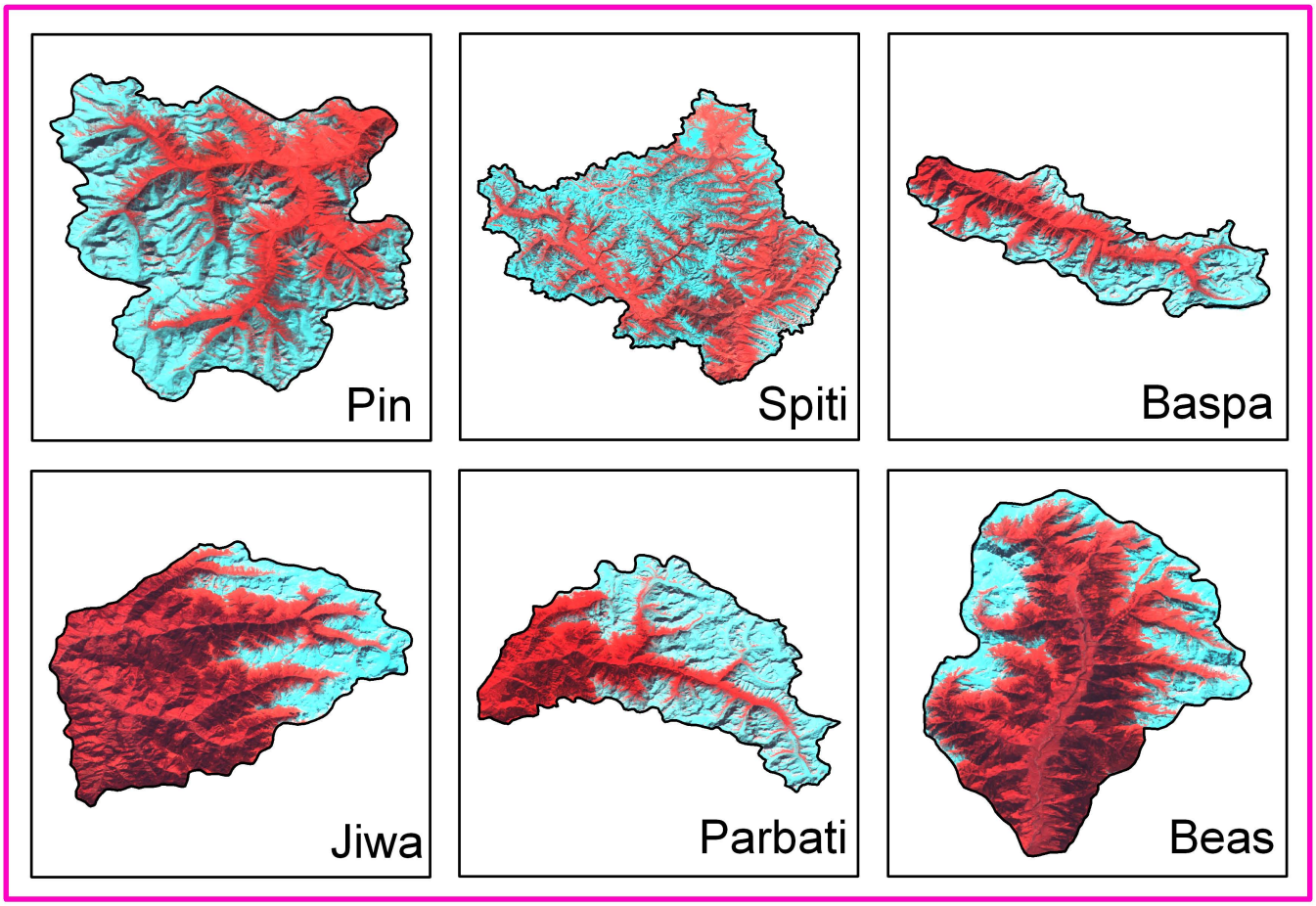
SNOW COVER ATLAS OF SATLUJ BASIN

Sub basins: Pin, Spiti, Baspa, Jiwa, Parbati and Beas

(A Joint Project of Indian Space Research Organisation and Ministry of Environment and Forests, Govt. of India)

Year : 2012-13



State Centre on Climate Change
(State Council for Science Technology & Environment, Shimla), Himachal Pradesh
and
Space Applications Centre (ISRO)
Ahmedabad - 380015

March, 2014

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Originating Unit	Geo Sciences Division, Marine, Geo and Planetary Sciences Group, Earth, Ocean, Atmosphere, Planetary Sciences and Applications area, Space Applications Centre (ISRO), Ahmedabad-15
Abstract	This atlas gives subbasin-wise distribution of snow cover in the Satluj basin from October 2012 to June 2013. The subbasins included in this report are Pin, Spiti, Baspa, Jiwa, Parbati and Beas. 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 curves. It is expected that this data will be useful for hydrological and climatological applications.
Key words	Snow cover, NDSI, AWiFS, depletion curve, Pin, Spiti, Baspa, Jiwa, Parbati and Beas basins.
Security Classification	Unrestricted
Distribution	As per list

CONTENTS

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:

The study area comprises of distribution of snow cover in Pin, Spiti, Baspa, Jiwa, Baspa, Parbati and Beas sub basins of Satluj basin. The location map of these sub basins is as per Figure 1.

3. Data used:

AWiFS data from October 2012 to June 2013 was 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 curve is given from October 2012 to June 2013. Snow ablation pattern varies from basin to basin, depending on area altitude distribution in the basins. For example, in the Jiwa river basin, which is located in lower altitude zone and contains few glaciers has shown and ablation of snow through out the winter season. However, in case of Pin & Baspa basins, located in high altitude region and large area is covered by glaciers has shown little or no ablation from January to April. For a period between October to December, snow ablation was observed in all basins.

Acknowledgements

This investigation was carried out under Snow and Glacier Studies Project, a joint initiative of Ministry of Environment and Forest (MoEF) and Department of Space (DOS). The authors are grateful to Shri A. S. Kiran Kumar, Director, Space Applications Centre, Ahmedabad for continuous guidance and encouragement during the investigation. Authors would like to thank Dr. J. S. Parihar, Deputy Director, EPSA, and Dr Manab Chakraborty GD, GSAG/EPSA SAC for their suggestions and comments on the atlas. The authors are also thankful to Sh. Sudripta Roy, IAS, Additional Chief Secretary (Env. S&T) Government of Himachal Pradesh and Dr. Nagin Nanda, IFS ,Secretary –cum-Director (Environment) and Member Secretary (SCSTE) for their guidance from time to time and permission to undertake the study.

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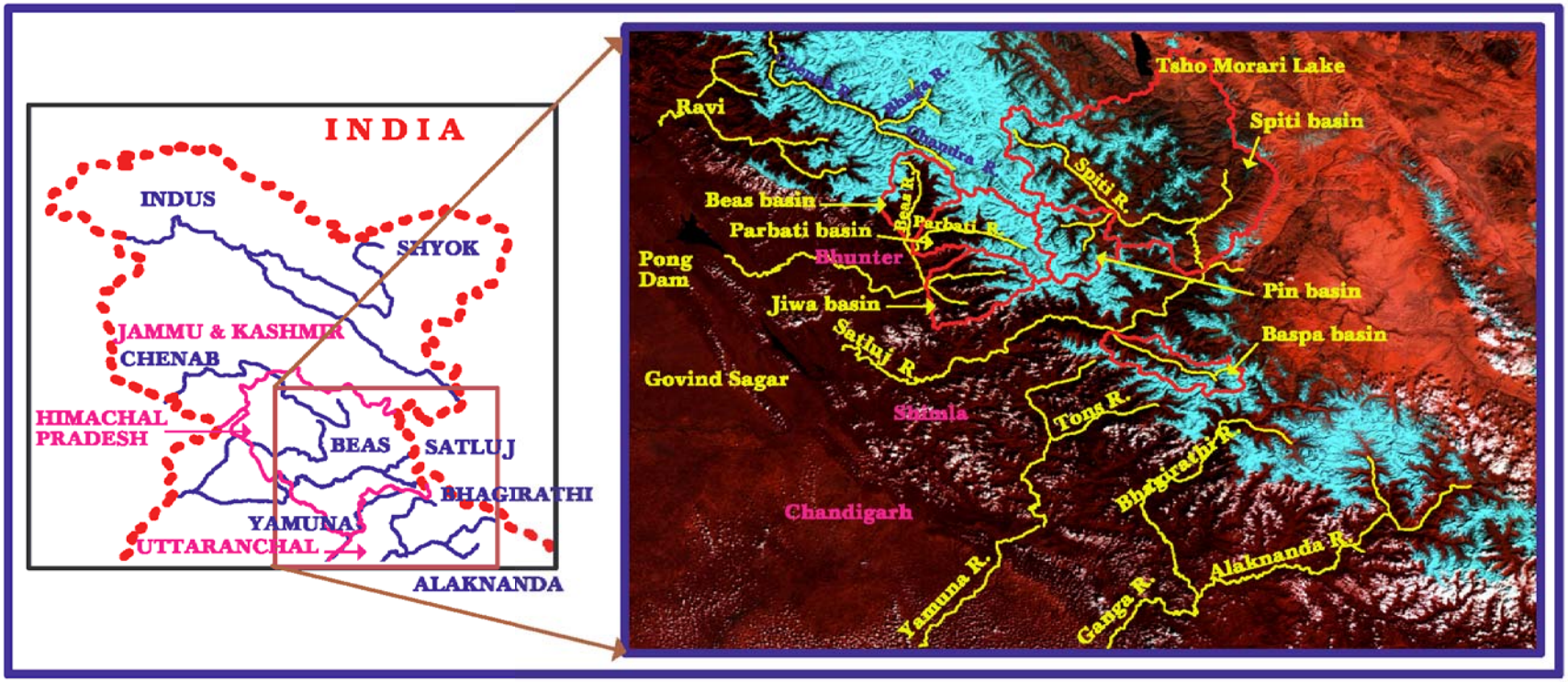


Figure 1: Location map of Pin, Spiti, Baspa, Jiwa, Parbati and Beas sub-basins (Part of Satluj basin)

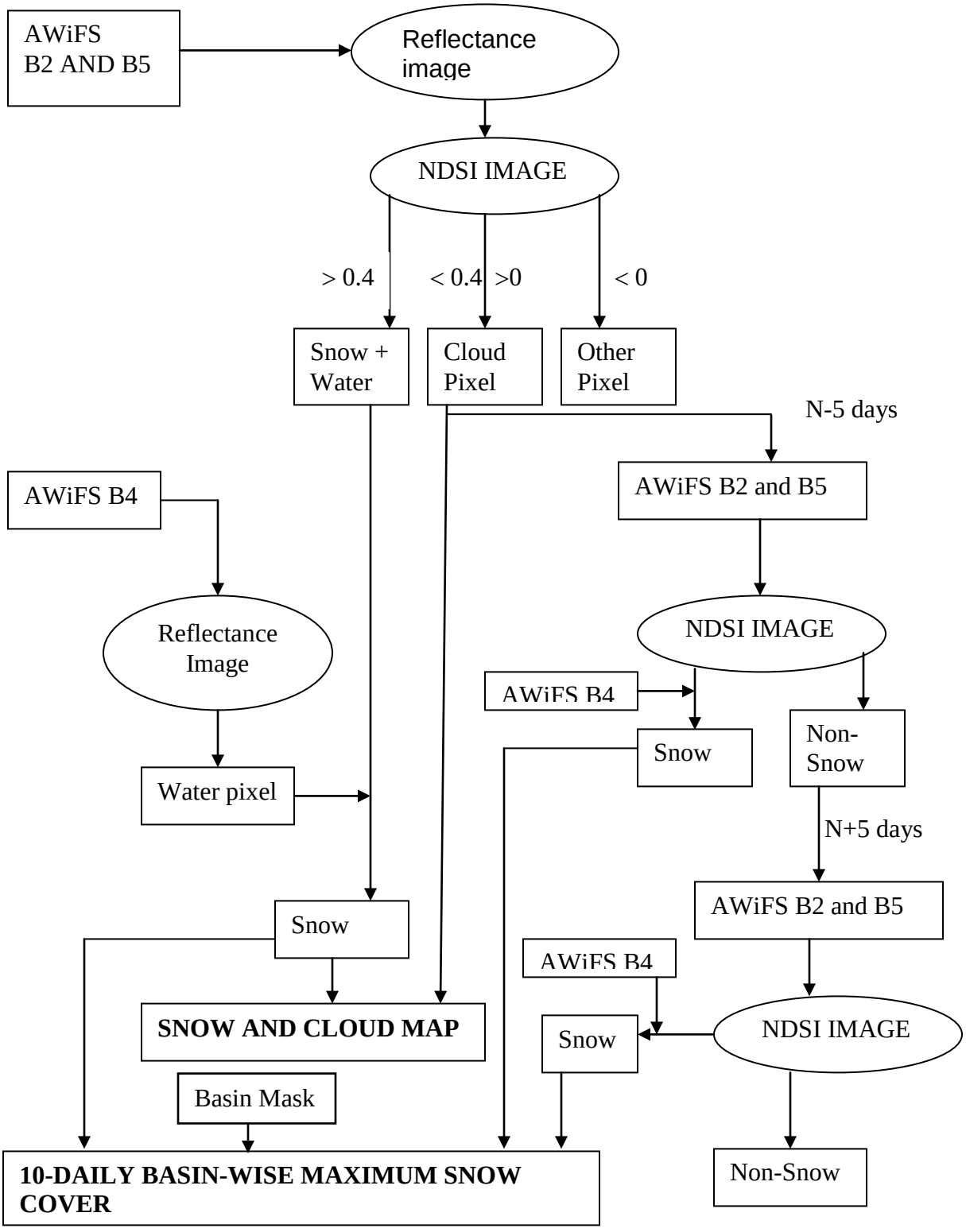


Figure 2: Algorithm for snow cover mapping using AWiFS data

PIN BASIN

AREAL EXTENT OF SNOW (5 DAILY)

BASIN NAME: PIN **BASIN AREA: 1266 sq km**

S No	DATE	Snow cover (sq km)	Snow cover (%)	Cloud Cover	S No	DATE	Snow cover (sq km)	Snow cover (%)	Cloud Cover
October 2012									
1	02-10-2012	313	25	Clear	**10**	19-10-2012	362	29	Clear
2	02-10-2012	315	25	Clear	**11**	19-10-2012	357	28	Clear
3	04-10-2012	486	38	Clear	**12**	23-10-2012	571	45	95%
4	07-10-2012	312	25	Clear	**13**	24-10-2012	821	65	40%
5	11-10-2012	385	30	Clear	**14**	26-10-2012	682	54	Clear
6	12-10-2012	320	25	Clear	**15**	28-10-2012	569	45	Clear
7	14-10-2012	305	24	Clear	**16**	29-10-2012	519	41	Clear
8	14-10-2012	304	24	Clear	**17**	31-10-2012	495	39	Clear
9	17-10-2012	577	46	Clear					
November 2012									
1	04-11-2012	316	25	Clear	**9**	16-11-2012	304	24	Clear
2	05-11-2012	384	30	Clear	**10**	17-11-2012	264	21	Clear
3	07-11-2012	358	28	Clear	**11**	17-11-2012	265	21	Clear
4	07-11-2012	355	28	Clear	**12**	19-11-2012	410	32	Clear
5	09-11-2012	266	21	Clear	**13**	19-11-2012	522	41	Clear
6	10-11-2012	338	27	Clear	**14**	24-11-2012	944	75	30%
7	12-11-2012	320	26	Clear	**15**	26-11-2012	537	42	20%
8	14-11-2012	351	28	Clear					
December 2012									
1	01-12-2012	1090	86	Clear	**5**	22-12-2012	1222	96	Clear
2	01-12-2012	1090	86	Clear	**6**	23-12-2012	1216	96	Clear
3	04-12-2012	972	77	Clear	**7**	25-12-2012	1183	93	Clear
4	16-12-2012	1271	100	45%	**8**	25-12-2012	1186	94	Clear
January 2013									
1	03-01-2013	1139	90	Clear	**7**	13-01-2013	1263	100	Clear
2	06-01-2013	1197	95	Clear	**8**	20-01-2013	1271	100	Clear
3	08-01-2013	1135	90	Clear	**9**	21-01-2013	1271	100	Clear
4	09-01-2013	1112	88	45%	**10**	22-01-2013	1226	97	Clear
5	11-01-2013	1159	92	Clear	**11**	25-01-2013	1271	100	Clear
6	13-01-2013	1262	100	Clear	**12**	27-01-2013	1266	100	Clear
February 2013									
1	01-02-2013	1271	100	Clear	**5**	18-02-2013	1272	100	Clear
2	08-02-2013	1272	100	Clear	**6**	20-02-2013	1271	100	10%

3	08-02-2013	1271	100	Clear	**7**	25-02-2013	1272	100	Clear
4	09-02-2013	1271	100	Clear	**8**	28-02-2013	1260	100	35%
March 2013									
1	02-03-2013	1271	100	Clear	**7**	17-03-2013	1272	100	Clear
2	04-03-2013	1270	100	75%	**8**	19-03-2013	1272	100	Clear
3	05-03-2013	1271	100	Clear	**9**	21-03-2013	1270	100	Clear
4	07-03-2013	1267	100	Clear	**10**	22-03-2013	1270	100	Clear
5	12-03-2013	1271	100	Clear	**11**	26-03-2013	1272	100	Clear
6	16-03-2013	1271	100	Clear	**12**	31-03-2013	1271	100	Clear
April 2013									
1	05-04-2013	1267	100	Clear	**6**	17-04-2013	1270	100	Clear
2	07-04-2013	1267	100	Clear	**7**	19-04-2013	1240	98	Clear
3	12-04-2013	1267	100	Clear	**8**	19-04-2013	1241	100	Clear
4	14-04-2013	1253	99	Clear	**9**	24-04-2013	1204	95	Clear
5	15-04-2013	1242	98	Clear					
May 2013									
1	03-05-2013	1177	93	Clear	**5**	09-05-2013	1099	87	Clear
2	04-05-2013	1053	83	20%	**6**	20-05-2013	1036	82	
3	06-05-2013	1203	95	15%	**7**	23-05-2013	1019	80	
4	08-05-2013	1110	88	Clear	**8**	25-05-2013	880	70	
June-13									
1	8-06-2013	768	61	Clear	**2**	30-06-2013	638	50	Clear

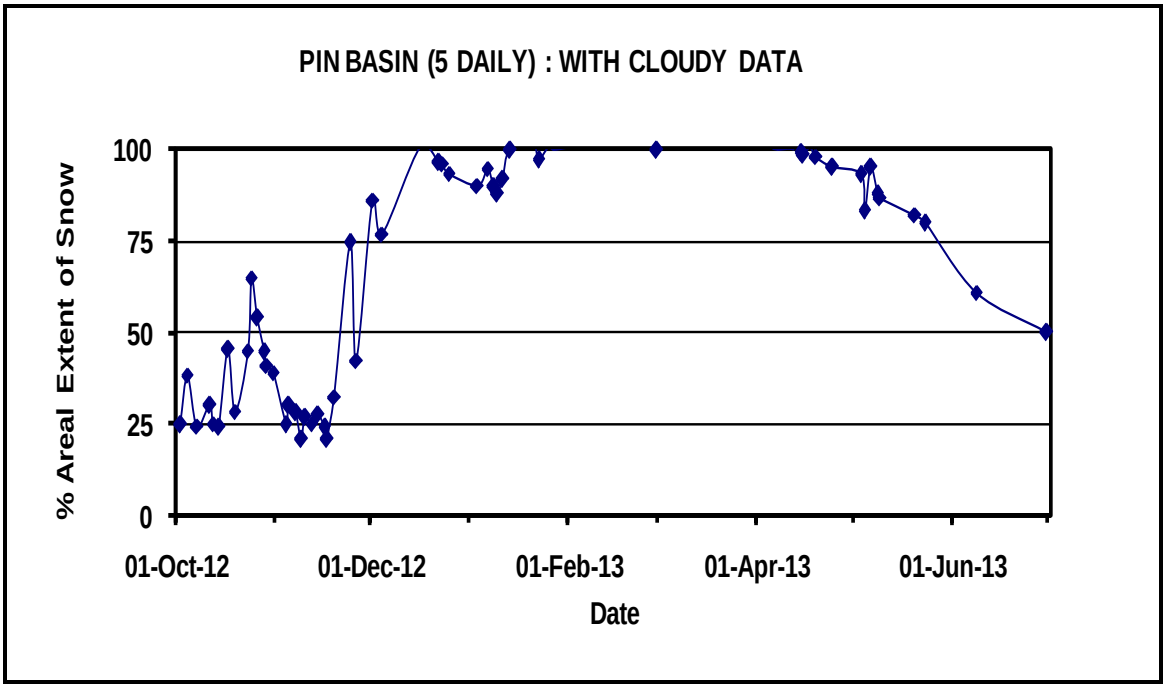
AREAL EXTENT OF SNOW (10 DAILY)

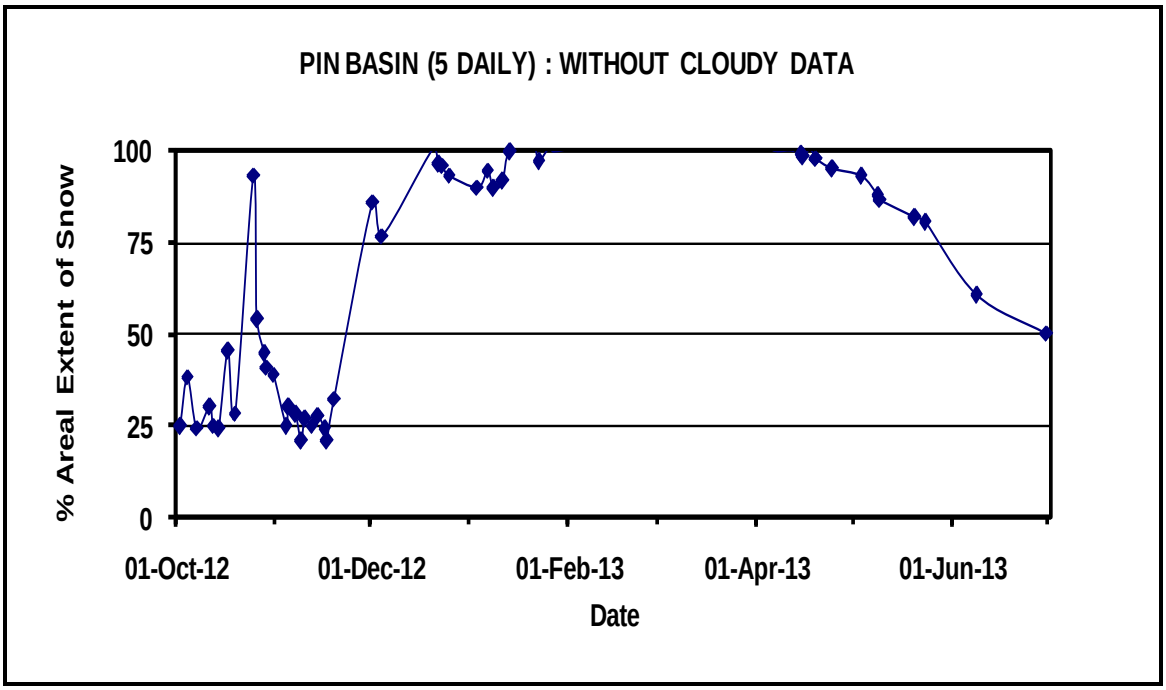
BASIN NAME: PIN **BASIN AREA: 1266 sq km**

