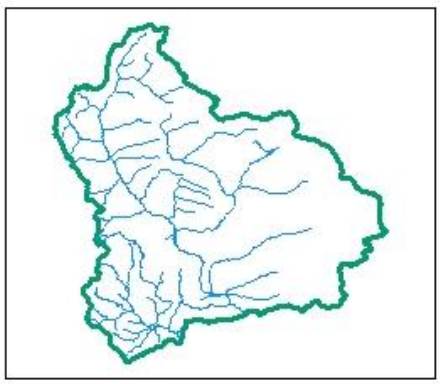

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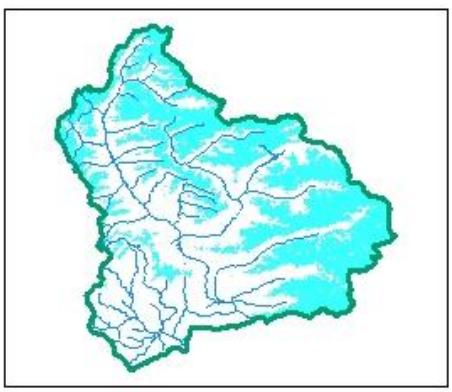


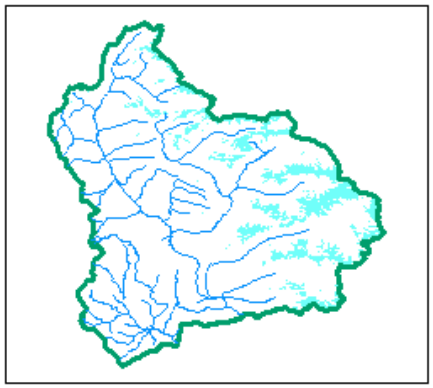
30 Oct 2014

SNOW

0 5 10 20 30 40

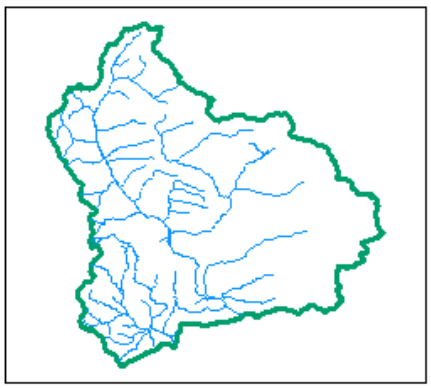
Kilometers

10 DAILY SNOW COVER MAP: WARAN BASIN



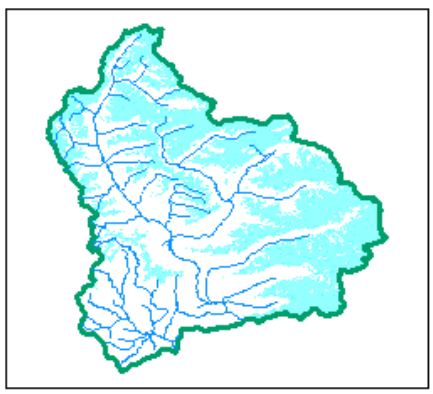
DATA USED

03 Oct 2014