S No	Date	Snow cover (sq km)	Snow cover (%)	Cloud cover	S No	Date	Snow cover (sq km)	Snow cover (%)	Cloud cover
October 2012									
1.	02-Oct-12	511	40	Clear	7.	26-Oct-12	684	54	Clear
2.	04-Oct-12			Clear	8.	29-Oct-12			Clear
3.	07-Oct-12			Clear	9.	31-Oct-12			Clear
4.	12-Oct-12	582	46	Clear					
5.	17-Oct-12			Clear					
6.	19-Oct-12			Clear					
November 2012									
1.	04-Nov-12	380	30	Clear	7.	24-Nov-12	772	61	30%
2.	07-Nov-12			Clear	8.	26-Nov-12			20%
3.	09-Nov-12			Clear					
4.	12-Nov-12	405	32	Clear					
5.	16-Nov-12			Clear					
6.	19-Nov-12			Clear					
December 2012									
1.	01-Dec-12	1089	86	Clear	4.	22-Dec-12	1215	96	Clear
2.	04-Dec-12			Clear	5.	23-Dec-12			Clear
3.	16-Dec-12	1266	100	45%	6.	25-Dec-12			Clear
January 2013									
1.	03-Jan-13	1203	95	Clear	7.	21-Jan-13	1266	100	Clear
2.	06-Jan-13			Clear	8.	25-Jan-13			Clear
3.	08-Jan-13			Clear	9.	27-Jan-13			Clear
4.	11-Jan-13	1266	100	Clear					
5.	13-Jan-13			Clear					
6.	20-Jan-13			Clear					
February 2013									
1.	01-Feb-13	1266	100	Clear	4.	18-Feb-13	1266	100	Clear
2.	08-Feb-13			Clear	5.	20-Feb-13			10%
3.	09-Feb-13			Clear	6.	25-Feb-13	1266	100	Clear
					7.	28-Feb-13			

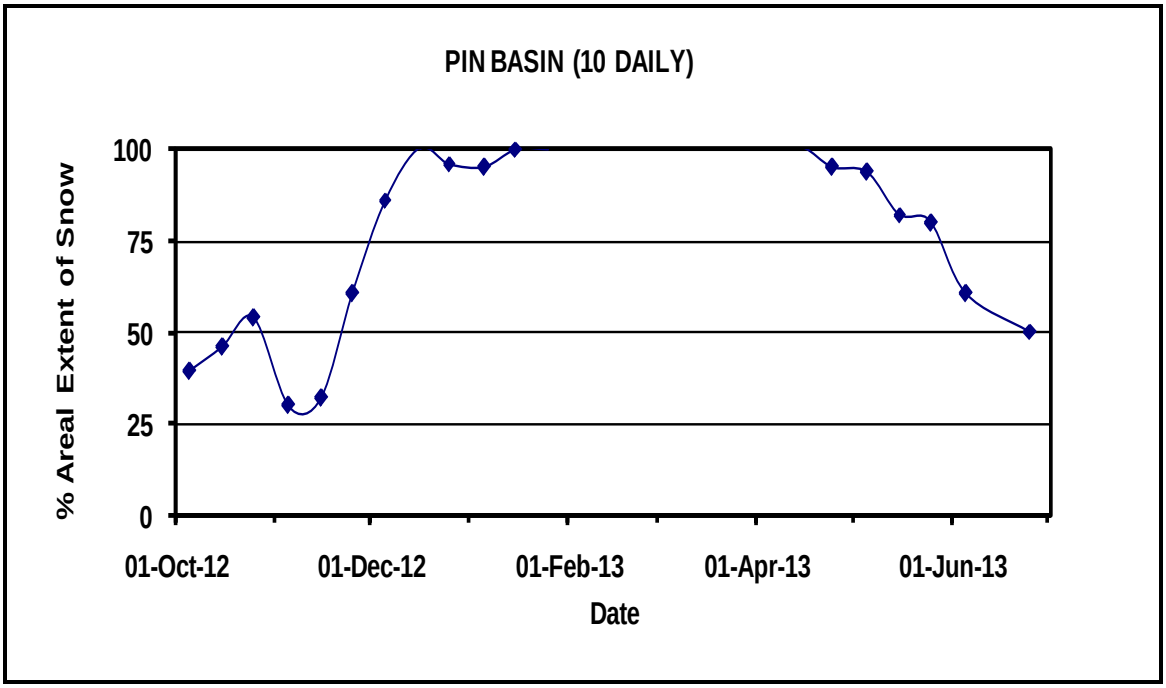
March 2013									
1.	02-Mar-13	1266	100	Clear	7.	21-Mar-13	1266	100	Clear
2.	05-Mar-13			Clear	8.	26-Mar-13			Clear
3.	07-Mar-13			Clear	9.	31-Mar-13			Clear
4.	12-Mar-13	1266	100	Clear					
5.	17-Mar-13			Clear					
6.	19-Mar-13			Clear					
April 2013									
1.	05-Apr-13	1266	100	Clear	6.	24-Apr-13	1204	95	Clear
2.	07-Apr-13			Clear					
3.	12-Apr-13	1266	100	Clear					
4.	15-Apr-13			Clear					
5.	19-Apr-13			Clear					
May 2013									
1.	03-May-13	1190	94	Clear		15-May-13	1038	82	
2.	08-May-13			Clear		23-may-13	1013	80	
3.	09-May-13			Clear		25-may-13			
June-2013									
1.	8-Jun-13	768	61		2.	30-Jun-13	638	50	

Snow cover depletion curve



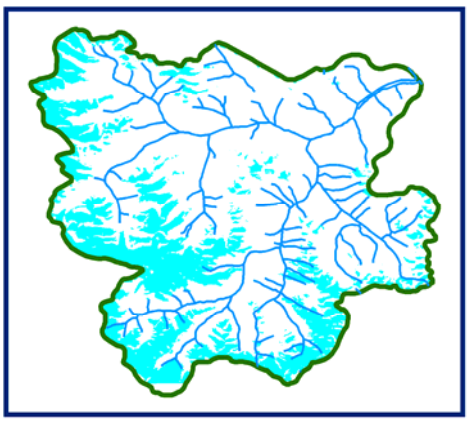


Snow cover depletion curve



SNOW COVER MAP

SNOW COVER MAP : PIN BASIN



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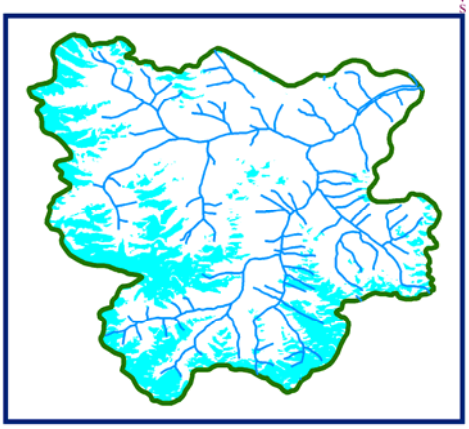

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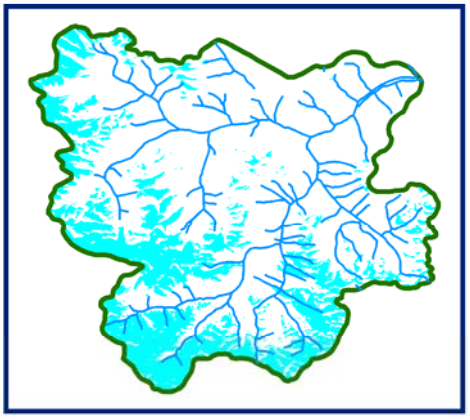

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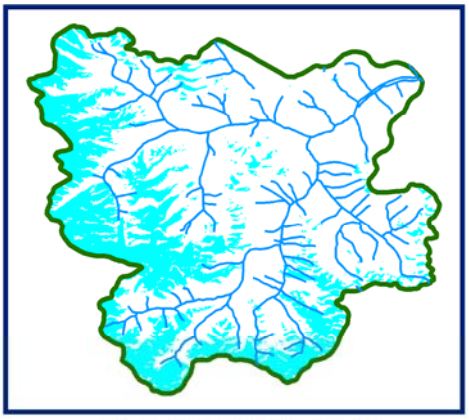

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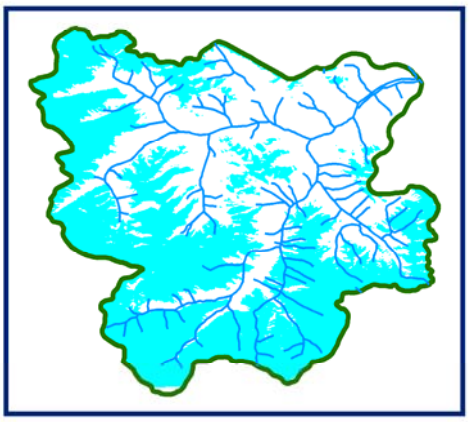

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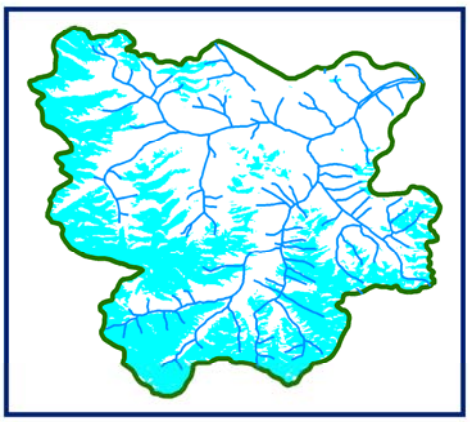


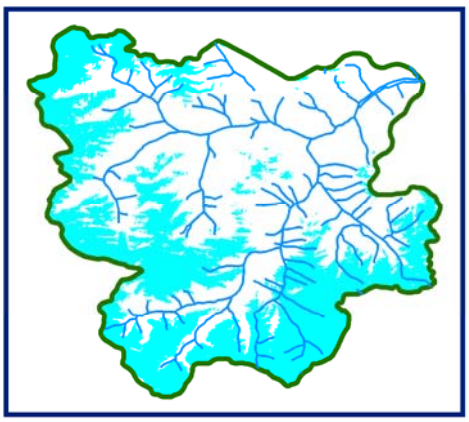
31 OCTOBER 2012

SNOW

0 2 4 8 12 16

Kilometers

10 DAILY SNOW COVER MAP: PIN BASIN



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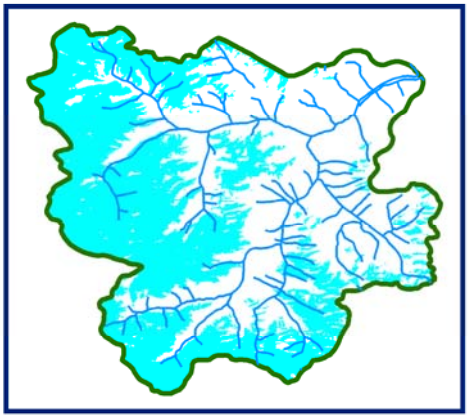

DATA USED
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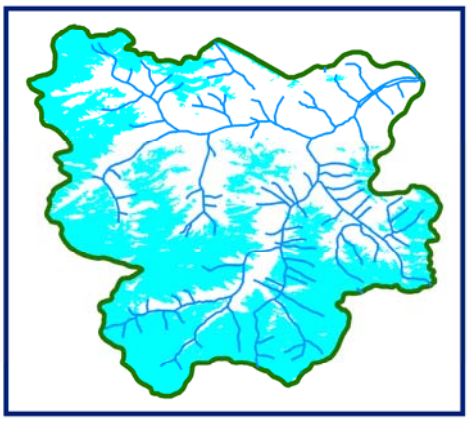
19 OCTOBER 2012

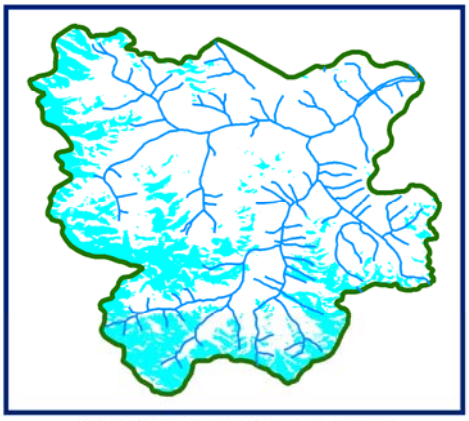


DATA USED
26 OCTOBER 2012
29 OCTOBER 2012
31 OCTOBER 2012

SNOW

0 2 4 8 12 16
Kilometers

SNOW COVER MAP : PIN BASIN



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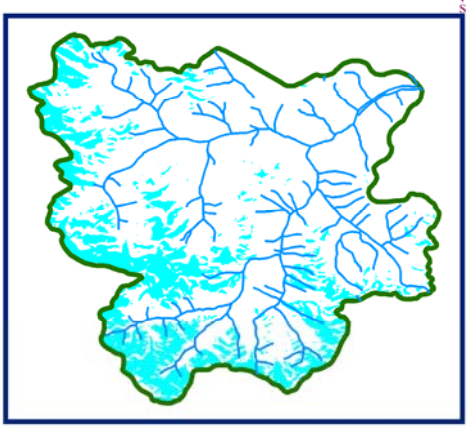

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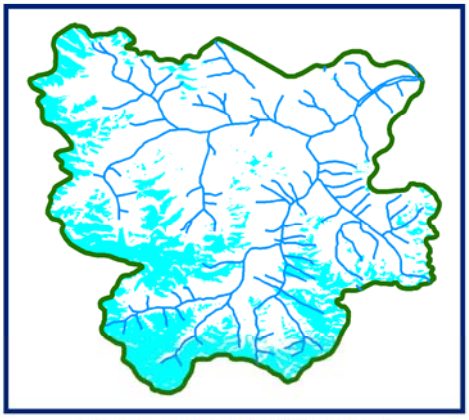
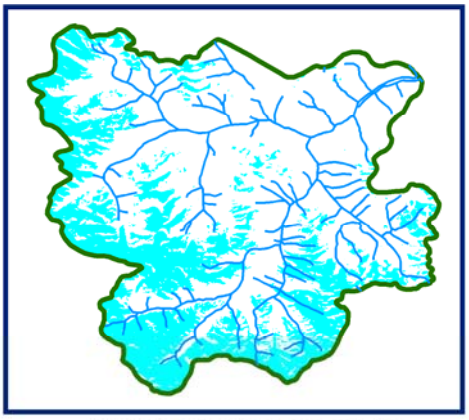
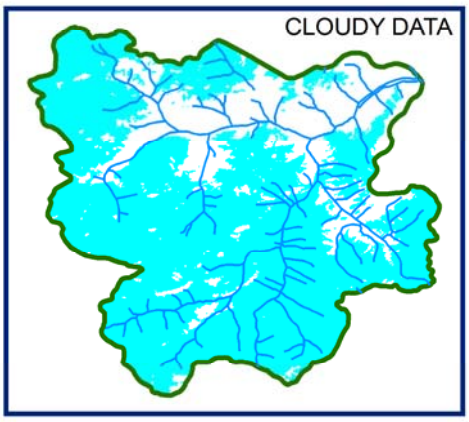


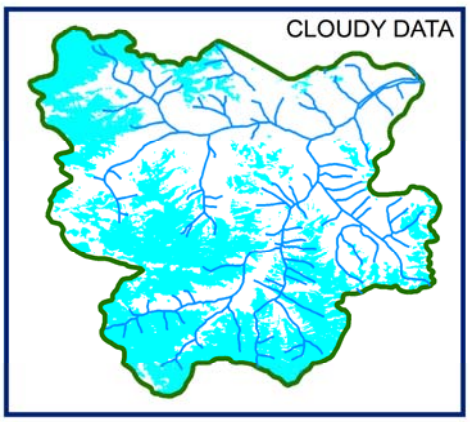
12 NOVEMBER 2012



19 NOVEMBER 2012



24 NOVEMBER 2012

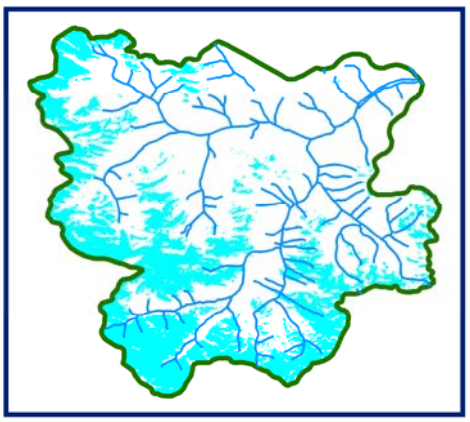


26 NOVEMBER 2012

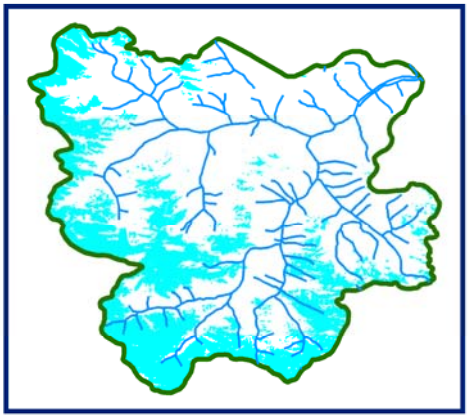
SNOW

0 2 4 8 12 16
Kilometers

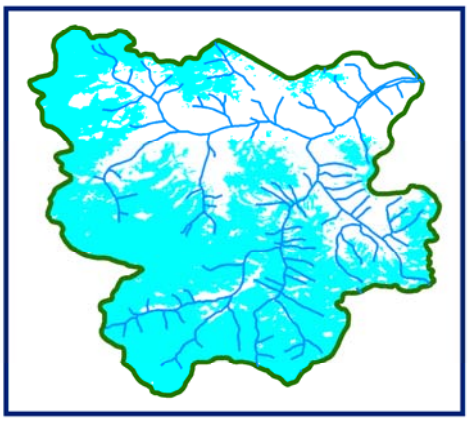
10 DAILY SNOW COVER MAP: PIN BASIN



DATA USED
04 NOVEMBER 2012
07 NOVEMBER 2012
09 NOVEMBER 2012



DATA USED
12 NOVEMBER 2012
16 NOVEMBER 2012
19 NOVEMBER 2012

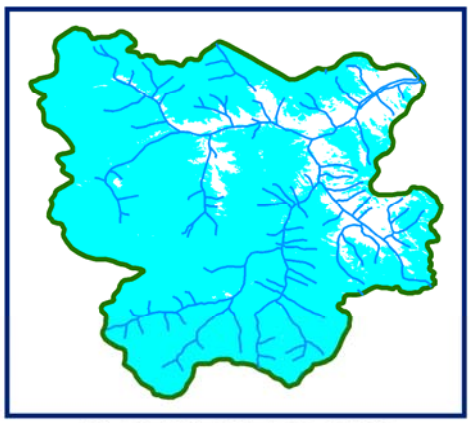


DATA USED
24 NOVEMBER 2012
26 NOVEMBER 2012

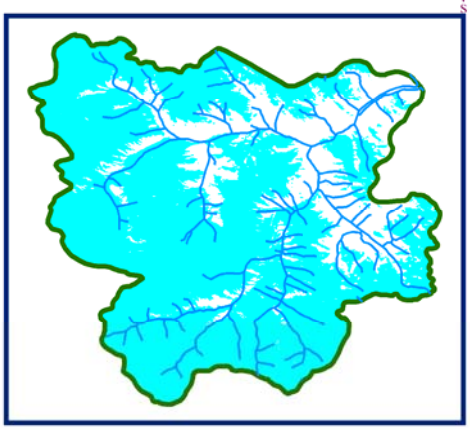
SNOW

0 2 4 8 12 16
Kilometers

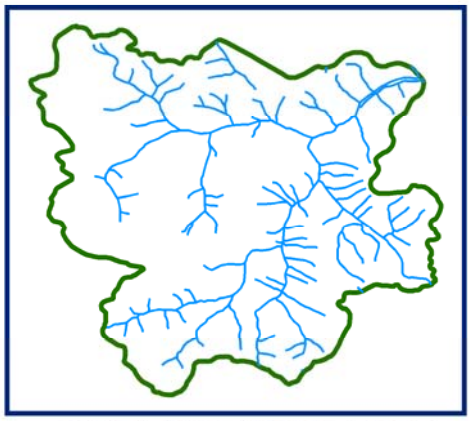
SNOW COVER MAP : PIN BASIN



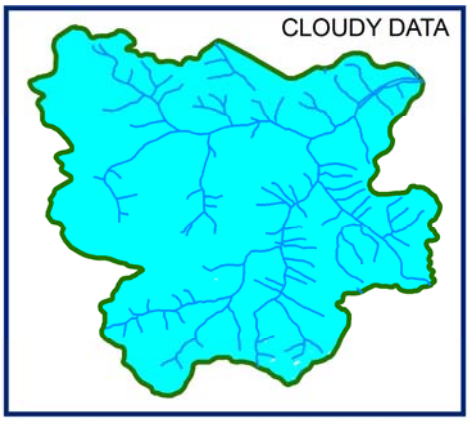
01 DECEMBER 2012



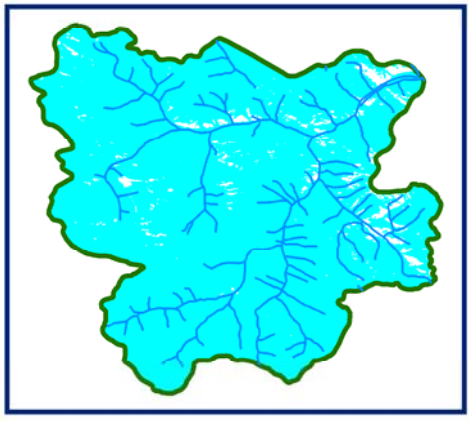
04 DECEMBER 2012



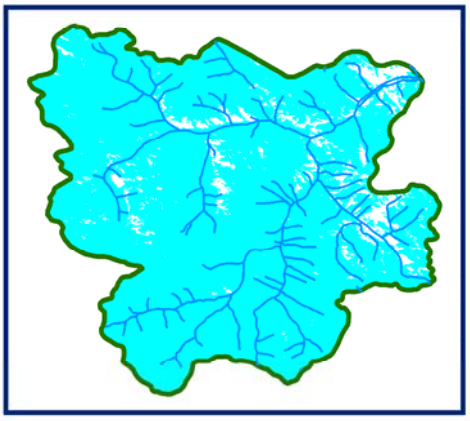
DATA NOT AVAILABLE



16 DECEMBER 2012



22 DECEMBER 2012

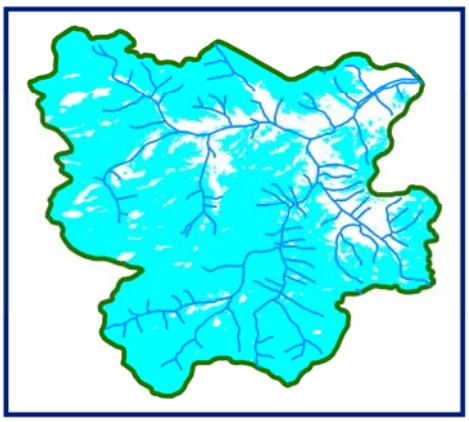


25 DECEMBER 2012

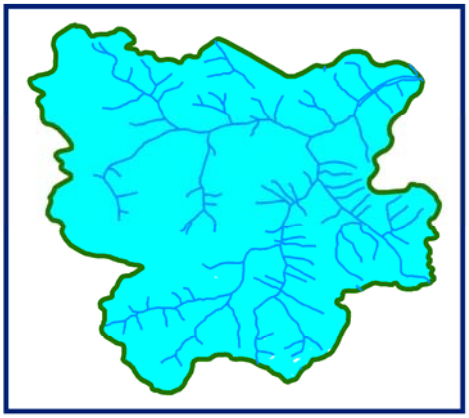
SNOW

0 2 4 8 12 16
Kilometers

10 DAILY SNOW COVER MAP: PIN BASIN



DATA USED
01 DECEMBER 2012
04 DECEMBER 2012



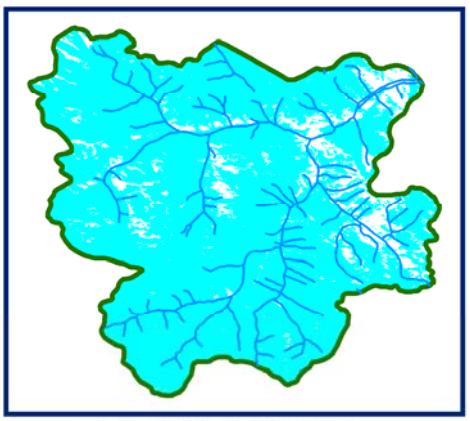
DATA USED
16 DECEMBER 2012

DATA USED
22 DECEMBER 2012
23 DECEMBER 2012
25 DECEMBER 2012

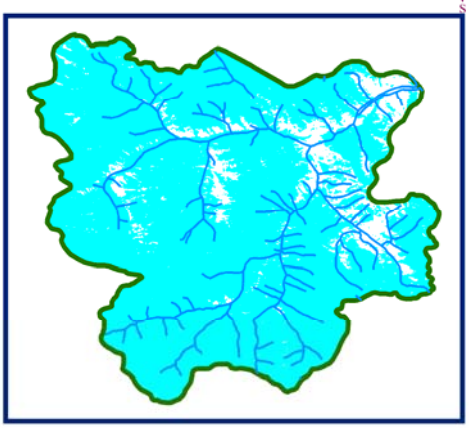
SNOW

0 2 4 8 12 16
Kilometers

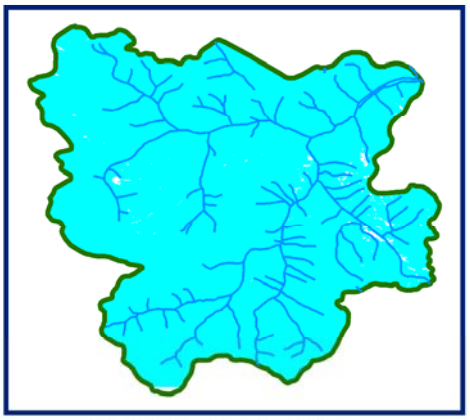
SNOW COVER MAP : PIN BASIN



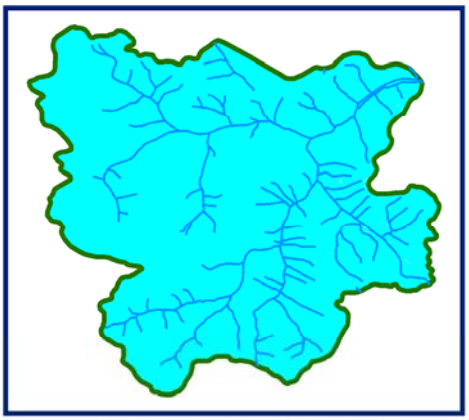
03 JANUARY 2013



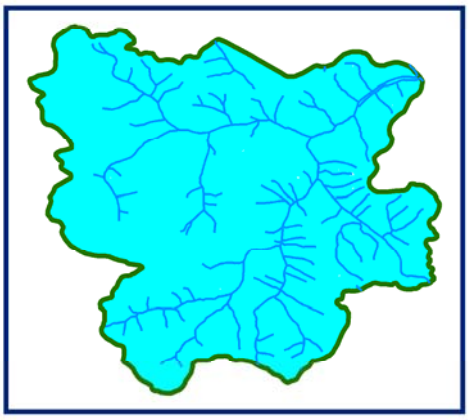
08 JANUARY 2013



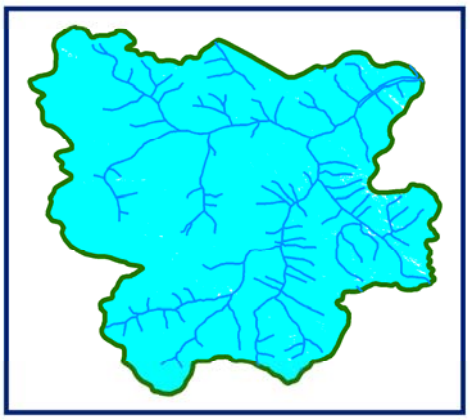
13 JANUARY 2013



20 JANUARY 2013



21 JANUARY 2013



27 JANUARY 2013

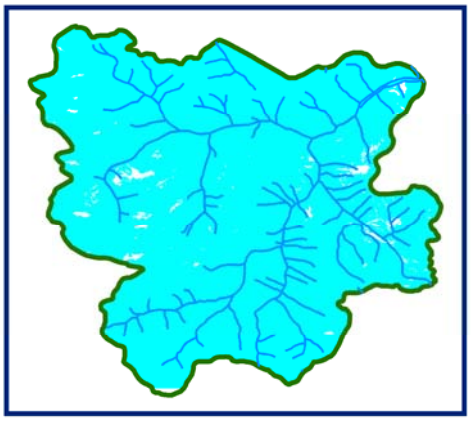
SNOW

0 2 4 8 12 16

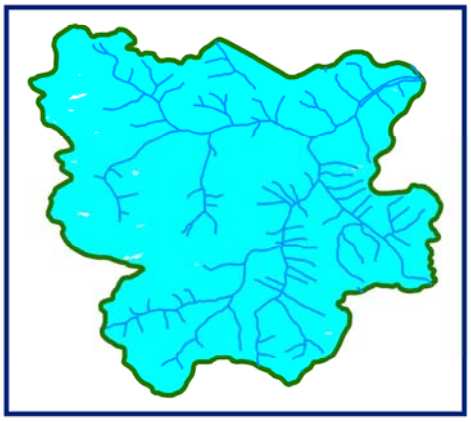
Kilometers

10 DAILY SNOW COVER MAP: PIN BASIN

DATA USED
03 JANUARY 2013
06 JANUARY 2013
08 JANUARY 2013



DATA USED
11 JANUARY 2013
13 JANUARY 2013
20 JANUARY 2013

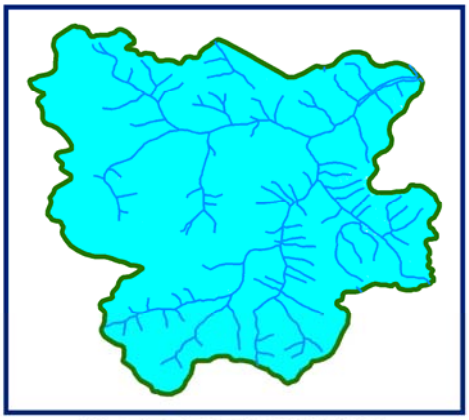


DATA USED
21 JANUARY 2013
25 JANUARY 2013
27 JANUARY 2013

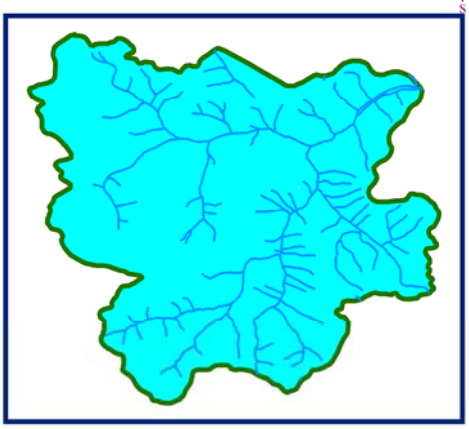
SNOW

0 2 4 8 12 16
Kilometers

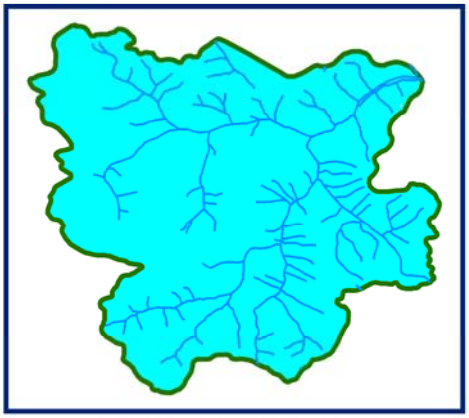
SNOW COVER MAP : PIN BASIN



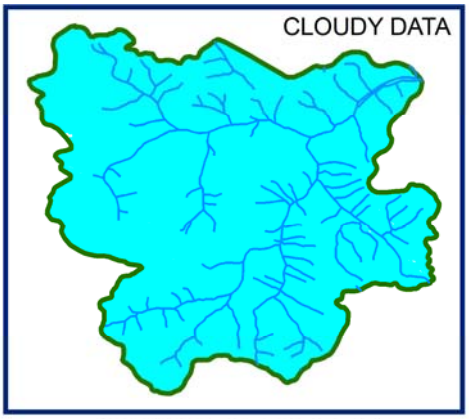
01 FEBRUARY 2013



09 FEBRUARY 2013



18 FEBRUARY 2013



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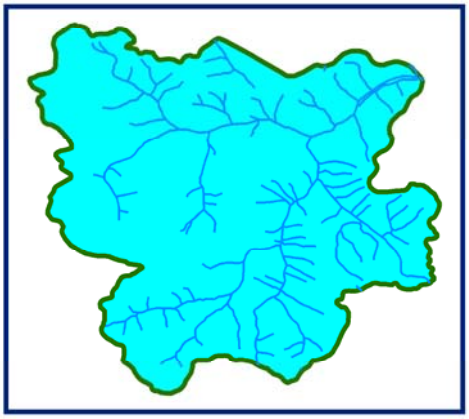
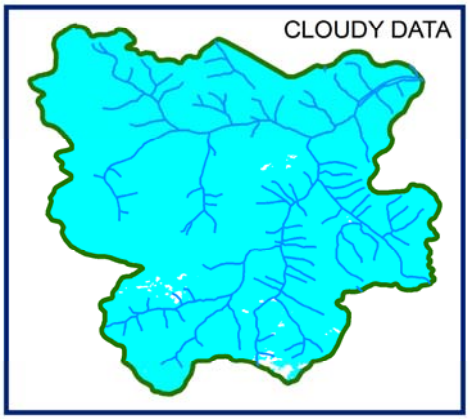