DATA USED

DATA NOT AVAILABLE



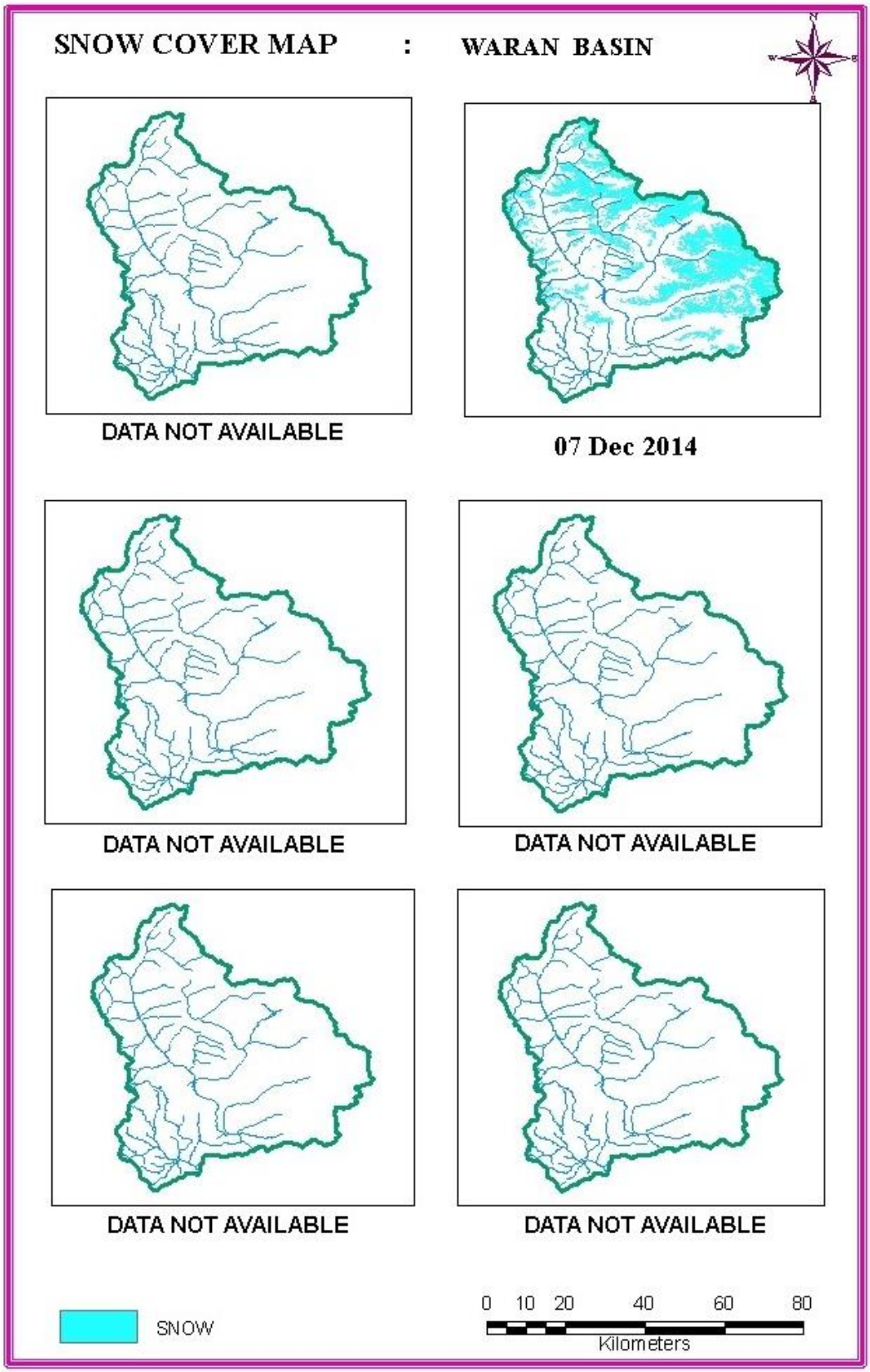
DATA USED

30 Oct 2014

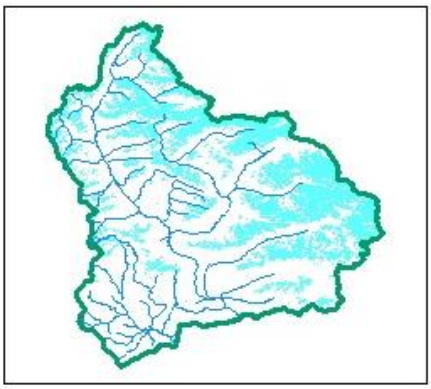
SNOW

0 10 20 40 60 80

Kilometers

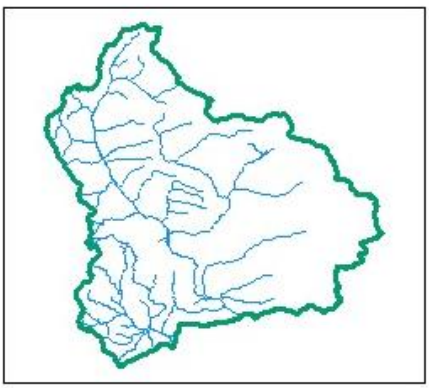

SNOW COVER MAP : WARAN BASIN
DATA NOT AVAILABLE
07 Dec 2014
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
SNOW
0 10 20 40 60 80
Kilometers