25 FEBRUARY 2013

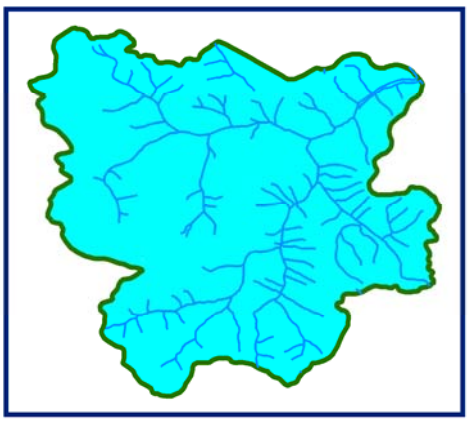


28 FEBRUARY 2013

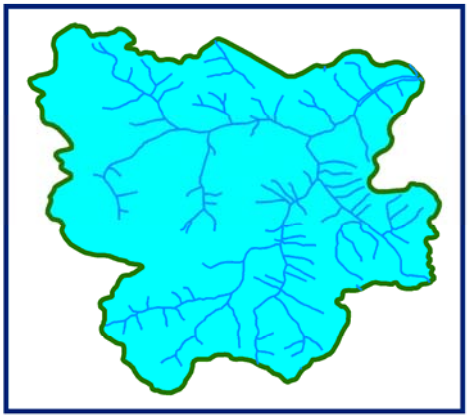
SNOW

0 2 4 8 12 16
Kilometers

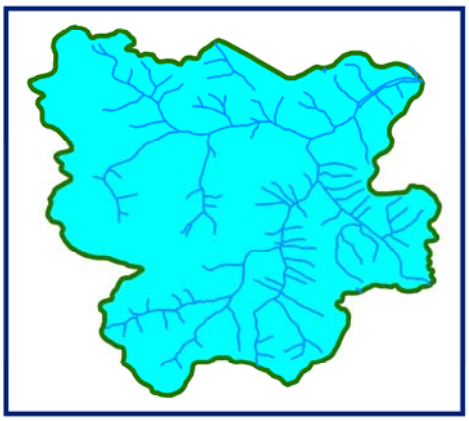
10 DAILY SNOW COVER MAP: PIN BASIN



DATA USED
01 FEBRUARY 2013
08 FEBRUARY 2013
09 FEBRUARY 2013



DATA USED
18 FEBRUARY 2013
20 FEBRUARY 2013

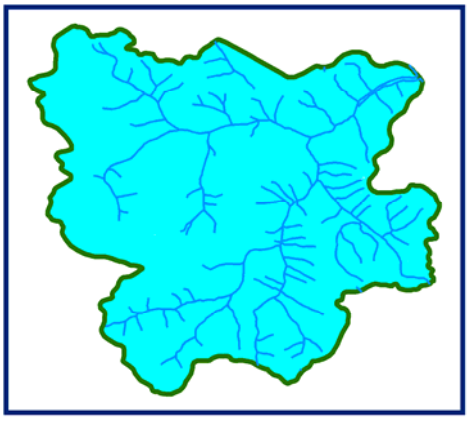


DATA USED
25 FEBRUARY 2013
28 FEBRUARY 2013

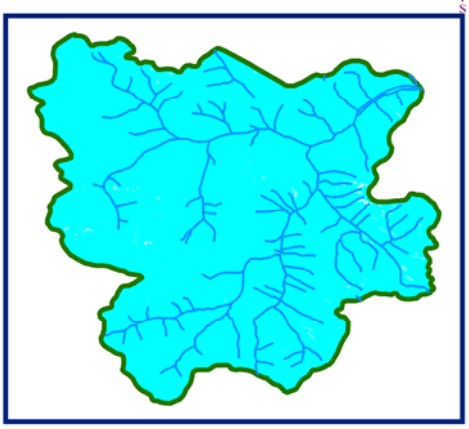
SNOW

0 2 4 8 12 16
Kilometers

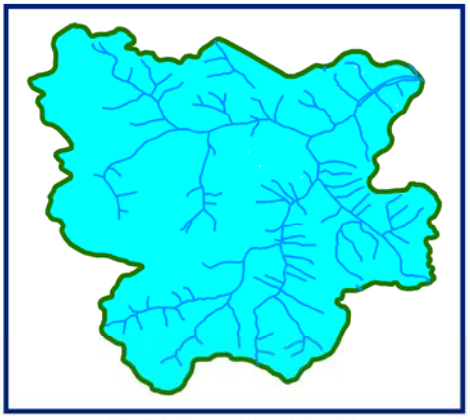
SNOW COVER MAP : PIN BASIN



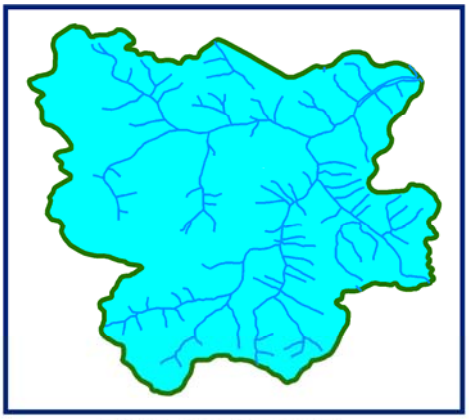
02 MARCH 2013



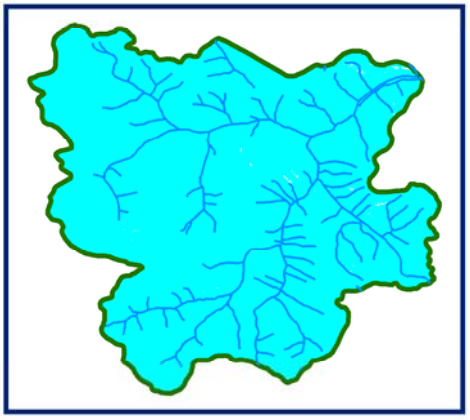
07 MARCH 2013



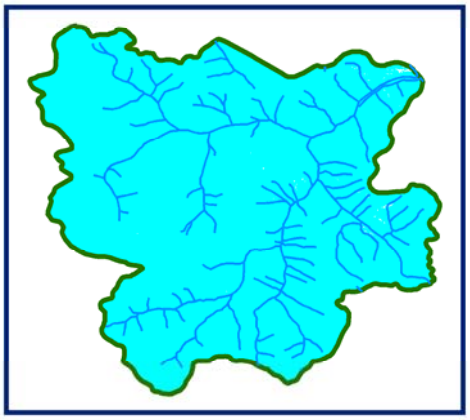
12 MARCH 2013



19 MARCH 2013



22 MARCH 2013



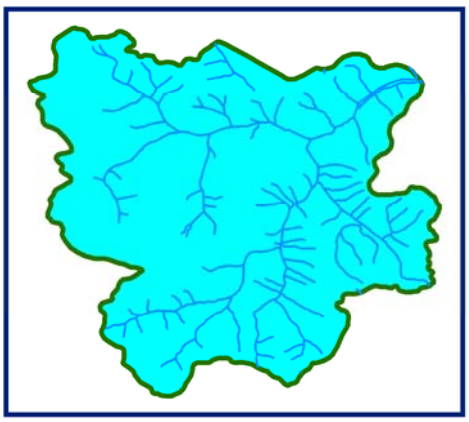
31 MARCH 2013

SNOW

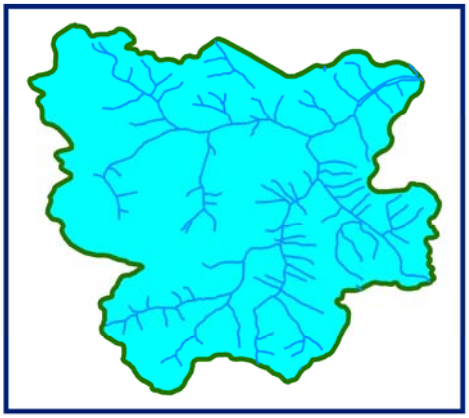
0 2 4 8 12 16

Kilometers

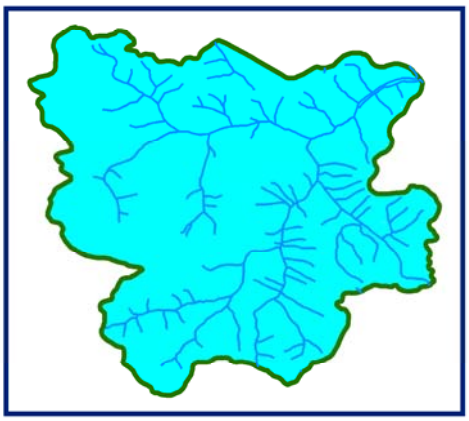
10 DAILY SNOW COVER MAP: PIN BASIN



DATA USED
02 MARCH 2013
05 MARCH 2013
07 MARCH 2013



DATA USED
12 MARCH 2013
17 MARCH 2013
19 MARCH 2013

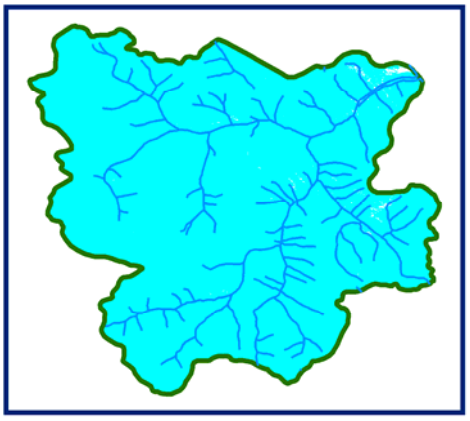


DATA USED
21 MARCH 2013
26 MARCH 2013
31 MARCH 2013

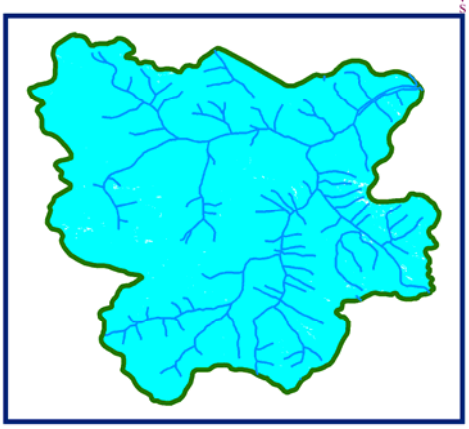
SNOW

0 2 4 8 12 16
Kilometers

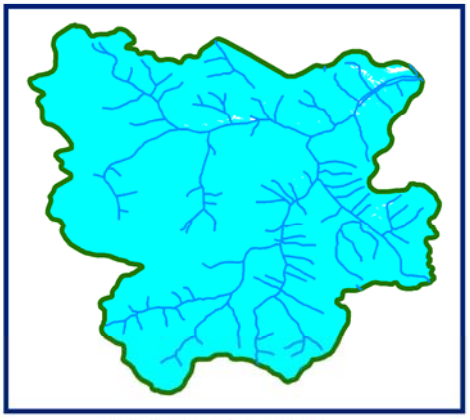
SNOW COVER MAP : PIN BASIN



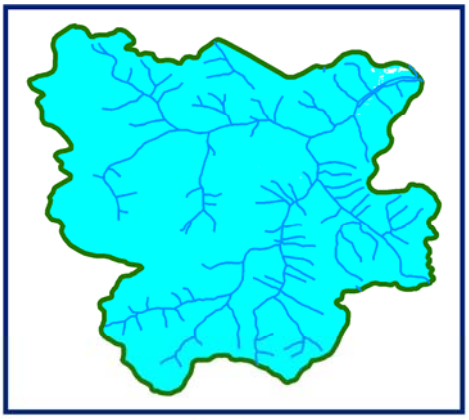
05 APRIL 2013



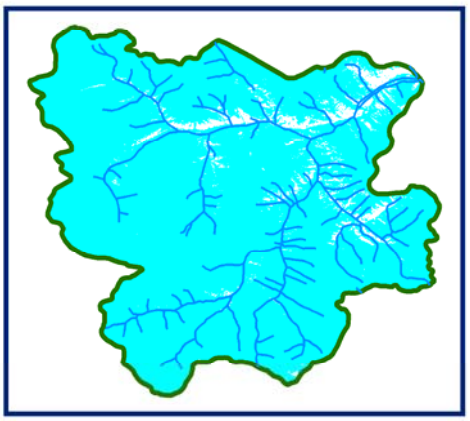
07 APRIL 2013



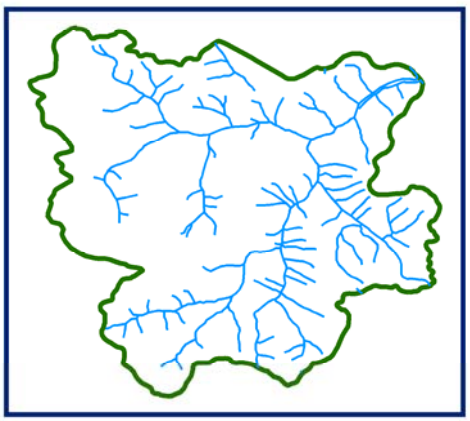
12 APRIL 2013



17 APRIL 2013



24 APRIL 2013

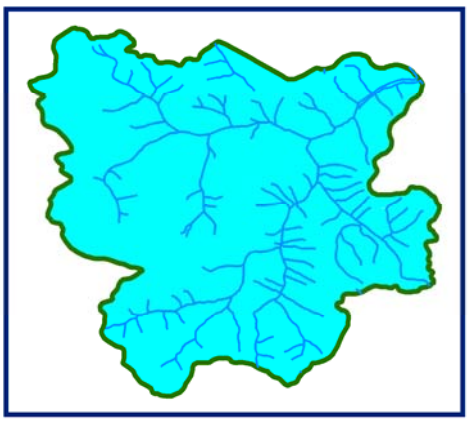


DATA NOT AVAILABLE

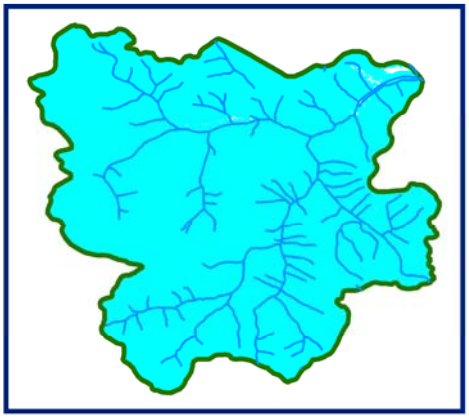
SNOW

0 2 4 8 12 16
Kilometers

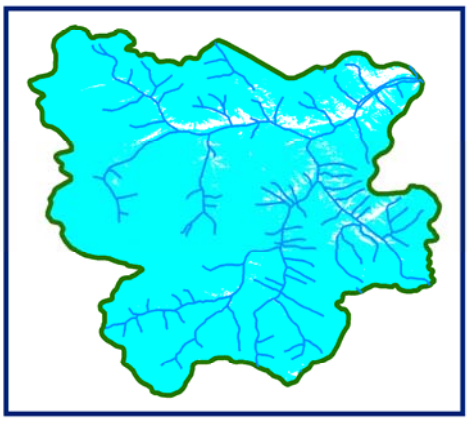
10 DAILY SNOW COVER MAP: PIN BASIN



DATA USED
05 APRIL 2013
07 APRIL 2013



DATA USED
12 APRIL 2013
15 APRIL 2013
19 APRIL 2013

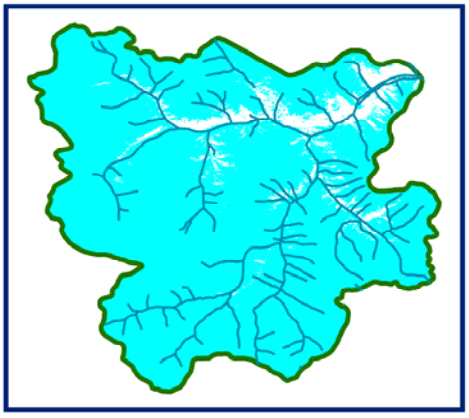


DATA USED
24 APRIL 2013

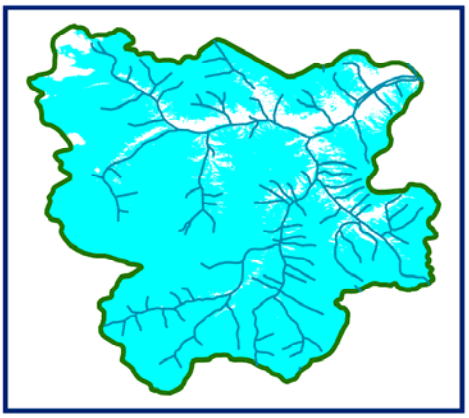
SNOW

0 2 4 8 12 16
Kilometers

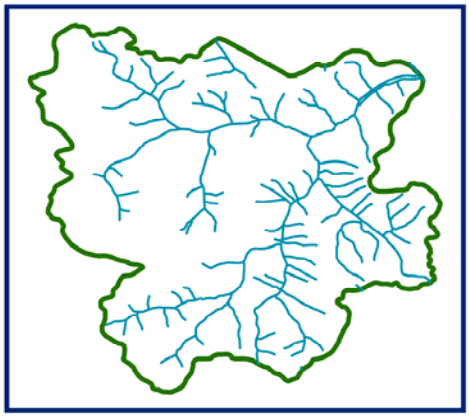
SNOW COVER MAP : PIN BASIN



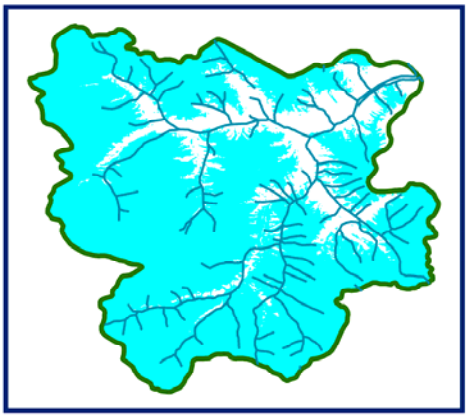
03 MAY 2013



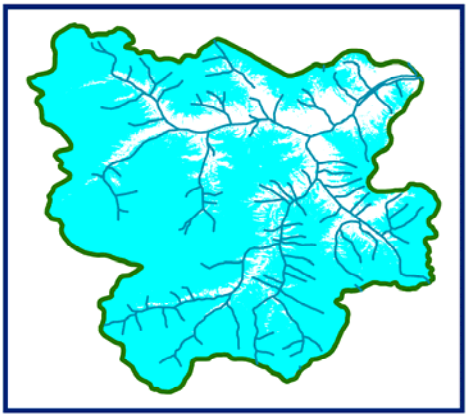
08 MAY 2013



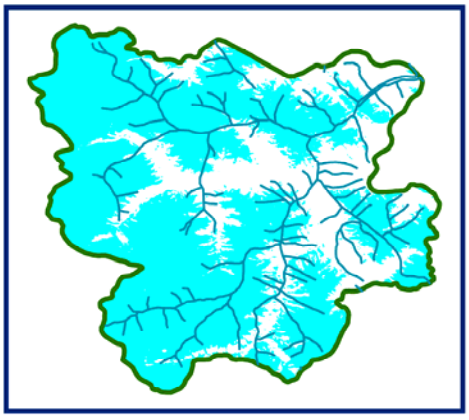
DATA NOT AVAILABLE



20 MAY 2013



23 MAY 2013



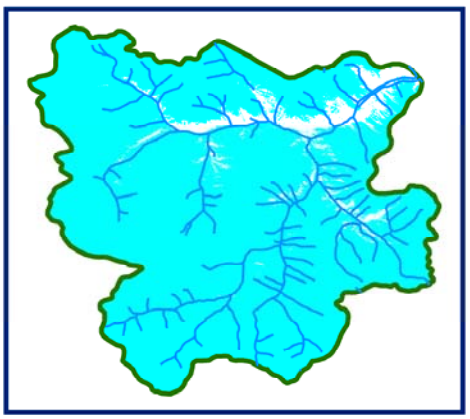
25 MAY 2013

SNOW

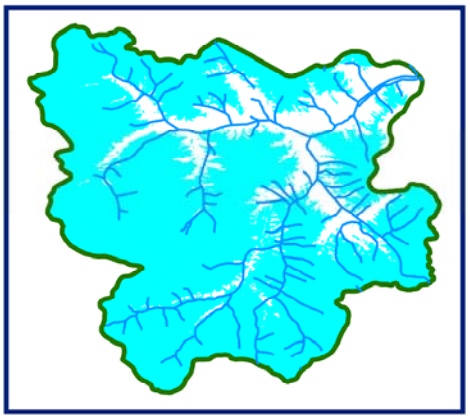
10 5 0 10 20 30 40

Kilometers

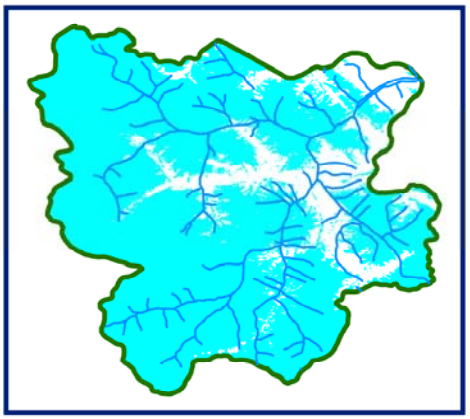
10 DAILY SNOW COVER MAP : PIN BASIN



DATA USED
03 MAY 2013
08 MAY 2013
09 MAY 2013



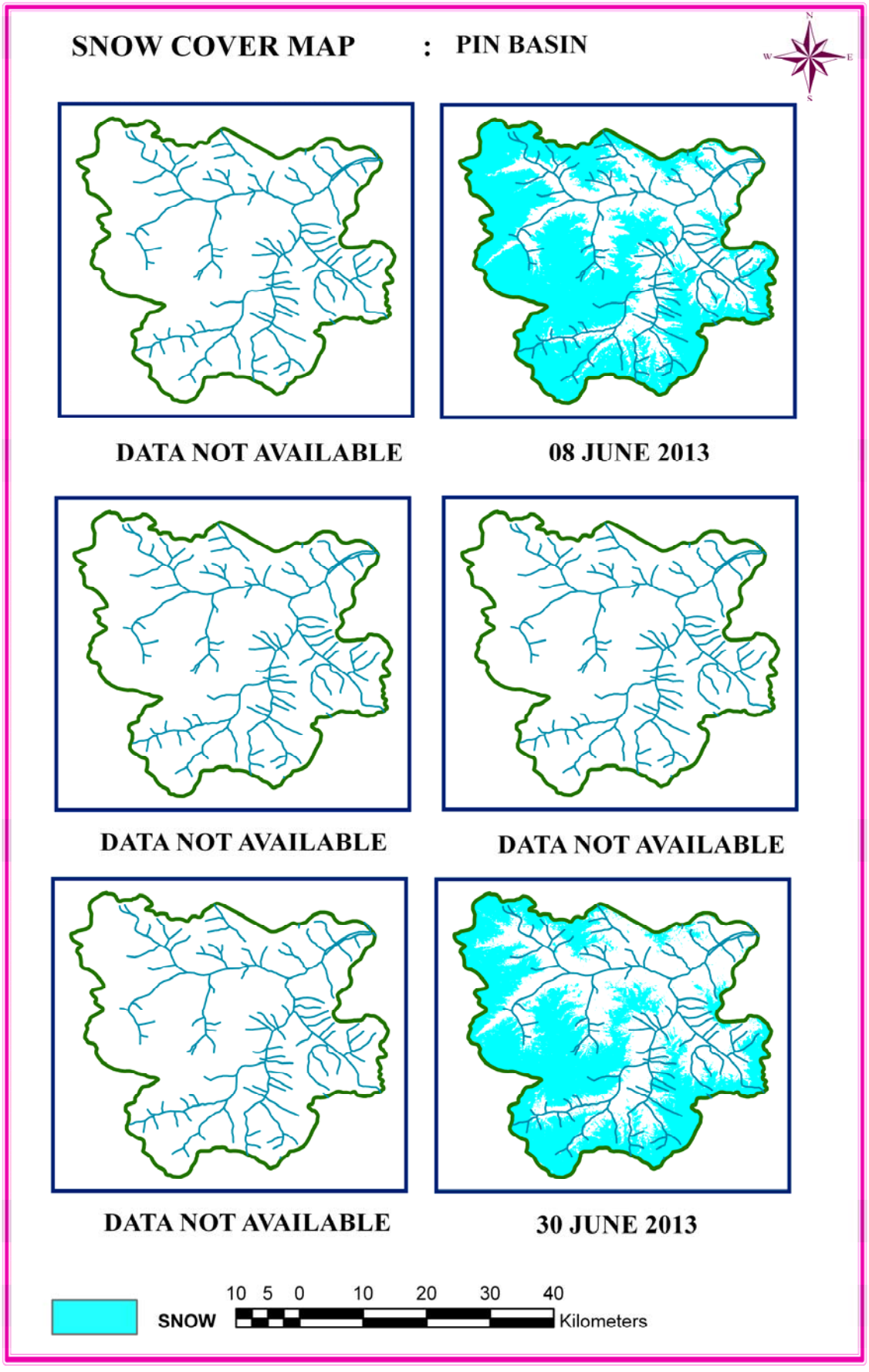
DATA USED
20 MAY 2013



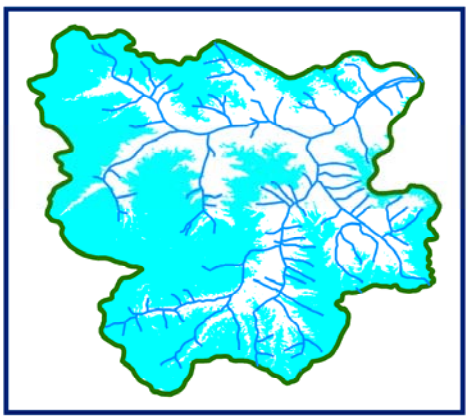
DATA USED
23 MAY 2013
25 MAY 2013

SNOW

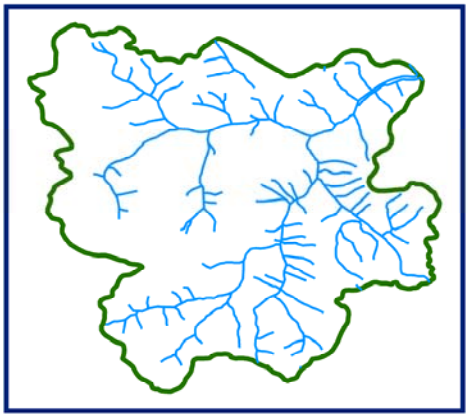
10 5 0 10 20 30 40
Kilometers


SNOW COVER MAP : PIN BASIN
N
W
E
S
DATA NOT AVAILABLE
08 JUNE 2013
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
30 JUNE 2013
SNOW
10 5 0 10 20 30 40
Kilometers

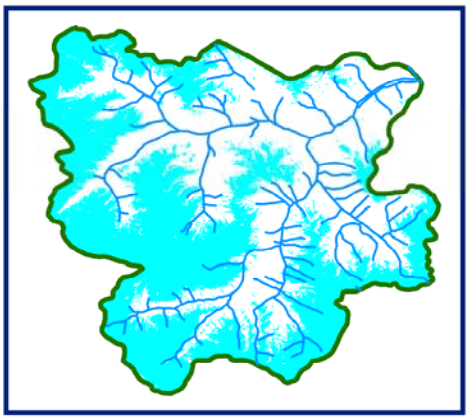
10 DAILY SNOW COVER MAP : PIN BASIN



DATA USED
08 JUNE 2013



DATA USED
DATA NOT AVAILABLE



DATA USED
30 JUNE 2013

SNOW

10 5 0 10 20 30 40 Kilometers

SPITI BASIN

AREAL EXTENT OF SNOW (5 DAILY)

BASIN NAME: SPITI **BASIN AREA: 8871 sq km**

S No	DATE	Snow cover (sq km)	Snow cover (%)	Cloud Cover	S No	DATE	Snow cover (sq km)	Snow cover (%)	Cloud Cover
October 2012									
1	02-10-2012	663	7	Clear	**12**	19-10-2012	1005	11	Clear
2	02-10-2012	649	7	Clear	**13**	19-10-2012	997	11	Clear
3	04-10-2012	1621	18	Clear	**14**	23-10-2012	2491	28	75%
4	07-10-2012	690	8	Clear	**15**	24-10-2012	2989	34	75%
5	11-10-2012	2037	23	70%	**16**	26-10-2012	2310	26	5%
6	12-10-2012	714	8	Clear	**17**	28-10-2012	1705	19	Clear
7	14-10-2012	1279	14	5%	**18**	29-10-2012	1572	18	50%
8	14-10-2012	1279	14	5%	**19**	31-10-2012	1473	17	Clear
9	17-10-2012	1362	15	Clear					
November 2012									
1	04-11-2012	680	8	Clear	**9**	16-11-2012	611	7	Clear
2	05-11-2012	997	11	Clear	**10**	17-11-2012	554	6	Clear
3	07-11-2012	865	10	Clear	**11**	17-11-2012	551	6	Clear
4	07-11-2012	860	10	Clear	**12**	19-11-2012	1046	12	Clear
5	09-11-2012	418	8	5%	**13**	19-11-2012	1174	13	Clear
6	10-11-2012	644	7	65%	**14**	24-11-2012	3718	42	70%
7	12-11-2012	709	8	Clear	**15**	26-11-2012	2084	23	Clear
8	14-11-2012	853	10	3%					
December 2012									
1	01-12-2012	4706	53	Clear	**6**	22-12-2012	5181	58	Clear
2	01-12-2012	4697	53	Clear	**7**	23-12-2012	5009	56	Clear
3	04-12-2012	3730	42	Clear	**8**	25-12-2012	4412	50	Clear
4	16-12-2012	7545	85	50%	**9**	25-12-2012	4425	50	Clear
January 2013									
1	03-01-2013	4541	51	Clear	**7**	13-01-2013	5819	66	Clear
2	06-01-2013	4964	56	Clear	**8**	20-01-2013	8847	100	Clear
3	08-01-2013	4322	49	Clear	**9**	21-01-2013	8758	99	Clear
4	09-01-2013	3761	42	80%	**10**	25-01-2013	8790	99	Clear
5	11-01-2013	4629	52	Clear	**11**	27-01-2013	8654	98	Clear
6	13-01-2013	5819	66	Clear					
February 2013									
1	01-02-2013	8847	100	Clear	**5**	18-02-2013	8858	100	Clear
2	08-02-2013	8865	100	Clear	**6**	20-02-2013	8855	100	Clear

3	09-02-2013	8860	100	Clear	**7**	25-02-2013	8868	100	Clear
4	11-02-2013	8871	100	70%	**8**	28-02-2013	8851	100	Clear
March 2013									
1	02-03-2013	8822	99	Clear	**7**	17-03-2013	8695	98	5%
2	04-03-2013	8765	99	45%	**8**	19-03-2013	8555	96	Clear
3	05-03-2013	8687	98	Clear	**9**	21-03-2013	8269	93	20%
4	07-03-2013	8367	94	Clear	**10**	22-03-2013	8093	91	Clear
5	12-03-2013	8318	94	Clear	**11**	26-03-2013	8418	95	Clear
6	16-03-2013	8654	98	15%	**12**	31-03-2013	8088	91	Clear
April 2013									
1	05-04-2013	7773	88	Clear	**6**	17-04-2013	7547	85	5%
2	07-04-2013	8352	94	Clear	**7**	19-04-2013	6603	74	10%
3	12-04-2013	7634	86	Clear	**8**	19-04-2013	6634	75	10%
4	14-04-2013	6308	71	48%	**9**	24-04-2013	5616	63	30%
5	15-04-2013	6893	78	Clear					
May 2013									
1	03-05-2013	5803	65	Clear	**5**	20-05-2013	4616	52	
2	04-05-2013	4930	56	35%	**6**	23-05-2013	4526	51	
3	06-05-2013	5021	57	65%	**7**	25-05-2013	3718	42	
4	08-05-2013	5032	57	25%					
June-2013									
1	08-06-2013	2511	28		**2**	30-06-2013	2076	23	

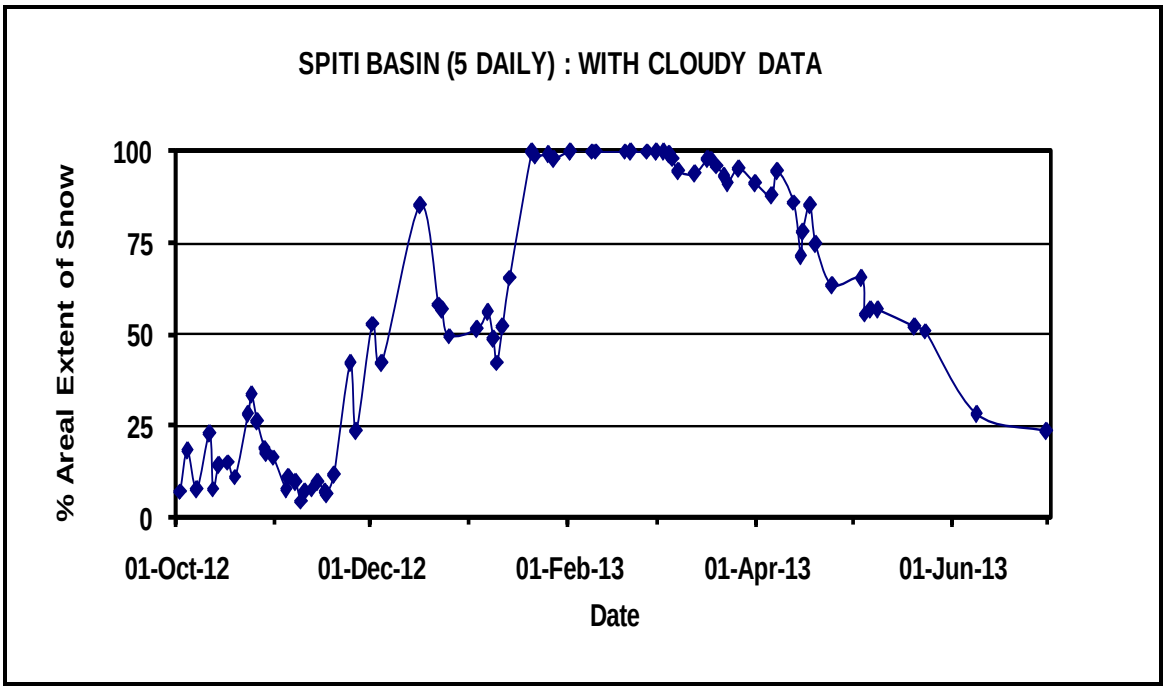
AREAL EXTENT OF SNOW (10 DAILY)

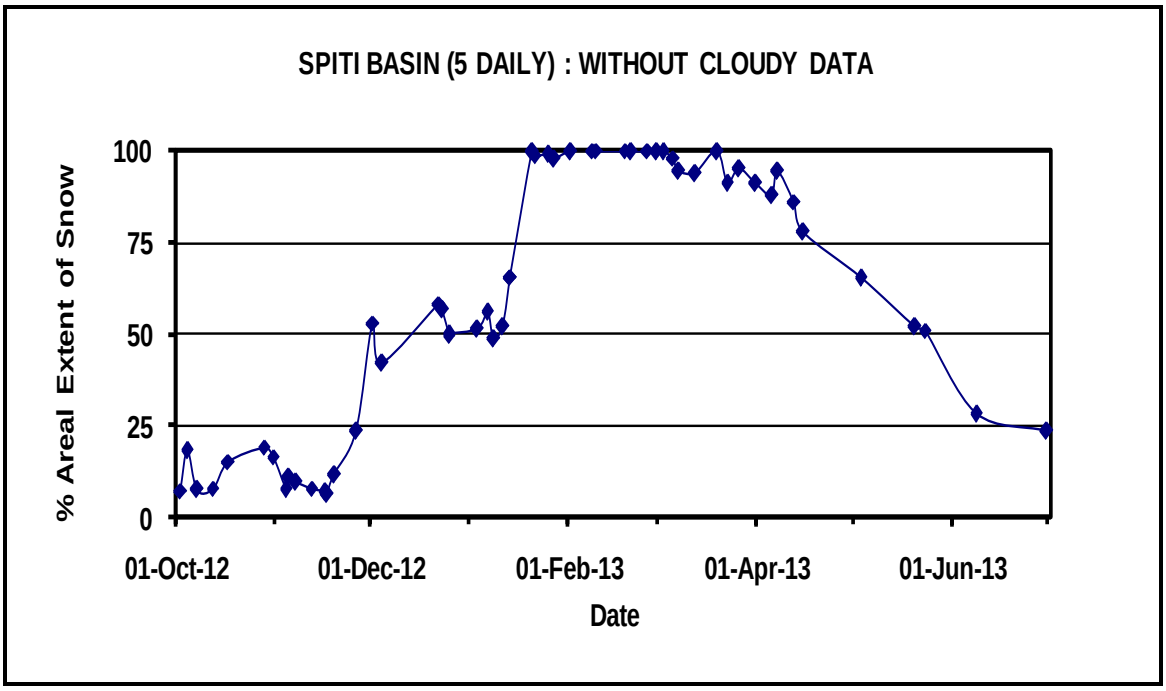
BASIN NAME: SPITI **BASIN AREA: 8871 sq km**

S No	Date	Snow cover (sq km)	Snow cover (%)	Snow cover	S No	Date	Snow cover (sq km)	Snow cover (%)	Snow cover
October 2012									
1.	02-Oct-12	1597	18	Clear	7.	26-Oct-12	1685	19	5%
2.	04-Oct-12			Clear	8.	28-Oct-12			Clear
3.	07-Oct-12			Clear	9.	31-Oct-12			Clear
4.	12-Oct-12	1331	15	Clear					
5.	14-Oct-12			Clear					
6.	19-Oct-12			Clear					
November 2012									
1.	04-Nov-12	1002	11	Clear	7.	24-Nov-12	2040	23	70%
2.	05-Nov-12			Clear	8.	26-Nov-12			Clear
3.	07-Nov-12			Clear					
4.	12-Nov-12	1065	12	Clear					
5.	17-Nov-12			Clear					
6.	19-Nov-12			Clear					
December 2012									
1.	01-Dec-12	4732	53	Clear	4.	22-Dec-12	5145	58	Clear
2.	04-Dec-12			Clear	5.	23-Dec-12			Clear
3.	16-Dec-12	7545	85	50%	6.	25-Dec-12			Clear
January 2013									
1.	03-Jan-13	4968	56	Clear	7.	21-Jan-13	8782	99	Clear
2.	06-Jan-13			Clear	8.	25-Jan-13			Clear
3.	08-Jan-13			Clear	9.	27-Jan-13			Clear
4.	11-Jan-13	8871	100	Clear					
5.	13-Jan-13			Clear					
6.	20-Jan-13			Clear					
February 2013									
1.	01-Feb-13	8871	100	Clear	7.	25-Feb-13	8871	100	Clear
2.	08-Feb-13			Clear	8.	28-Feb-13			Clear
3.	09-Feb-13			Clear					
4.	11-Feb-13	8873	100	Clear					
5.	18-Feb-13			Clear					
6.	20-Feb-13			Clear					

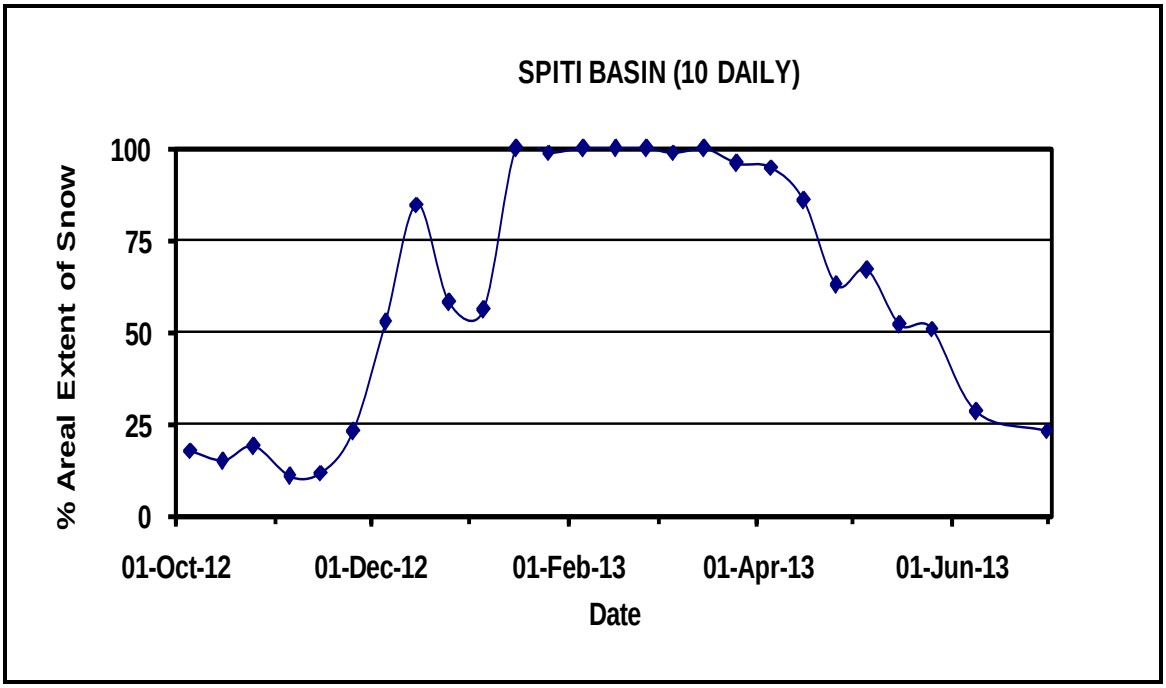
March 2013									
1.	02-Mar-13	8782	99	Clear	7.	22-Mar-13	8516	96	Clear
2.	05-Mar-13			Clear	8.	26-Mar-13			Clear
3.	07-Mar-13			Clear	9.	31-Mar-13			Clear
4.	12-Mar-13	8871	100	Clear					
5.	17-Mar-13			5%					
6.	19-Mar-13			Clear					
April 2013									
1.	05-Apr-13	8427	95	Clear	6.	24-Apr-13	5616	63	30%
2.	07-Apr-13			Clear					
3.	12-Apr-13	7629	86	Clear					
4.	15-Apr-13			Clear					
5.	17-Apr-13			5%					
May 2013									
1.	03-May-13	5974	67	Clear	5.	23-May-13	4524	51	
2.	08-May-13			25%		25-May-13			
3.	09-May-13								
4.	15-May-2013	4652	52						
June-2013									
1.	8-June-13	2511	28		2.	30-June-13	2040	23	2076