10 DAILY SNOW COVER MAP: WARAN BASIN



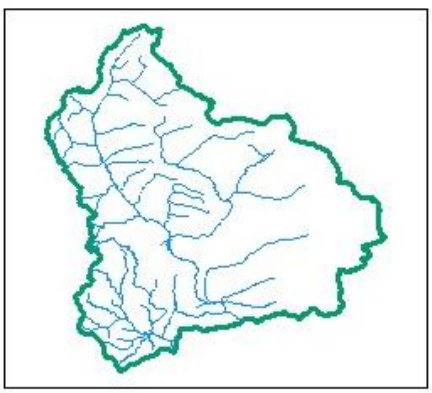
DATA USED

07 Dec 2014



DATA USED

DATA NOT AVAILABLE



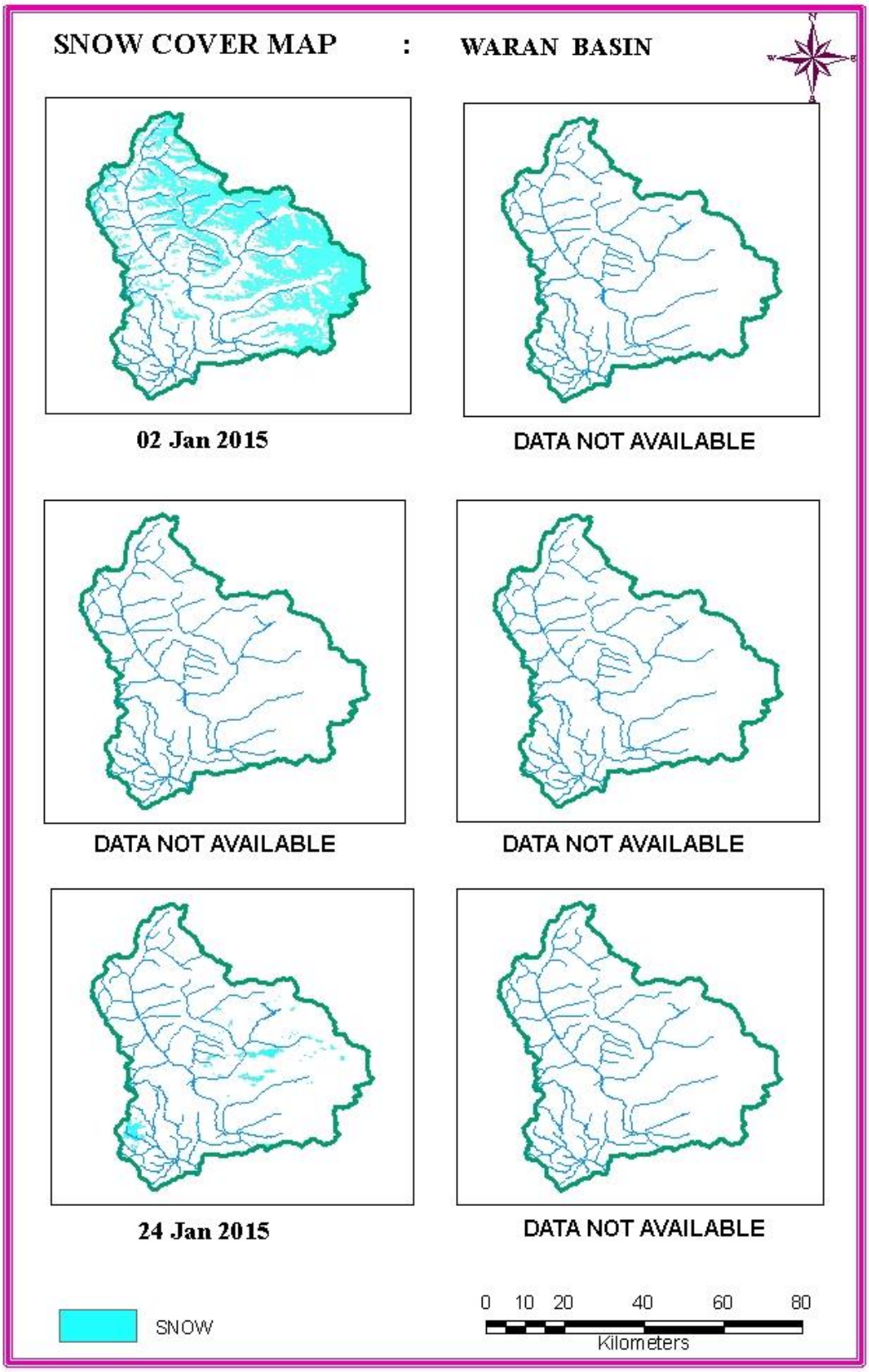
DATA USED

DATA NOT AVAILABLE

SNOW

0 10 20 40 60 80

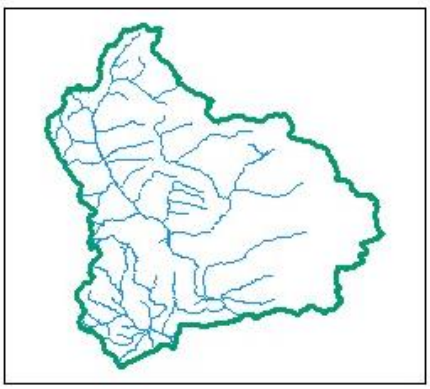
Kilometers


SNOW COVER MAP : WARAN BASIN
02 Jan 2015
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
24 Jan 2015
DATA NOT AVAILABLE
SNOW
0 10 20 40 60 80
Kilometers