Snow cover depletion curve





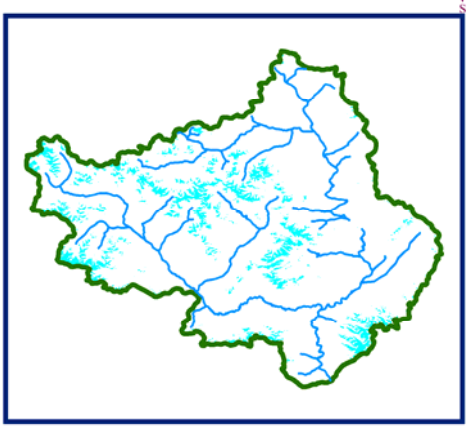
Snow cover depletion curve



SNOW COVER MAP

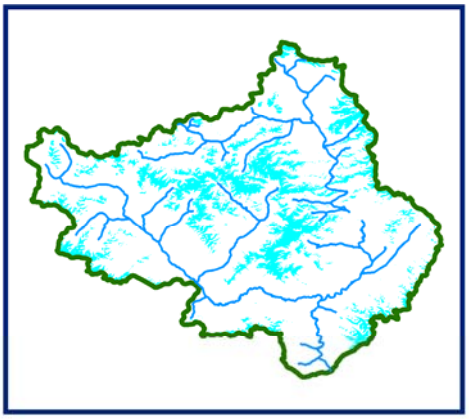
SNOW COVER MAP : SPITI BASIN

02 OCTOBER 2012

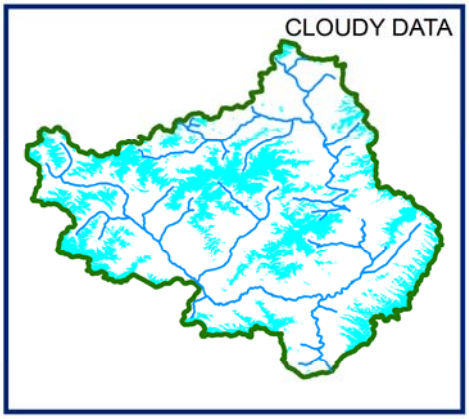


07 OCTOBER 2012

12 OCTOBER 2012



17 OCTOBER 2012



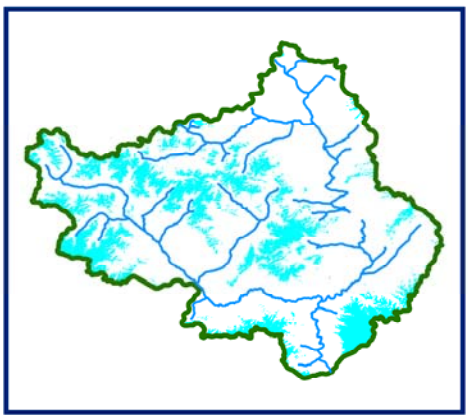
26 OCTOBER 2012

31 OCTOBER 2012

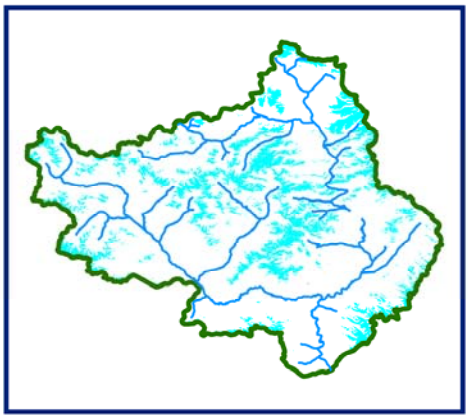
SNOW

0 0.5 1 2 3 4 6
Kilometers

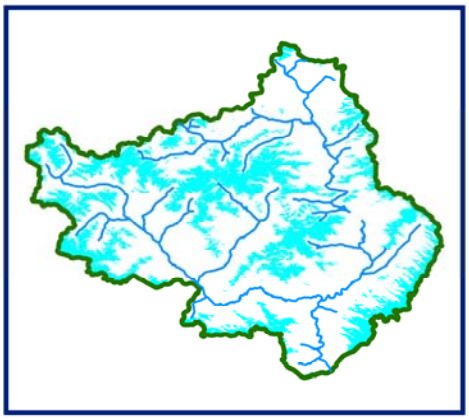
10 DAILY SNOW COVER MAP : SPITI BASIN



DATA USED
02 OCTOBER 2012
04 OCTOBER 2012
07 OCTOBER 2012



DATA USED
12 OCTOBER 2012
14 OCTOBER 2012
19 OCTOBER 2012

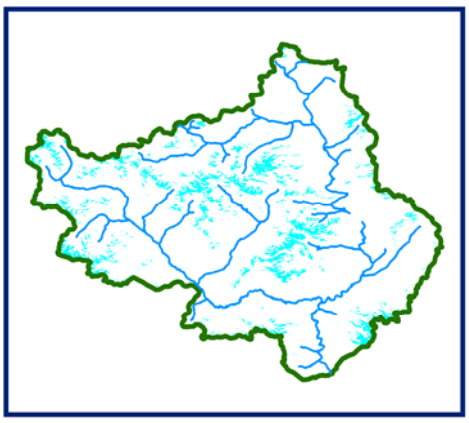


DATA USED
26 OCTOBER 2012
28 OCTOBER 2012
31 OCTOBER 2012

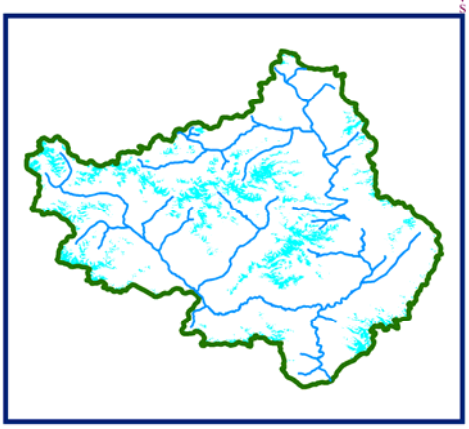
SNOW

2512.50 25 50 75 100
Kilometers

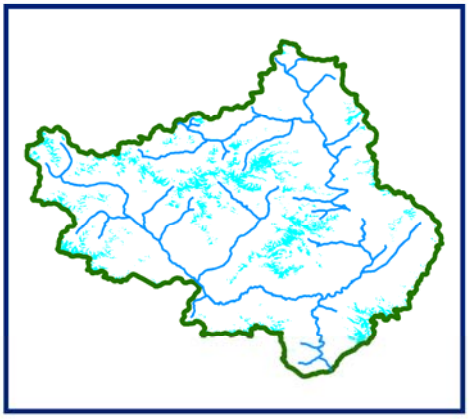
SNOW COVER MAP : SPITI BASIN



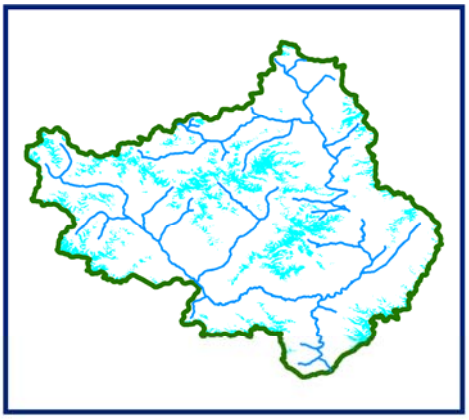
04 NOVEMBER 2012



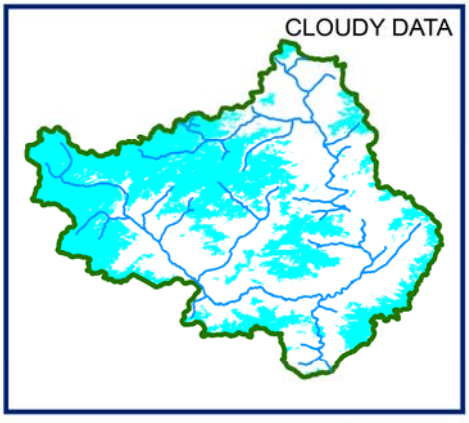
07 NOVEMBER 2012



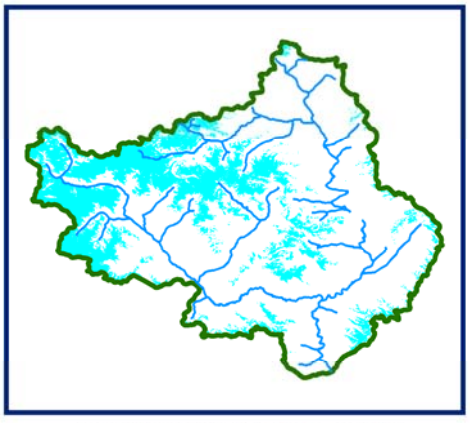
12 NOVEMBER 2012



19 NOVEMBER 2012



24 NOVEMBER 2012



26 NOVEMBER 2012

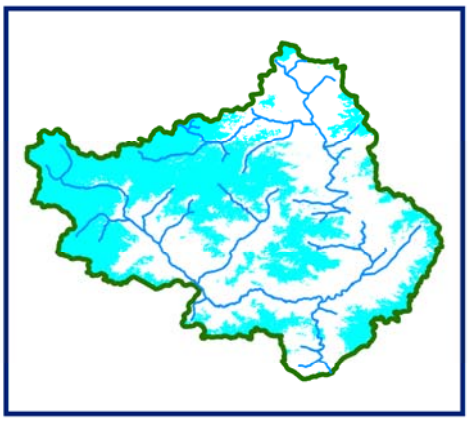
SNOW

0 0.5 1 2 3 4
Kilometers

10 DAILY SNOW COVER MAP: SPITI BASIN

DATA USED
04 NOVEMBER 2012
05 NOVEMBER 2012
07 NOVEMBER 2012

DATA USED
12 NOVEMBER 2012
17 NOVEMBER 2012
19 NOVEMBER 2012

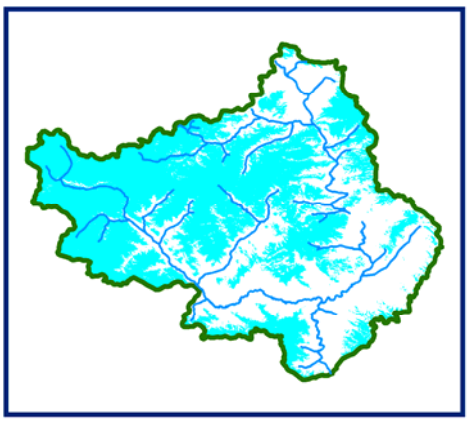


DATA USED
24 NOVEMBER 2012
26 NOVEMBER 2012

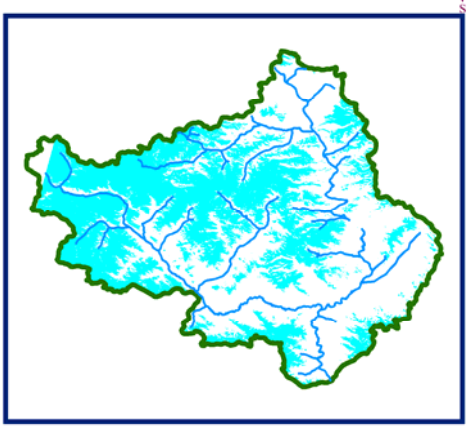
SNOW

0 4.5 9 18 27 36
Kilometers

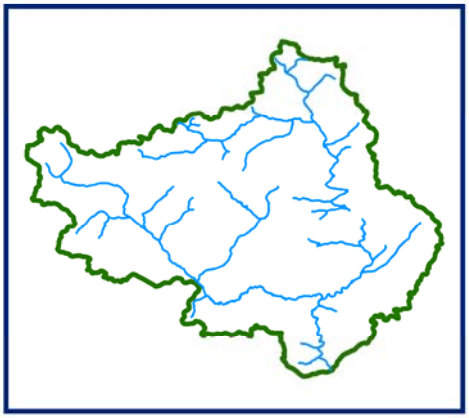
SNOW COVER MAP : SPITI BASIN



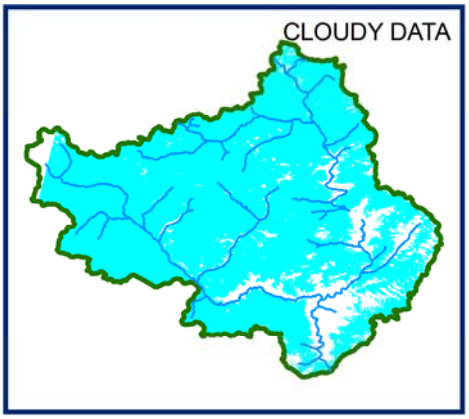
01 DECEMBER 2012



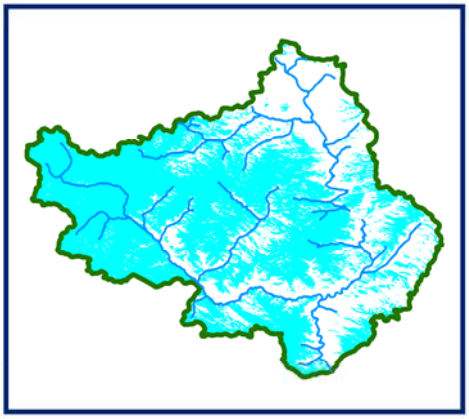
04 DECEMBER 2012



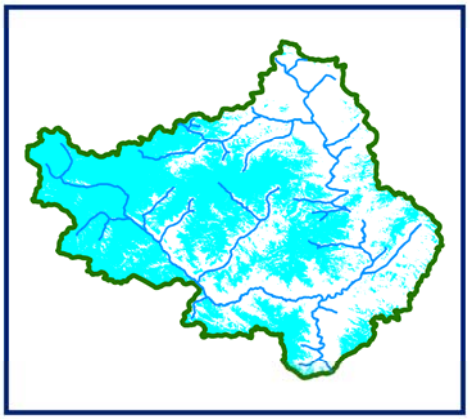
DATA NOT AVAILABLE



16 DECEMBER 2012



22 DECEMBER 2012

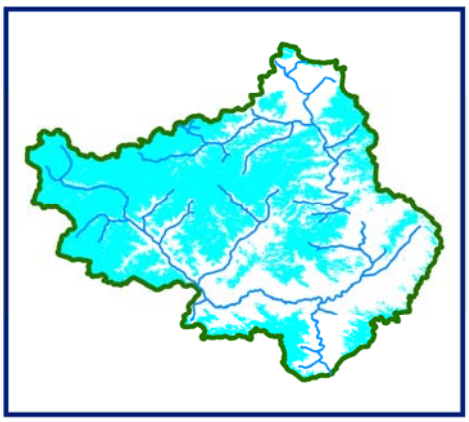


25 DECEMBER 2012

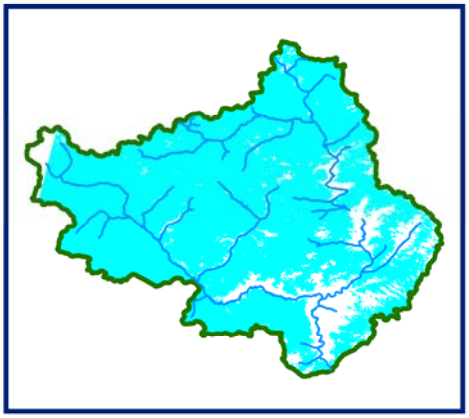
SNOW

0 0.5 1 2 3 4 5 6 7 8 9 10
Kilometers

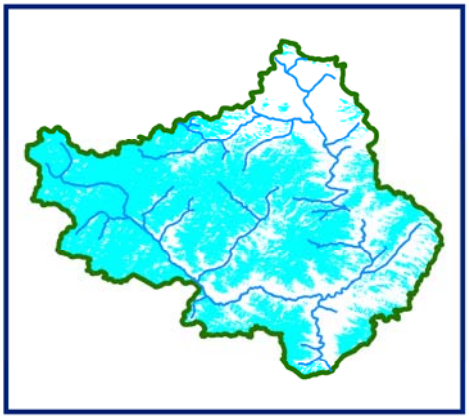
10 DAILY SNOW COVER MAP: SPITI BASIN



DATA USED
01 DECEMBER 2012
04 DECEMBER 2012



DATA USED
16 DECEMBER 2012

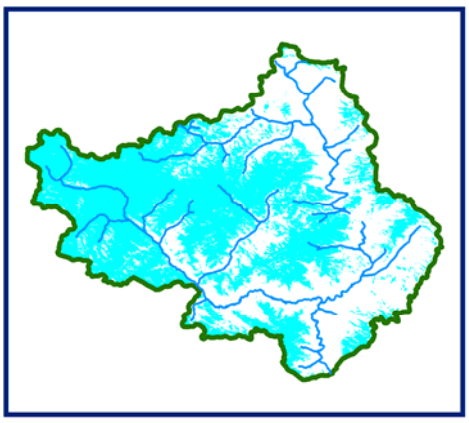


DATA USED
22 DECEMBER 2012
23 DECEMBER 2012
25 DECEMBER 2012

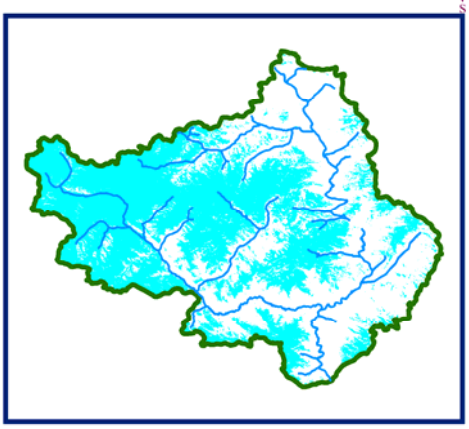
SNOW

0 4.5 9 18 27 36
Kilometers

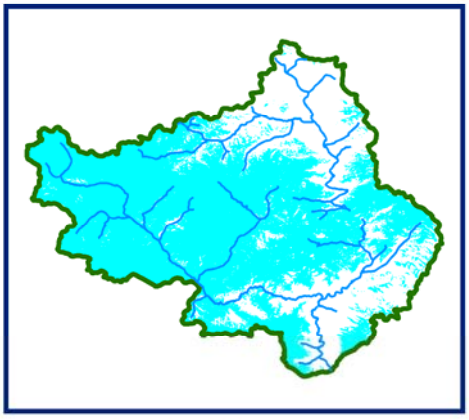
SNOW COVER MAP : SPITI BASIN



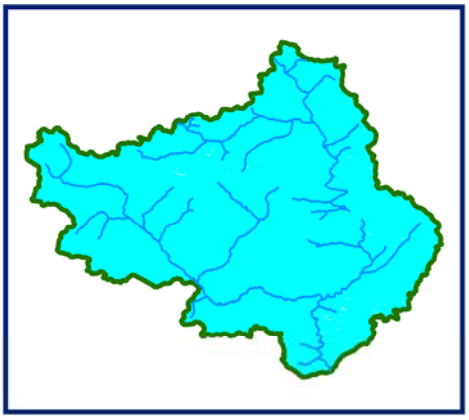
03 JANUARY 2013



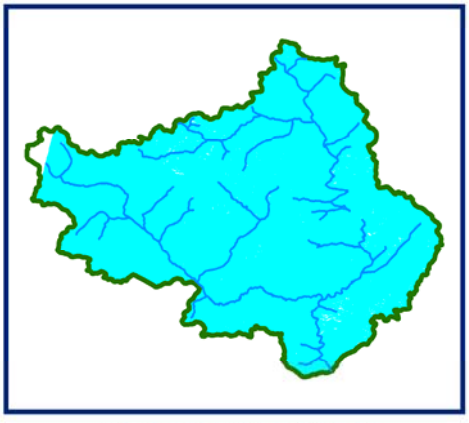
08 JANUARY 2013



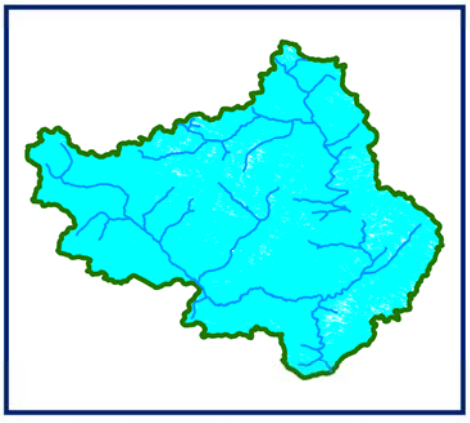
13 JANUARY 2013



20 JANUARY 2013



21 JANUARY 2013



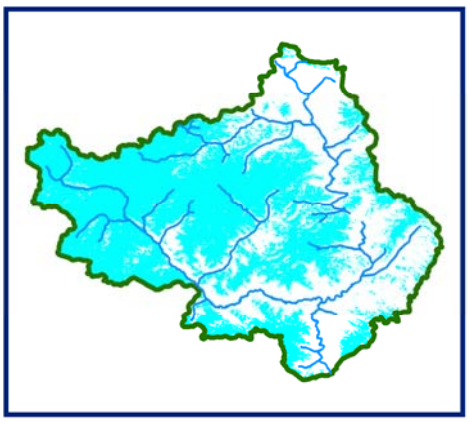
27 JANUARY 2013

SNOW

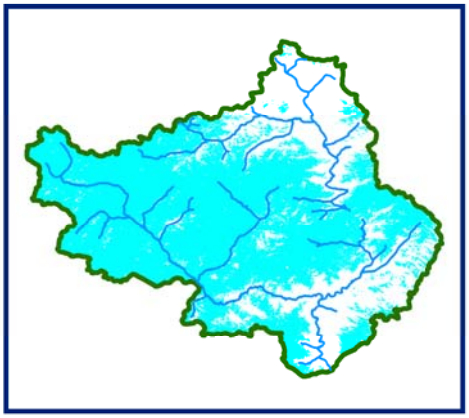
0 9 18 27 36

Kilometers

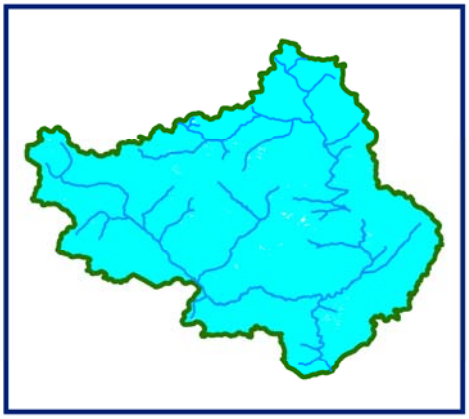
10 DAILY SNOW COVER MAP: SPITI BASIN



DATA USED
03 JANUARY 2013
06 JANUARY 2013
08 JANUARY 2013



DATA USED
11 JANUARY 2013
13 JANUARY 2013
20 JANUARY 2013

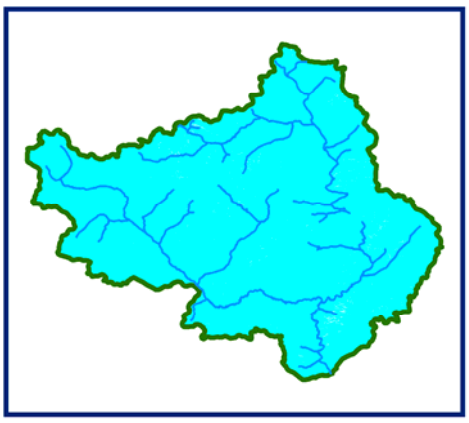


DATA USED
21 JANUARY 2013
25 JANUARY 2013
27 JANUARY 2013

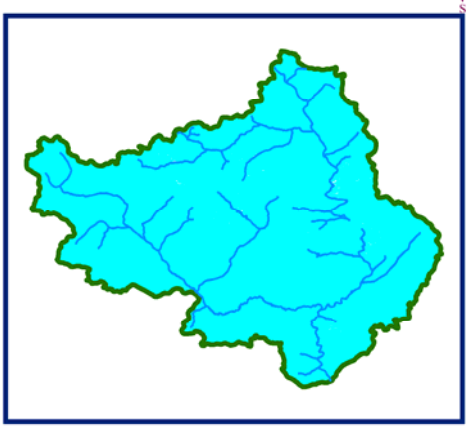
SNOW

0 4.5 9 18 27 36
Kilometers

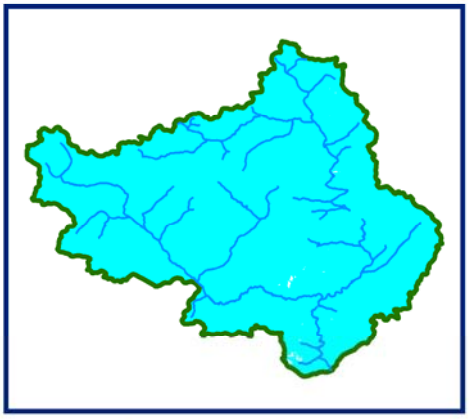
SNOW COVER MAP : SPITI BASIN



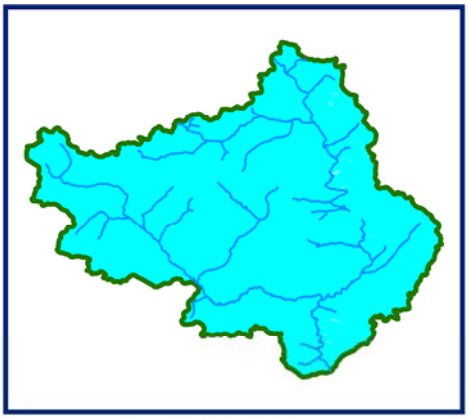
01 FEBRUARY 2013



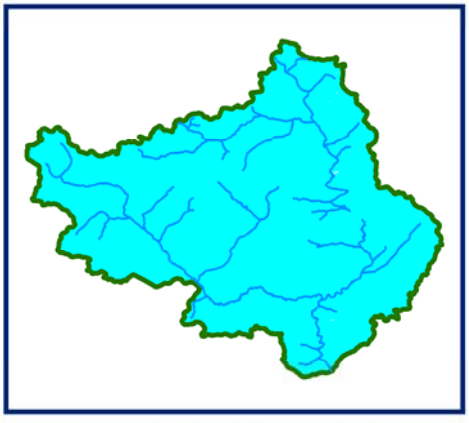
08 FEBRUARY 2013



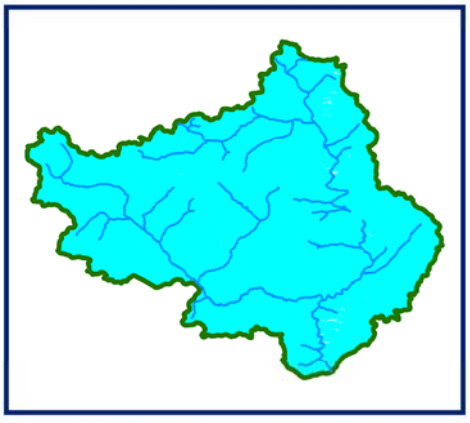
18 FEBRUARY 2013



20 FEBRUARY 2013



25 FEBRUARY 2013



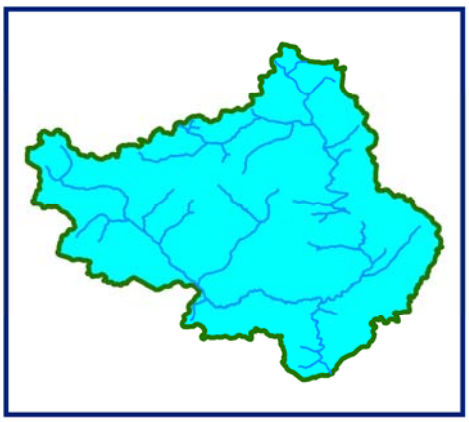
28 FEBRUARY 2013

SNOW

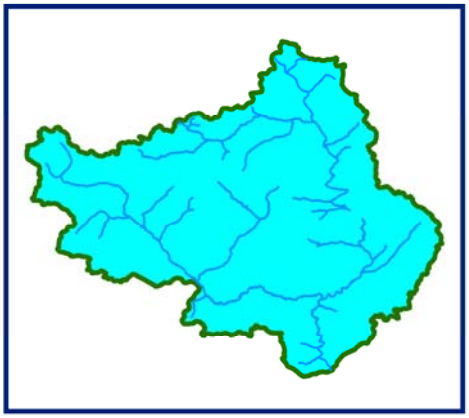
0 5 10 20 30 40

Kilometers

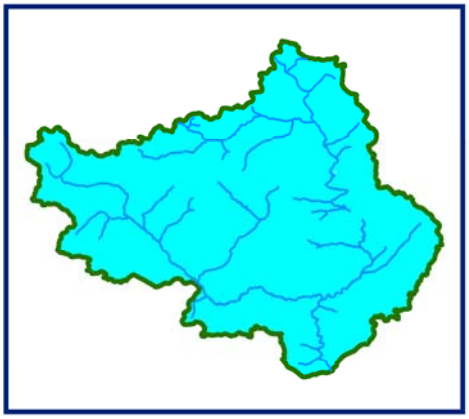
10 DAILY SNOW COVER MAP: SPITI BASIN



DATA USED
01 FEBRUARY 2013
08 FEBRUARY 2013
09 FEBRUARY 2013



DATA USED
11 FEBRUARY 2013
18 FEBRUARY 2013
20 FEBRUARY 2013

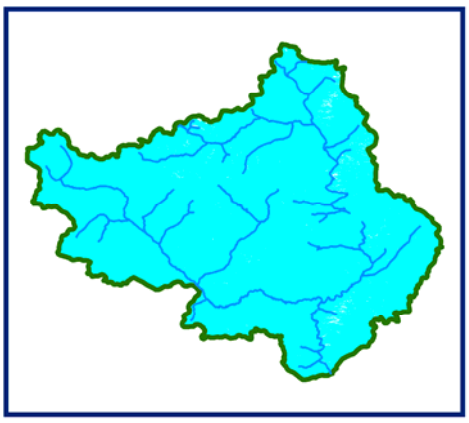


DATA USED
25 FEBRUARY 2013
28 FEBRUARY 2013

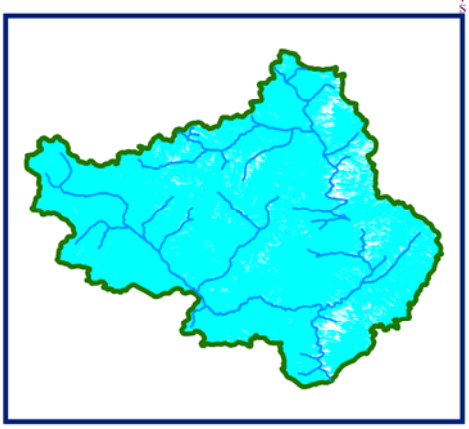
SNOW

0 0.5 1 2 3 4
Kilometers

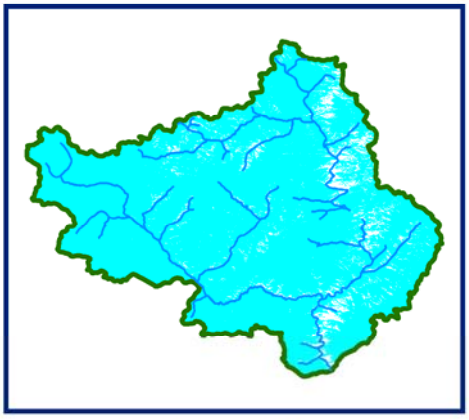
SNOW COVER MAP : SPITI BASIN



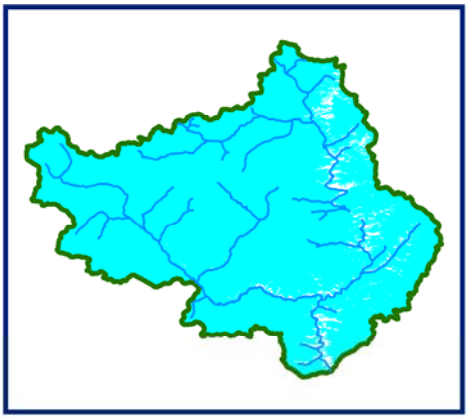
02 MARCH 2013



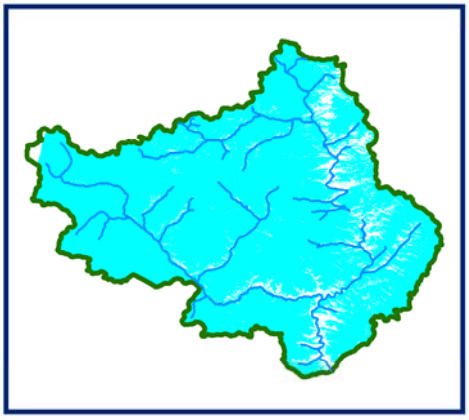
07 MARCH 2013



12 MARCH 2013



19 MARCH 2013



22 MARCH 2013

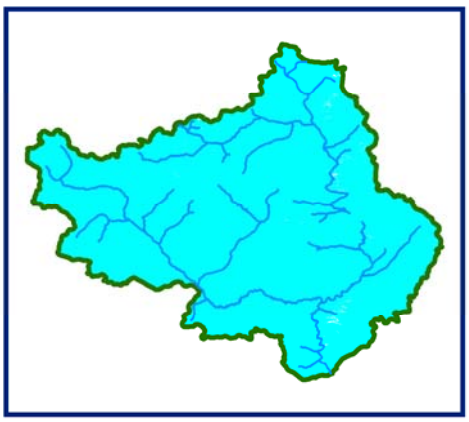
31 MARCH 2013

SNOW

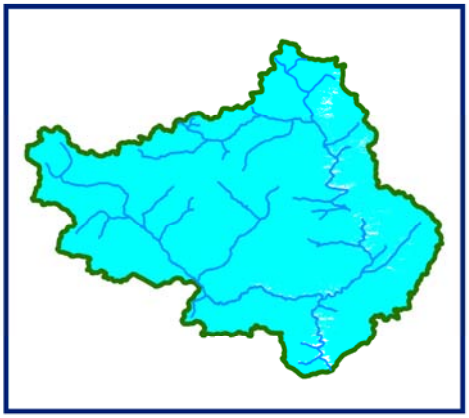
0 5 10 20 30 40

Kilometers

10 DAILY SNOW COVER MAP: SPITI BASIN



DATA USED
02 MARCH 2013
05 MARCH 2013
07 MARCH 2013



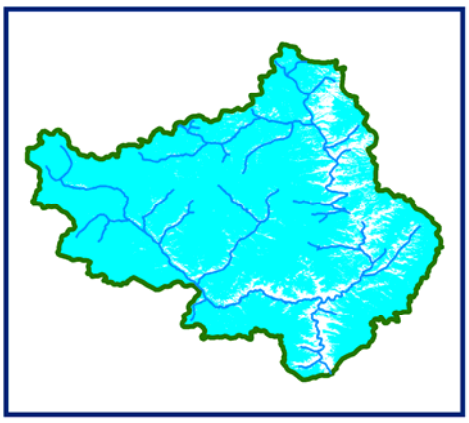
DATA USED
12 MARCH 2013
17 MARCH 2013
19 MARCH 2013

DATA USED
22 MARCH 2013
26 MARCH 2013
31 MARCH 2013

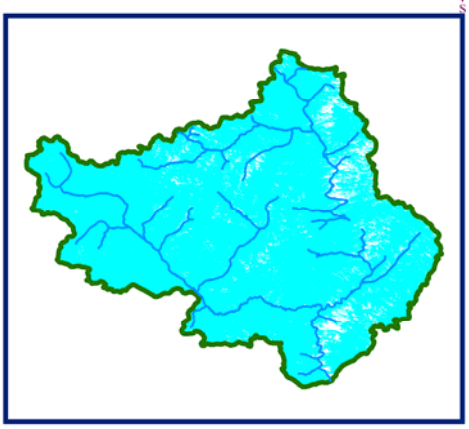
SNOW

0 4.5 9 18 27 36
Kilometers

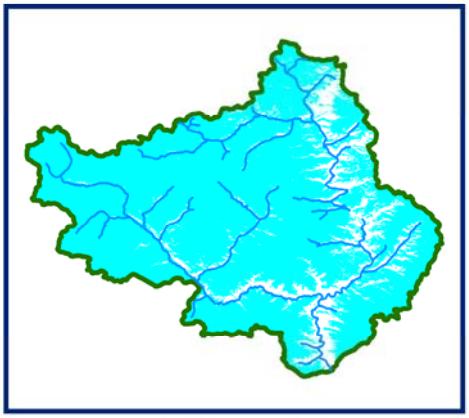
SNOW COVER MAP : SPITI BASIN



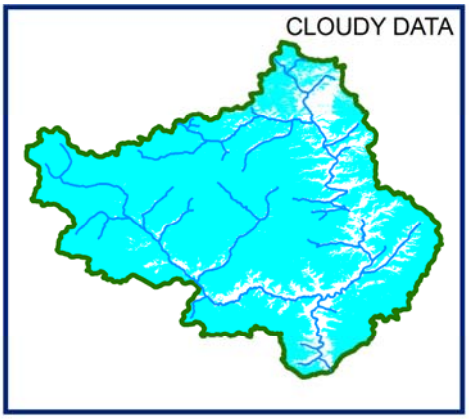
05 APRIL 2013



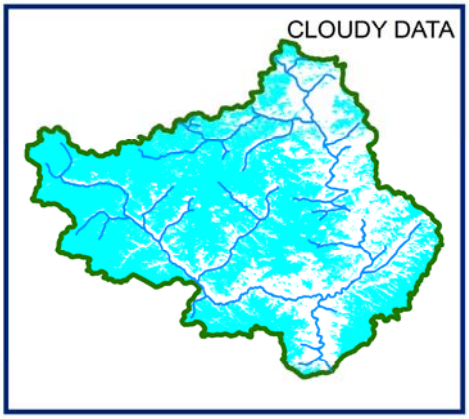
07 APRIL 2013



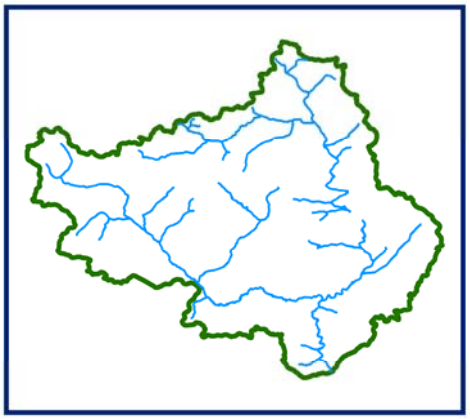
12 APRIL 2013



17 APRIL 2013



24 APRIL 2013



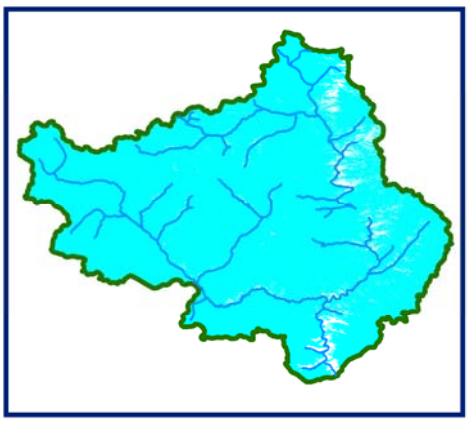
DATA NOT AVAILABLE

SNOW

0 5 10 20 30 40

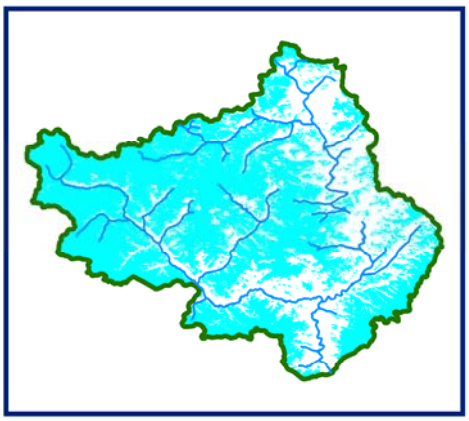
Kilometers

10 DAILY SNOW COVER MAP: SPITI BASIN



DATA USED
05 APRIL 2013
07 APRIL 2013

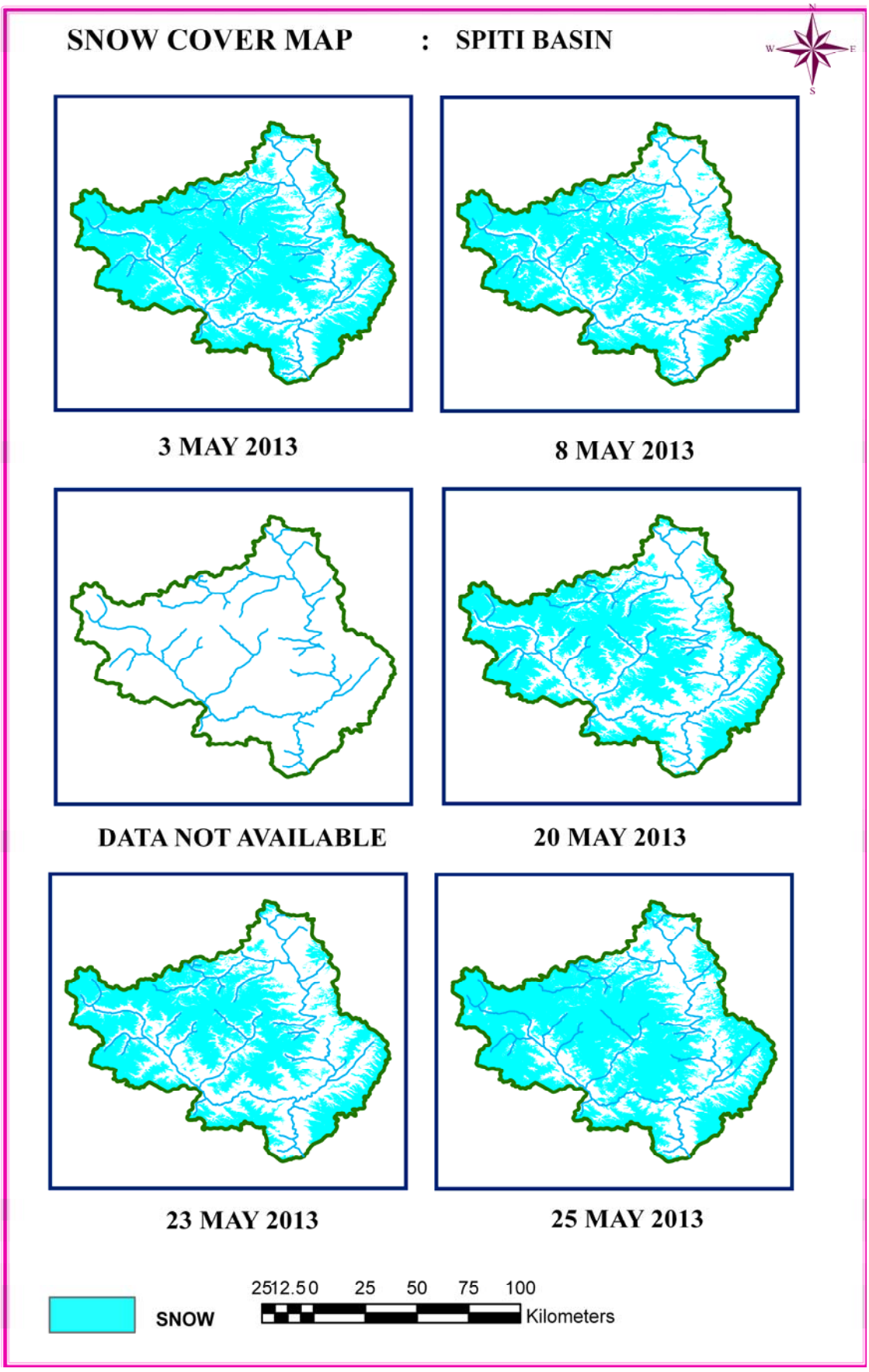
DATA USED
12 APRIL 2013
15 APRIL 2013
17 APRIL 2013



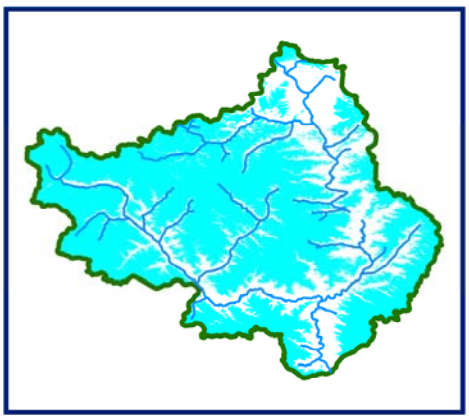
DATA USED
24 APRIL 2013

SNOW

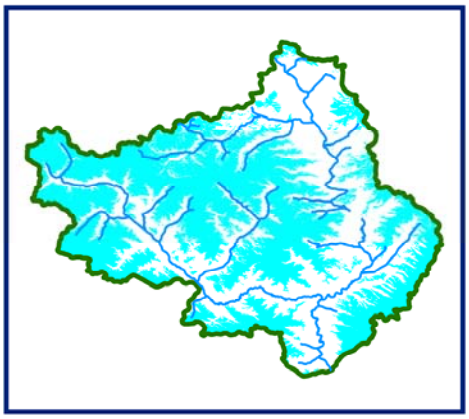
0 4.5 9 18 27 36
Kilometers


SNOW COVER MAP : SPITI BASIN
N
W
E
S
3 MAY 2013
8 MAY 2013
DATA NOT AVAILABLE
20 MAY 2013
23 MAY 2013
25 MAY 2013
SNOW
2512.50 25 50 75 100
Kilometers

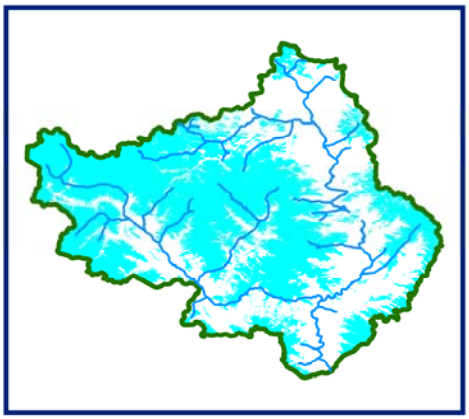
10 DAILY SNOW COVER MAP : SPITI BASIN



DATA USED
03 MAY 2013
08 MAY 2013
09 MAY 2013



DATA USED
20 MAY 2013

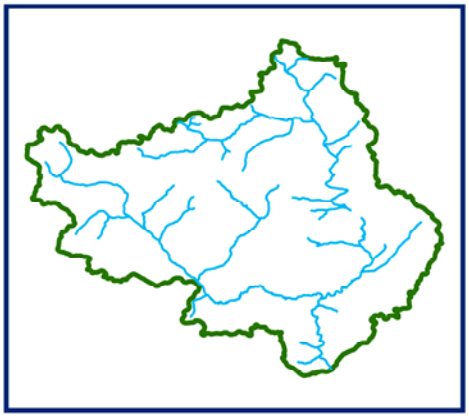


DATA USED
23 MAY 2013
25 MAY 2013

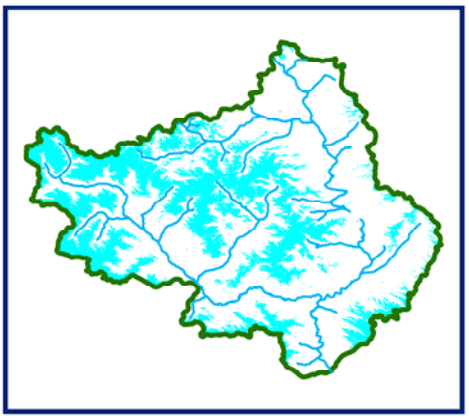
SNOW

2512.50 25 50 75 100 Kilometers

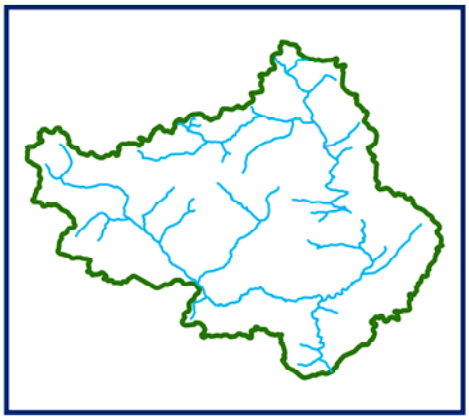
SNOW COVER MAP : SPITI BASIN



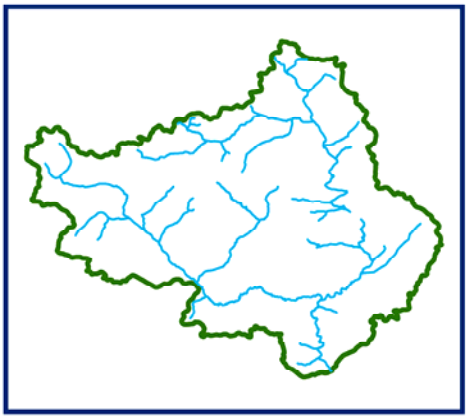
DATA NOT AVAILABLE



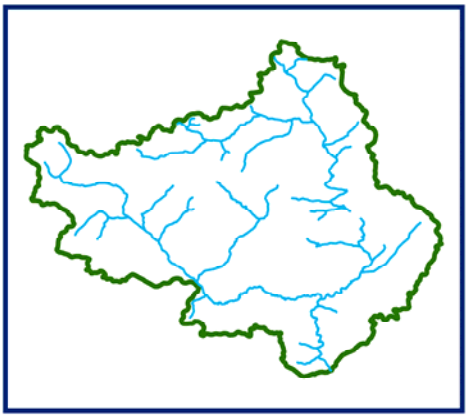
8 JUNE 2013



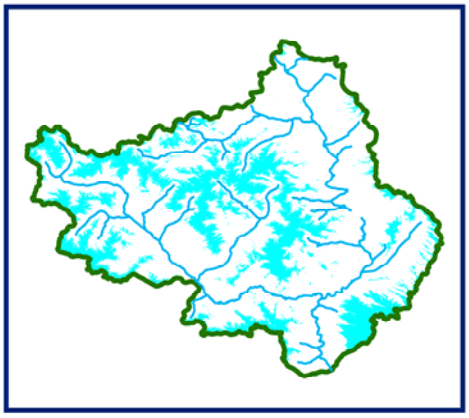
DATA NOT AVAILABLE



DATA NOT AVAILBLE



DATA NOT AVAILABLE



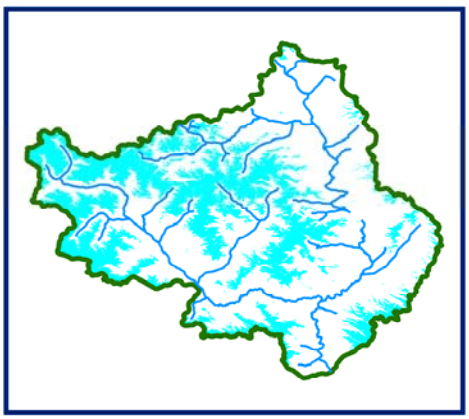
30 JUNE 2013

SNOW

2512.50 25 50 75 100

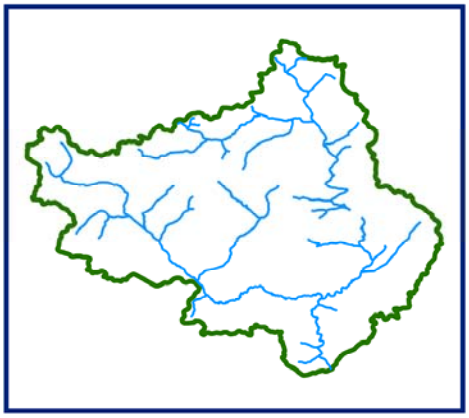
Kilometers

10 DAILY SNOW COVER MAP : SPITI BASIN



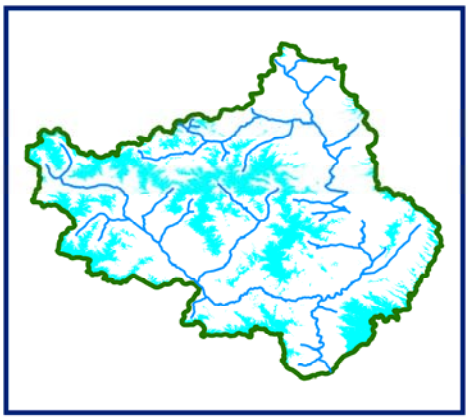
DATA USED

08 JUNE 2013



DATA USED

DATA NOT AVAILABLE



DATA USED

30 JUNE 2013

SNOW

2512.50 25 50 75 100 Kilometers

BASPA BASIN

AREAL EXTENT OF SNOW (5 DAILY)

BASIN NAME: BASPA **BASIN AREA: 1096 sq km**

S No	DATE	Snow cover (sq km)	Snow cover (%)	Cloud Cover	S No	DATE	Snow cover (sq km)	Snow cover (%)	Cloud Cover
October 2012									
1	02-10-2012	226	21	Clear	**9**	19-10-2012	321	29	Clear
2	04-10-2012	377	34	5%	**10**	23-10-2012	502	46	10%
3	04-10-2012	379	35	5%	**11**	23-10-2012	502	462	10%
4	07-10-2012	251	23	Clear	**12**	24-10-2012	663	60	10%
5	11-10-2012	398	36	Clear	**13**	28-10-2012	468	43	Clear
6	14-10-2012	270	259	Clear	**14**	29-10-2012	422	38	Clear
7	17-10-2012	514	47	Clear	**15**	31-10-2012	427	39	Clear
8	19-10-2012	319	29	Clear					
November 2012									
1	04-11-2012	275	25	Clear	**7**	16-11-2012	296	27	Clear
2	05-11-2012	345	31	Clear	**8**	17-11-2012	262	24	Clear
3	07-11-2012	321	29	Clear	**9**	19-11-2012	341	31	Clear
4	09-11-2012	222	20	Clear	**10**	24-11-2012	448	41	80%
5	10-11-2012	297	27	Clear	**11**	26-11-2012	247	23	Clear
6	12-11-2012	405	37	Clear					
December 2012									
1	01-12-2012	798	73	Clear	**5**	22-12-2012	896	82	Clear
2	04-12-2012	692	63	Clear	**6**	23-12-2012	876	80	Clear
3	16-12-2012	940	86	40%	**7**	25-12-2012	784	72	Clear
4	20-12-2012	785	72	Clear					
January 2013									
1	03-01-2013	676	62	Clear	**7**	16-01-2013	802	73	Clear
2	06-01-2013	732	67	Clear	**8**	20-01-2013	1095	100	Clear
3	08-01-2013	634	58	Clear	**9**	21-01-2013	1094	100	Clear
4	09-01-2013	521	48	35%	**10**	25-01-2013	1084	99	Clear
5	11-01-2013	712	65	Clear	**11**	25-01-2013	1084	99	Clear
6	13-01-2013	914	83	Clear	**12**	27-01-2013	1045	95	5%
February 2013									
1	01-02-2013	1090	99	Clear	**6**	18-02-2013	1101	100	Clear
2	08-02-2013	1098	100	Clear	**7**	25-02-2013	1099	100	Clear
3	09-02-2013	1097	100	Clear	**8**	25-02-2013	1099	100	Clear
4	11-02-2013	1100	100	25%	**9**	28-02-2013	1092	100	Clear
5	11-02-2013	1090	99	25%					

March 2013									
1	04-03-2013	1088	99	30%	**7**	19-03-2013	1059	97	Clear
2	05-03-2013	1078	98	Clear	**8**	21-03-2013	1006	92	Clear
3	07-03-2013	1039	95	Clear	**9**	22-03-2013	995	91	Clear
4	12-03-2013	1059	97	45%	**10**	26-03-2013	1025	93	Clear
5	16-03-2013	1083	99	30%	**11**	31-03-2013	987	90	Clear
6	17-03-2013	1082	990	Clear					
April 2013									
1	05-04-2013	979	89	Clear	**5**	17-04-2013	1001	91	Clear
2	12-04-2013	978	89	Clear	**6**	19-04-2013	918	84	Clear
3	14-04-2013	970	88	15%	**7**	24-04-2013	882	80	5%
4	15-04-2013	923	84	Clear					
May 2013									
1	03-05-2013	876	80	Clear	**7**	20-May-13	784	72	Clear
2	04-05-2013	557	51	50%	**8**	23-May-13	764	70	Clear
3	06-05-2013	959	88	80%	**9**	25-May-13	622	57	Clear
4	08-05-2013	1098	100	Clear	**10**	8-Jun-13	546	50	Clear
5	08-05-2013	849	77	Clear	**11**	30-Jun-13	678	62	Clear
6	09-05-2013	818	75	Clear					

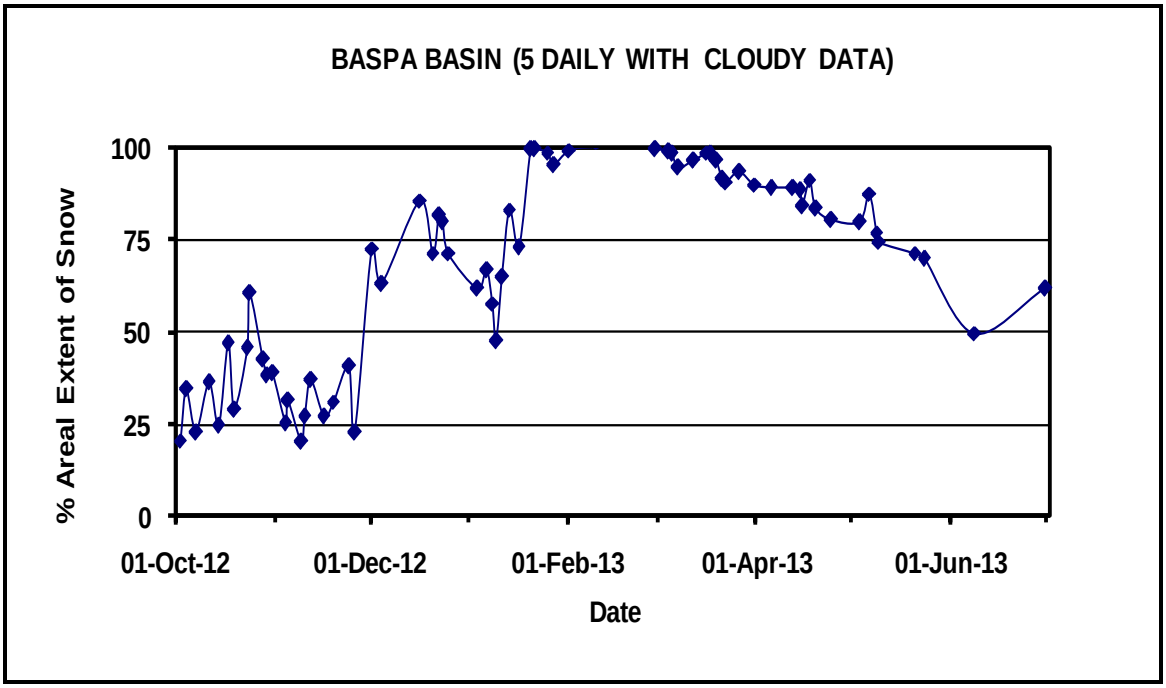
AREAL EXTENT OF SNOW (10 DAILY)

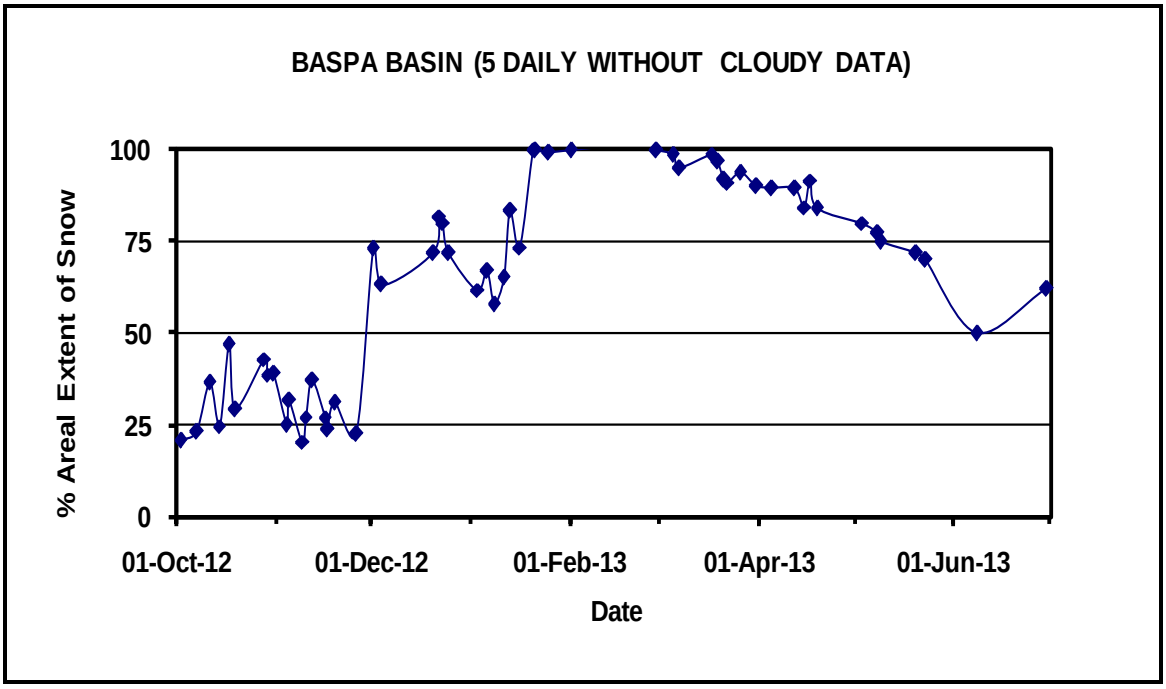
BASIN NAME: BASPA BASIN AREA: 1096 sq km