10 DAILY SNOW COVER MAP: WARAN BASIN

DATA USED

02 Jan 2015



DATA USED

DATA NOT AVAILABLE

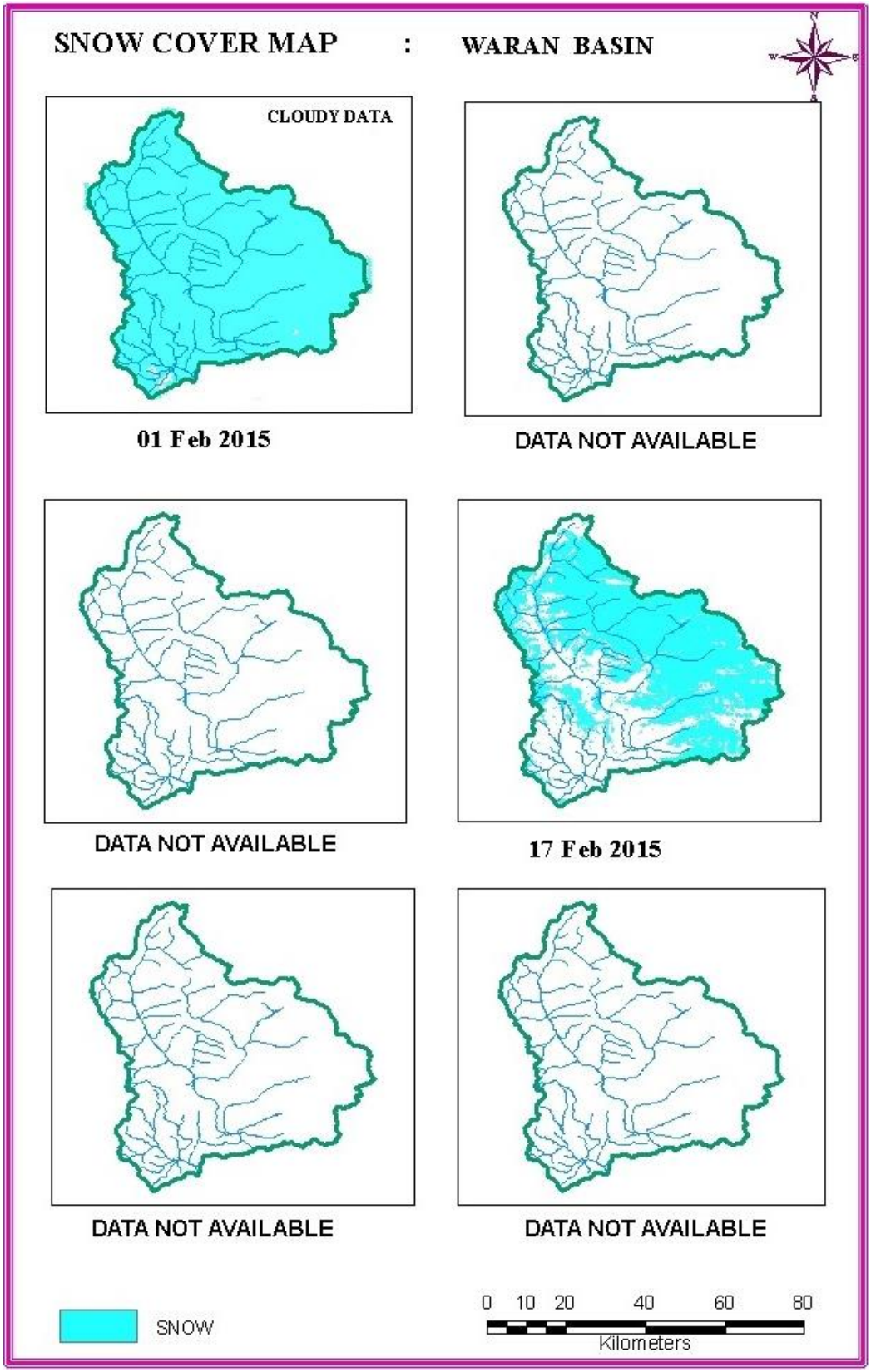
DATA USED

24 Jan 2015

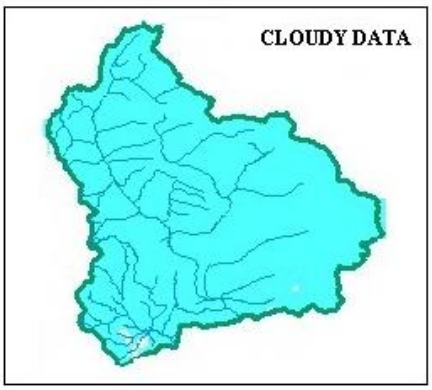
SNOW

0 10 20 40 60 80

Kilometers

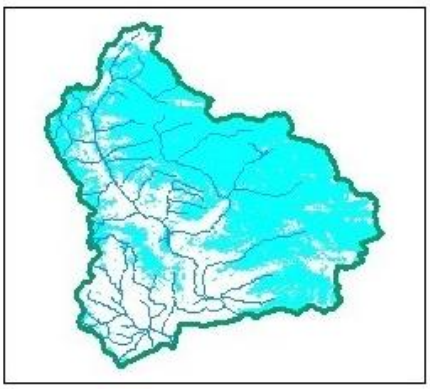

SNOW COVER MAP : WARAN BASIN
CLOUDY DATA
01 Feb 2015
DATA NOT AVAILABLE
DATA NOT AVAILABLE
17 Feb 2015
DATA NOT AVAILABLE
DATA NOT AVAILABLE
SNOW
0 10 20 40 60 80
Kilometers

10 DAILY SNOW COVER MAP: WARAN BASIN



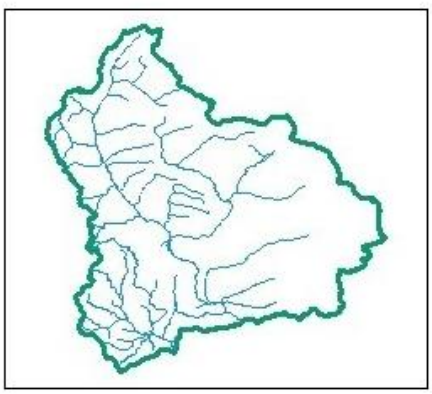
DATA USED

01 Feb 2015



DATA USED

17 Feb 2015



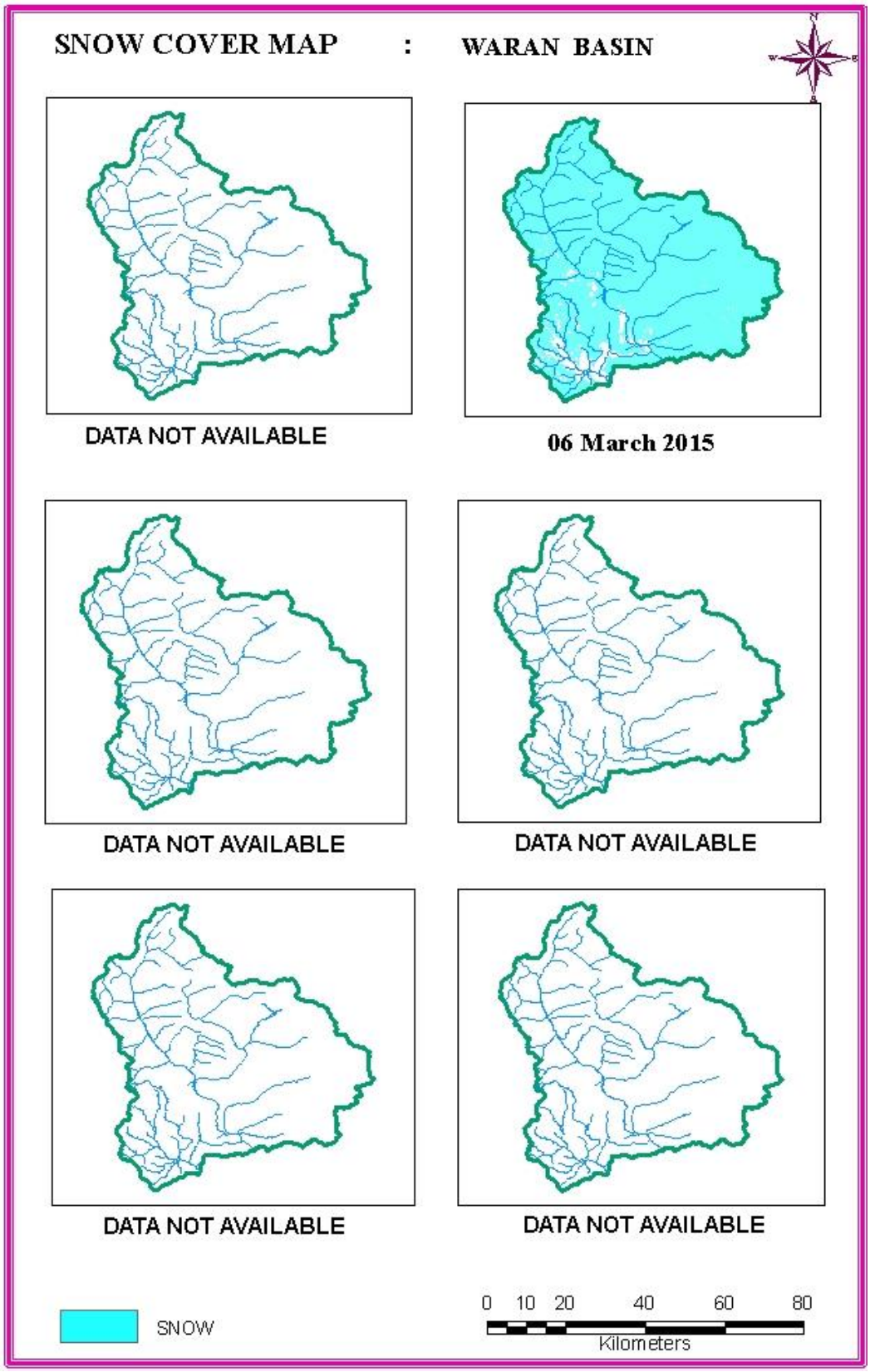
DATA USED

DATA NOT AVAILABLE

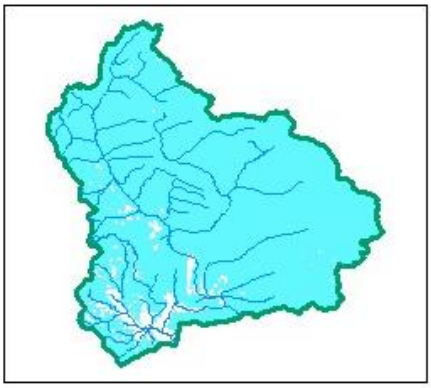
SNOW

0 10 20 40 60 80

Kilometers

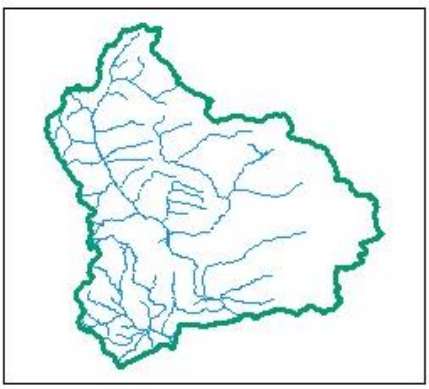

SNOW COVER MAP : WARAN BASIN
DATA NOT AVAILABLE
06 March 2015
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
SNOW
0 10 20 40 60 80
Kilometers

10 DAILY SNOW COVER MAP: WARAN BASIN



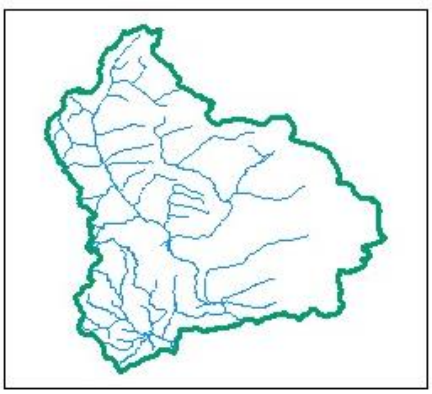
DATA USED

06 March 2015



DATA USED

DATA NOT AVAILABLE



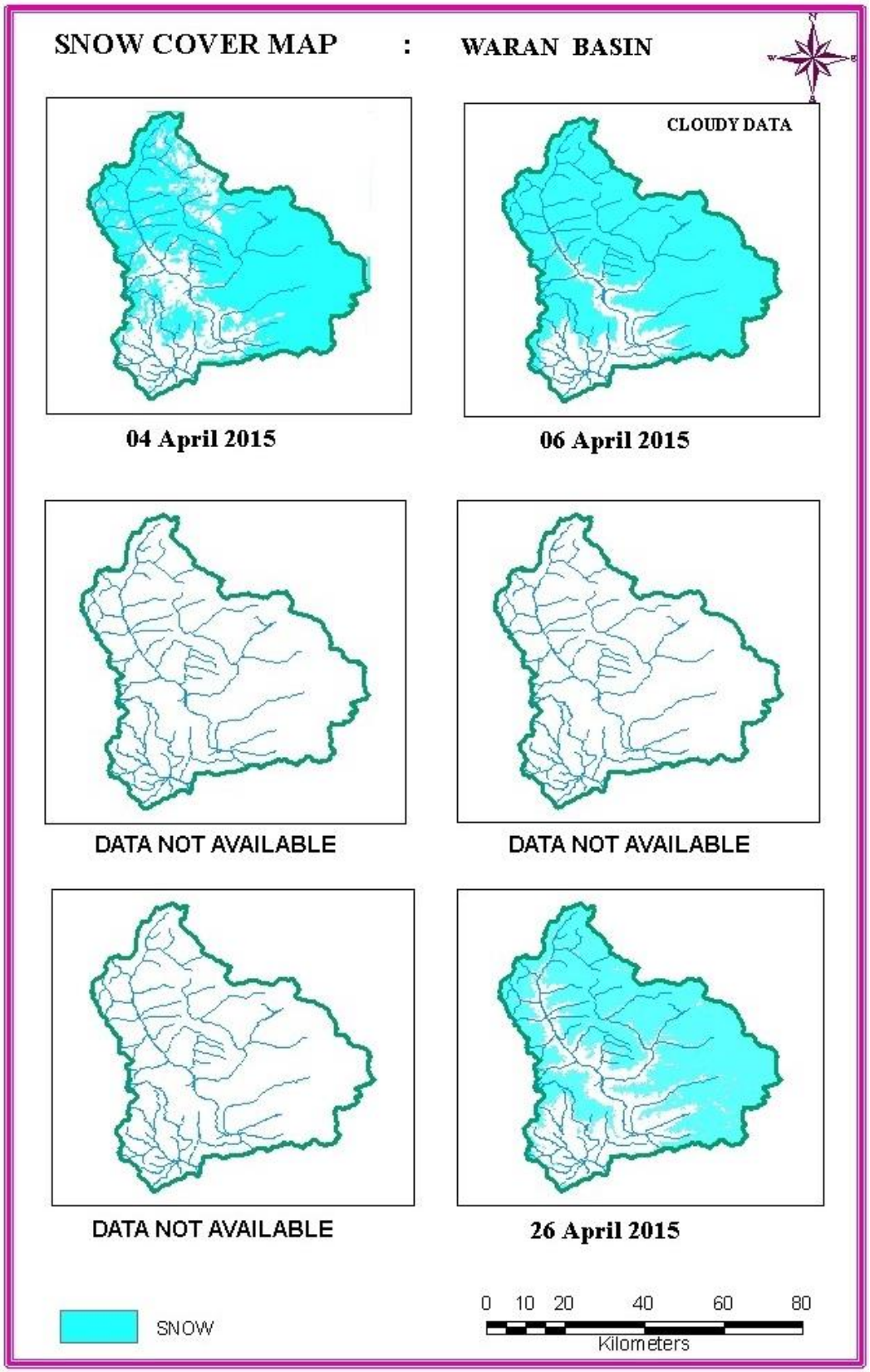
DATA USED

DATA NOT AVAILABLE

SNOW

0 10 20 40 60 80

Kilometers

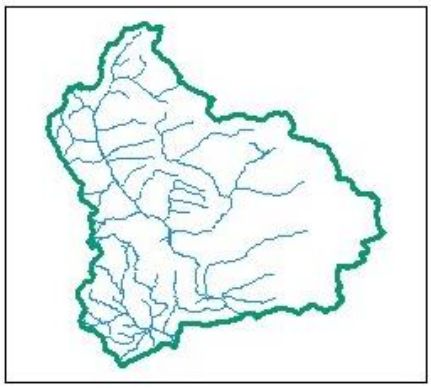

SNOW COVER MAP : WARAN BASIN
CLOUDY DATA
04 April 2015
06 April 2015
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
26 April 2015
SNOW
0 10 20 40 60 80
Kilometers

10 DAILY SNOW COVER MAP: WARAN BASIN

DATA USED

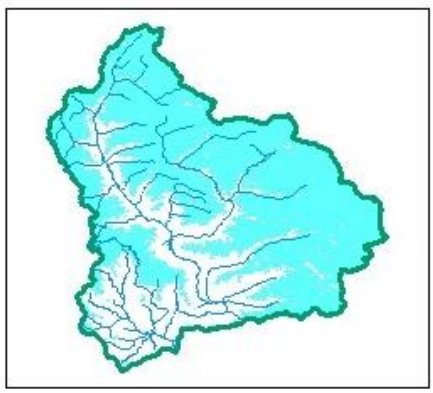
04 April 2015

06 April 2015



DATA USED

DATA NOT AVAILABLE



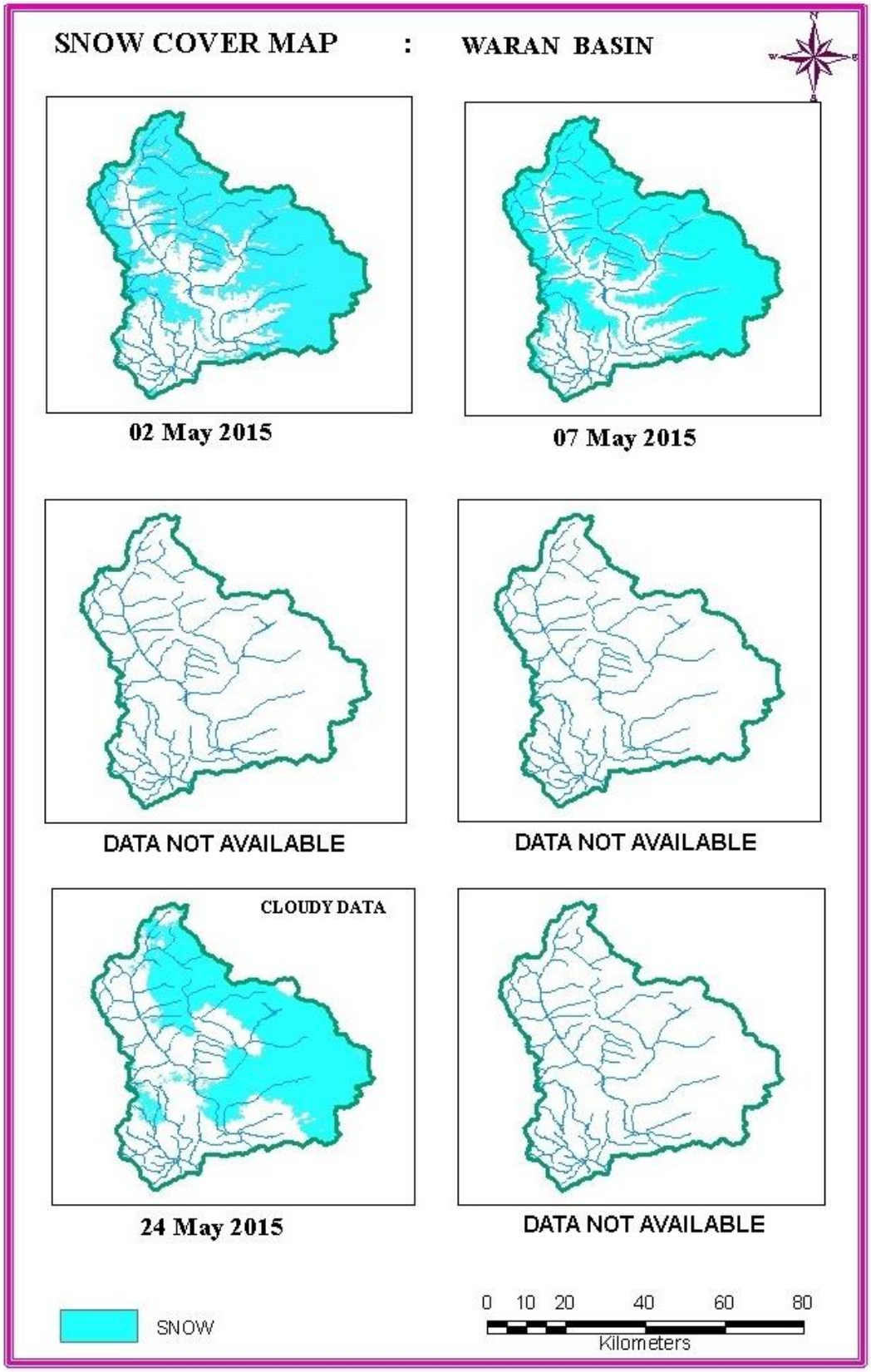
DATA USED

26 April 2015

SNOW

0 10 20 40 60 80

Kilometers


SNOW COVER MAP : WARAN BASIN
02 May 2015
07 May 2015
DATA NOT AVAILABLE
DATA NOT AVAILABLE
CLOUDY DATA
24 May 2015
DATA NOT AVAILABLE
SNOW
0 10 20 40 60 80
Kilometers

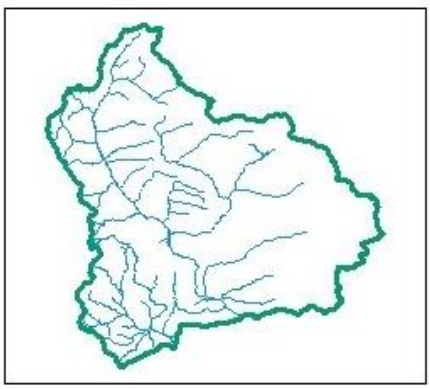
10 DAILY SNOW COVER MAP: WARAN BASIN

DATA USED

02 May 2015

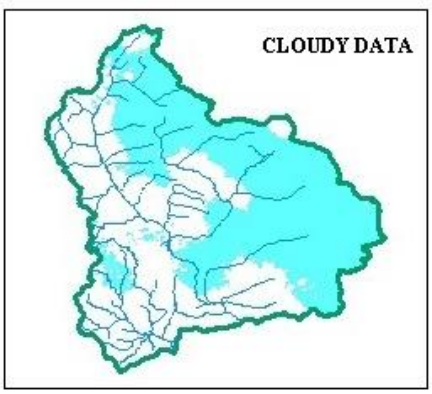
03 May 2015

07 May 2015



DATA USED

DATA NOT AVAILABLE



DATA USED

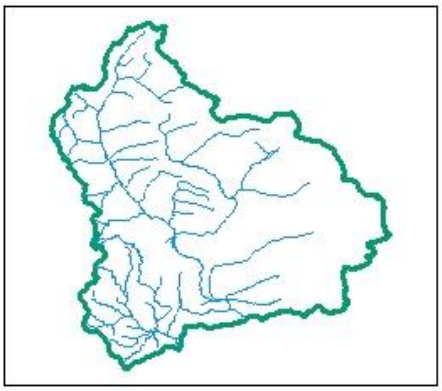
24 May 2015

SNOW

0 10 20 40 60 80

Kilometers

SNOW COVER MAP : BASPA BASIN



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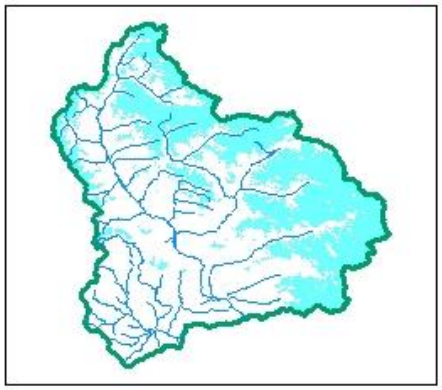
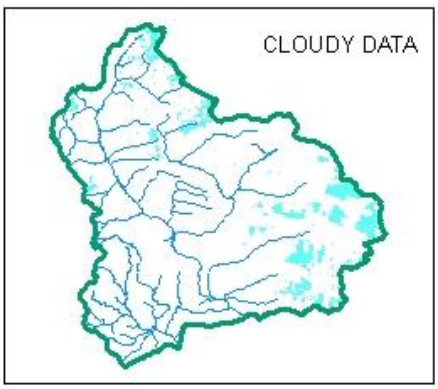
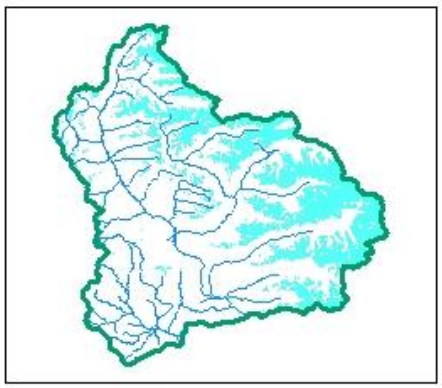


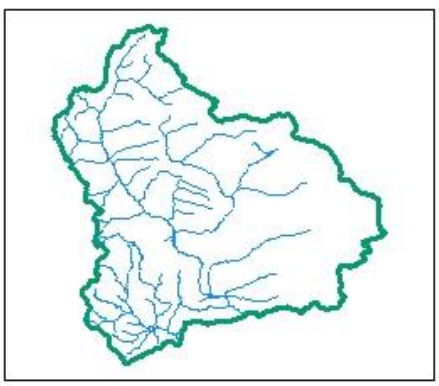
07 June 2015



15 June 2015



20 June 2015



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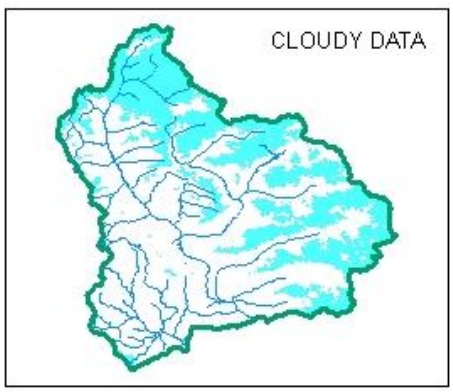


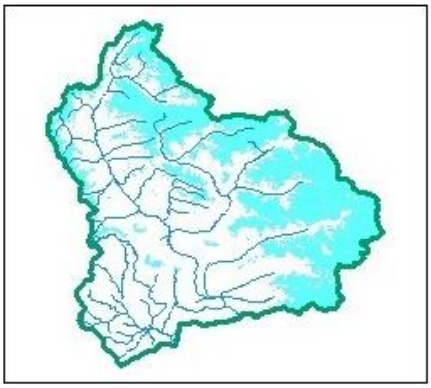
29 June 2015

SNOW

0 5 10 20 30 40

Kilometers

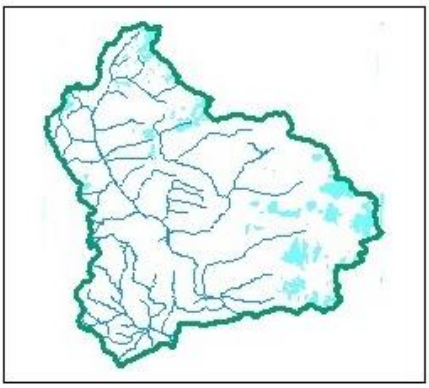
10 DAILY SNOW COVER MAP: WARAN BASIN



DATA USED

07 June 2015

10 June 2015



DATA USED

15 June 2015

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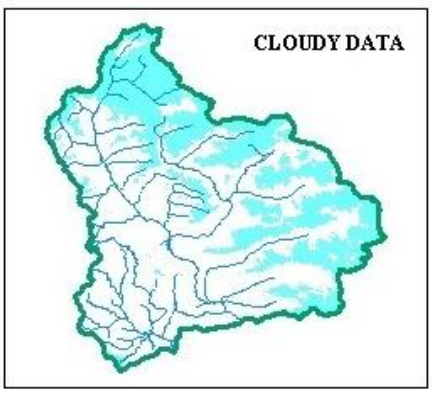

DATA USED

29 June 2015

SNOW

0 10 20 40 60 80

Kilometers