S No	Date	Snow cover (sq km)	Snow cover (%)	Cloud cover	S No	Date	Snow cover (sq km)	Snow cover (%)	Cloud cover
October 2012									
1.	02-Oct-12	394	36	Clear	7.	24-Oct-12	575	52	10%
2.	04-Oct-12			5%	8.	28-Oct-12			Clear
3.	07-Oct-12			Clear	9.	31-Oct-12			Clear
4.	11-Oct-12	347	32	Clear					
5.	14-Oct-12			Clear					
6.	19-Oct-12			Clear					
November 2012									
1.	04-Nov-12	321	29	Clear	7.	26-Nov-12	147	13	Clear
2.	07-Nov-12			Clear					
3.	09-Nov-12			Clear					
4.	12-Nov-12	344	31	Clear					
5.	16-Nov-12			Clear					
6.	19-Nov-12			Clear					
December 2012									
1.	01-Dec-12	770	70	Clear	5.	22-Dec-12	809	74	Clear
2.	04-Dec-12			Clear	6.	23-Dec-12			Clear
3.	16-Dec-12	1014	93	40%	7.	25-Dec-12			Clear
4.	20-Dec-12			Clear					
January2013									
1.	03-Jan-13	649	59	Clear	7.	21-Jan-13	1069	98	Clear
2.	06-Jan-13			Clear	8.	25-Jan-13			Clear
3.	08-Jan-13			Clear	9.	27-Jan-13			5%
4.	11-Jan-13	744	68	Clear					
5.	16-Jan-13			Clear					
6.	20-Jan-13			Clear					
February 2013									
1.	01-Feb-13	1094	100	Clear	6.	25-Feb-13	1099	100	Clear
2.	08-Feb-13			Clear	7.	28-Feb-13			Clear
3.	09-Feb-13			Clear					
4.	11-Feb-13	1100	100	25%					
5.	18-Feb-13			Clear					
March 2013									
1.	05-Mar-13	1078	98	Clear	6.	21-Mar-13	1039	95	Clear
2.	07-Mar-13			Clear	7.	26-Mar-13			Clear

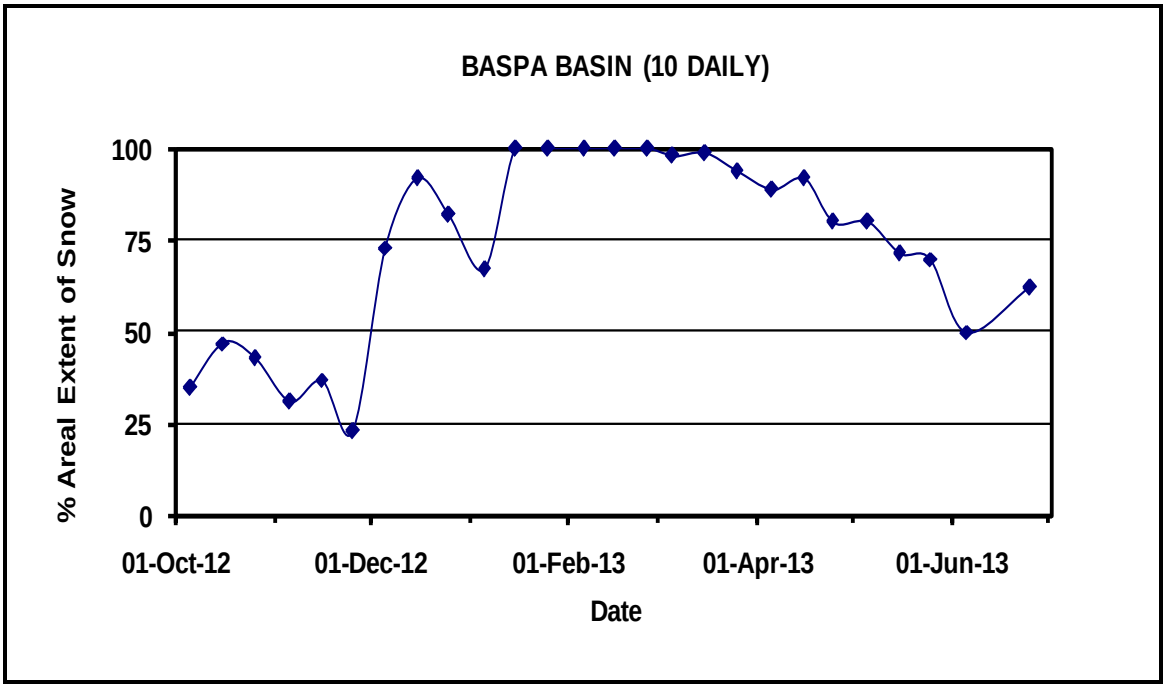
3.	12-Mar-13	1084	99	45%	8.	31-Mar-13			Clear
4.	17-Mar-13			Clear					
5.	19-Mar-13			Clear					
April 2013									
1.	05-Apr-13	979	90	Clear	5.	24-Apr-13	882	80	5%
2.	12-Apr-13	1012	93	Clear					
3.	17-Apr-13			Clear					
4.	19-Apr-13			Clear					
May 2013									
1.	03-May-13	886	81	Clear	5.	23-May-13	871	80	
2.	08-May-13			Clear		25-May-13			
3.	09-May-13			Clear					
4.	15-May-13	784	72						
June-2013									
1.	8-June-13	546	50		2.	30-June-13	679	62	

Snow cover depletion curve

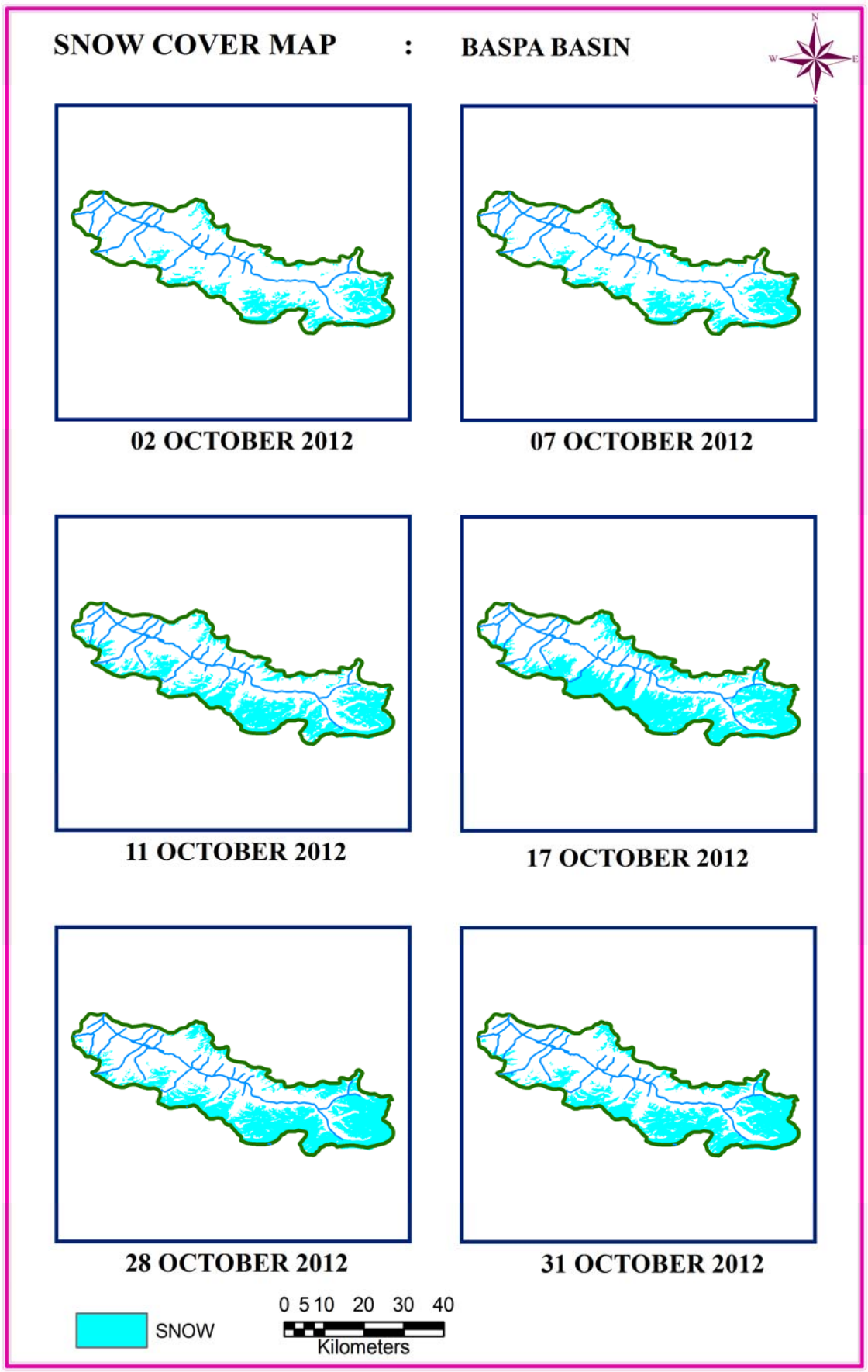




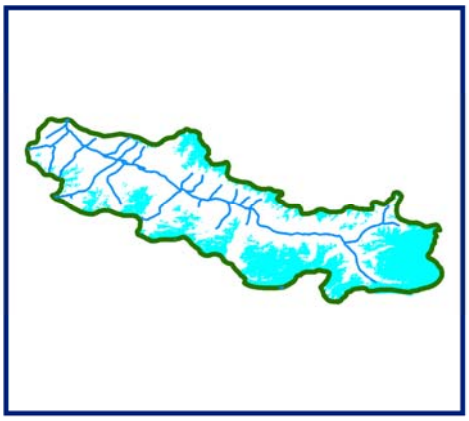
Snow cover depletion curve



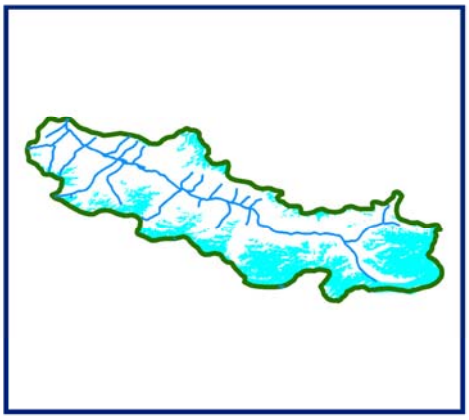
SNOW COVER MAP


SNOW COVER MAP : BASPA BASIN
N
W
E
S
02 OCTOBER 2012
07 OCTOBER 2012
11 OCTOBER 2012
17 OCTOBER 2012
28 OCTOBER 2012
31 OCTOBER 2012
SNOW
0 5 10 20 30 40
Kilometers

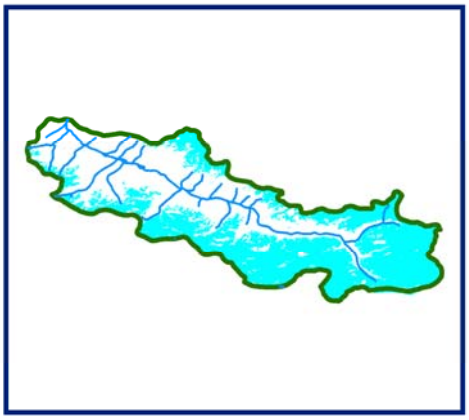
10 DAILY SNOW COVER MAP: BASPA BASIN



DATA USED
02 OCTOBER 2012
04 OCTOBER 2012
07 OCTOBER 2012



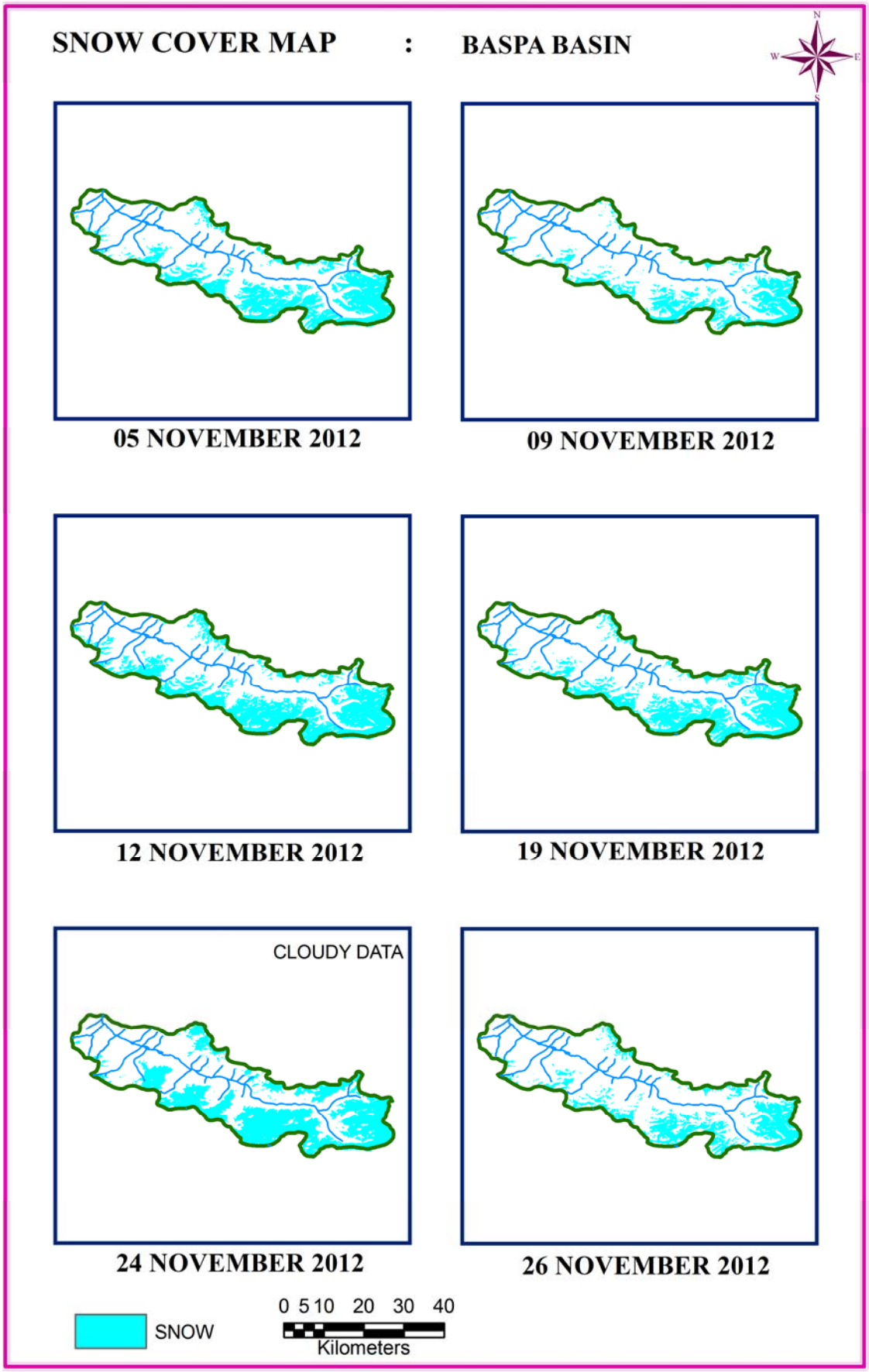
DATA USED
11 OCTOBER 2012
14 OCTOBER 2012
19 OCTOBER 2012



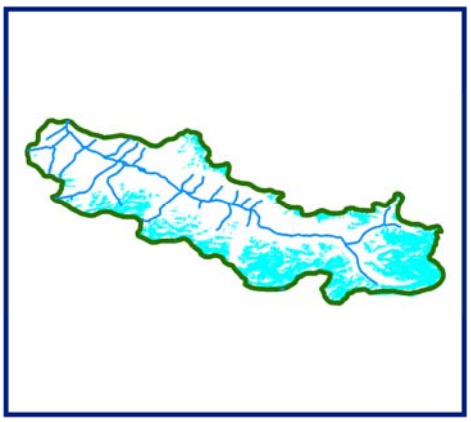
DATA USED
24 OCTOBER 2012
28 OCTOBER 2012
31 OCTOBER 2012

SNOW

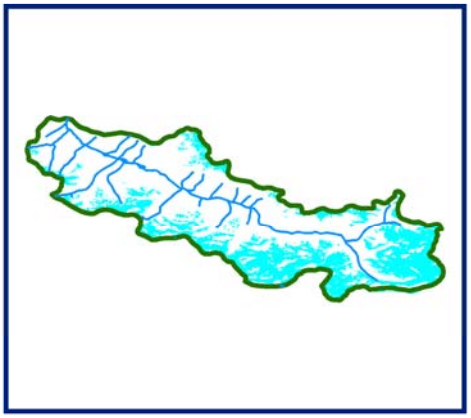
0 5 10 20 30 40
Kilometers


SNOW COVER MAP : BASPA BASIN
N
W
E
S
05 NOVEMBER 2012
09 NOVEMBER 2012
12 NOVEMBER 2012
19 NOVEMBER 2012
CLOUDY DATA
24 NOVEMBER 2012
26 NOVEMBER 2012
SNOW
0 5 10 20 30 40
Kilometers

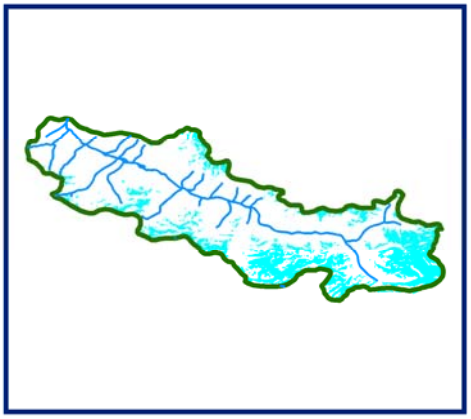
10 DAILY SNOW COVER MAP: BASPA BASIN



DATA USED
04 NOVEMBER 2012
07 NOVEMBER 2012
09 NOVEMBER 2012



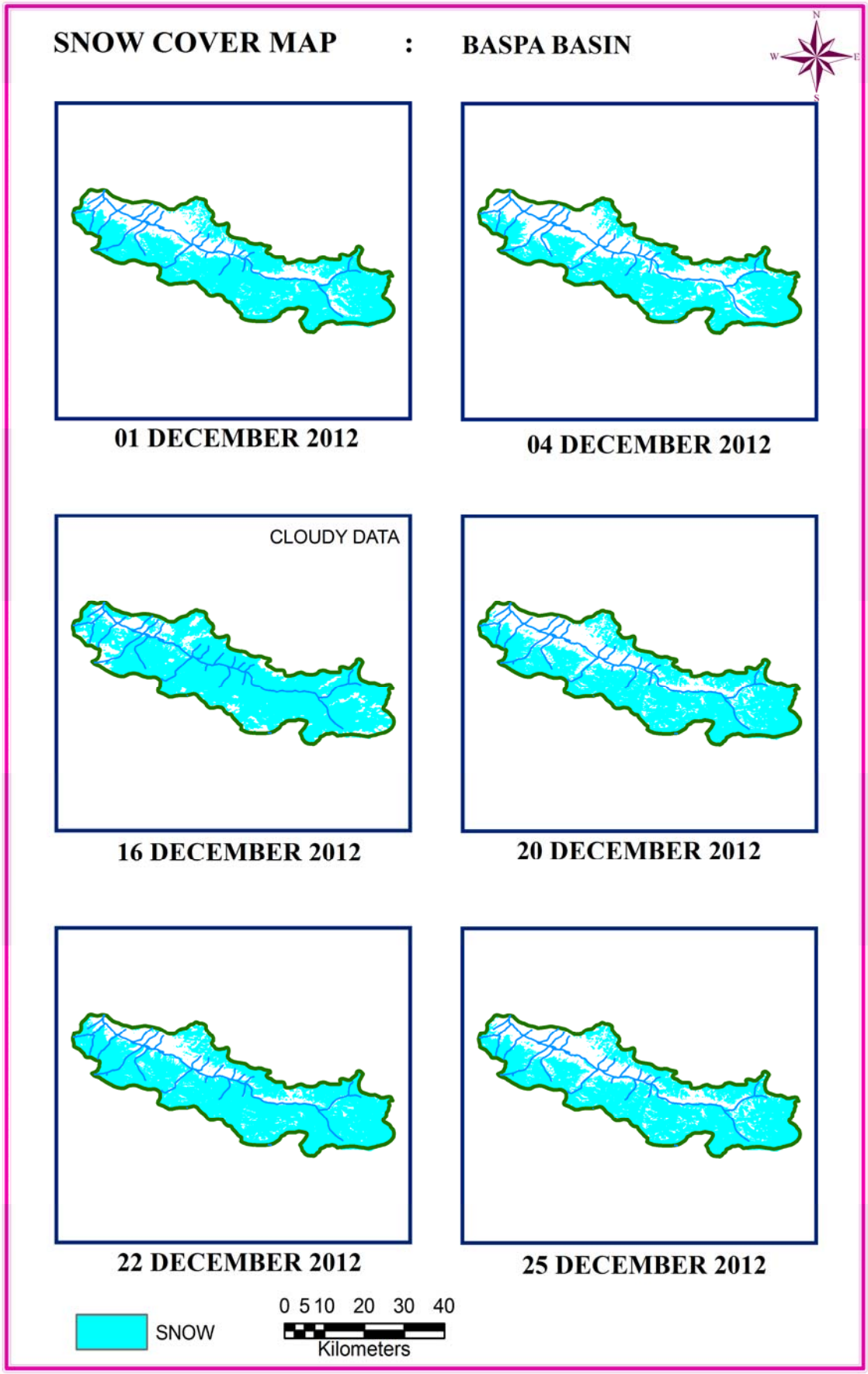
DATA USED
12 NOVEMBER 2012
16 NOVEMBER 2012
19 NOVEMBER 2012



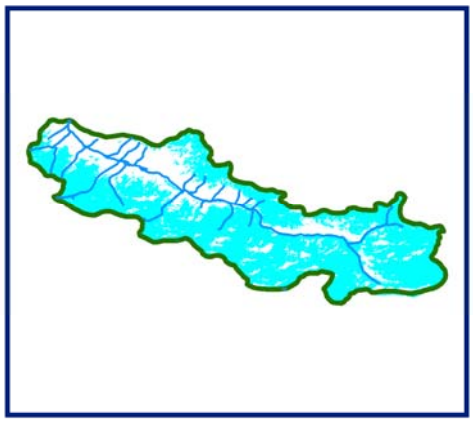
DATA USED
26 NOVEMBER 2012

SNOW

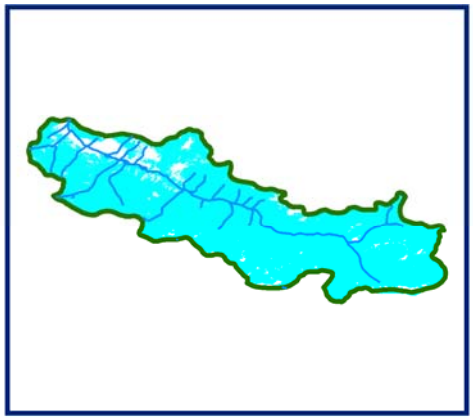
0 5 10 20 30 40
Kilometers


SNOW COVER MAP : BASPA BASIN
N
W
E
S
01 DECEMBER 2012
04 DECEMBER 2012
CLOUDY DATA
16 DECEMBER 2012
20 DECEMBER 2012
22 DECEMBER 2012
25 DECEMBER 2012
SNOW
0 5 10 20 30 40
Kilometers

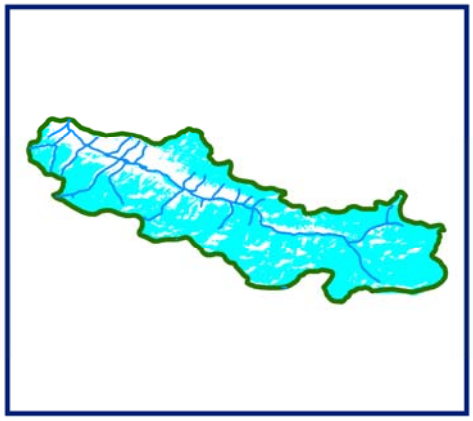
10 DAILY SNOW COVER MAP: BASPA BASIN



DATA USED
01 DECEMBER 2012
04 DECEMBER 2012



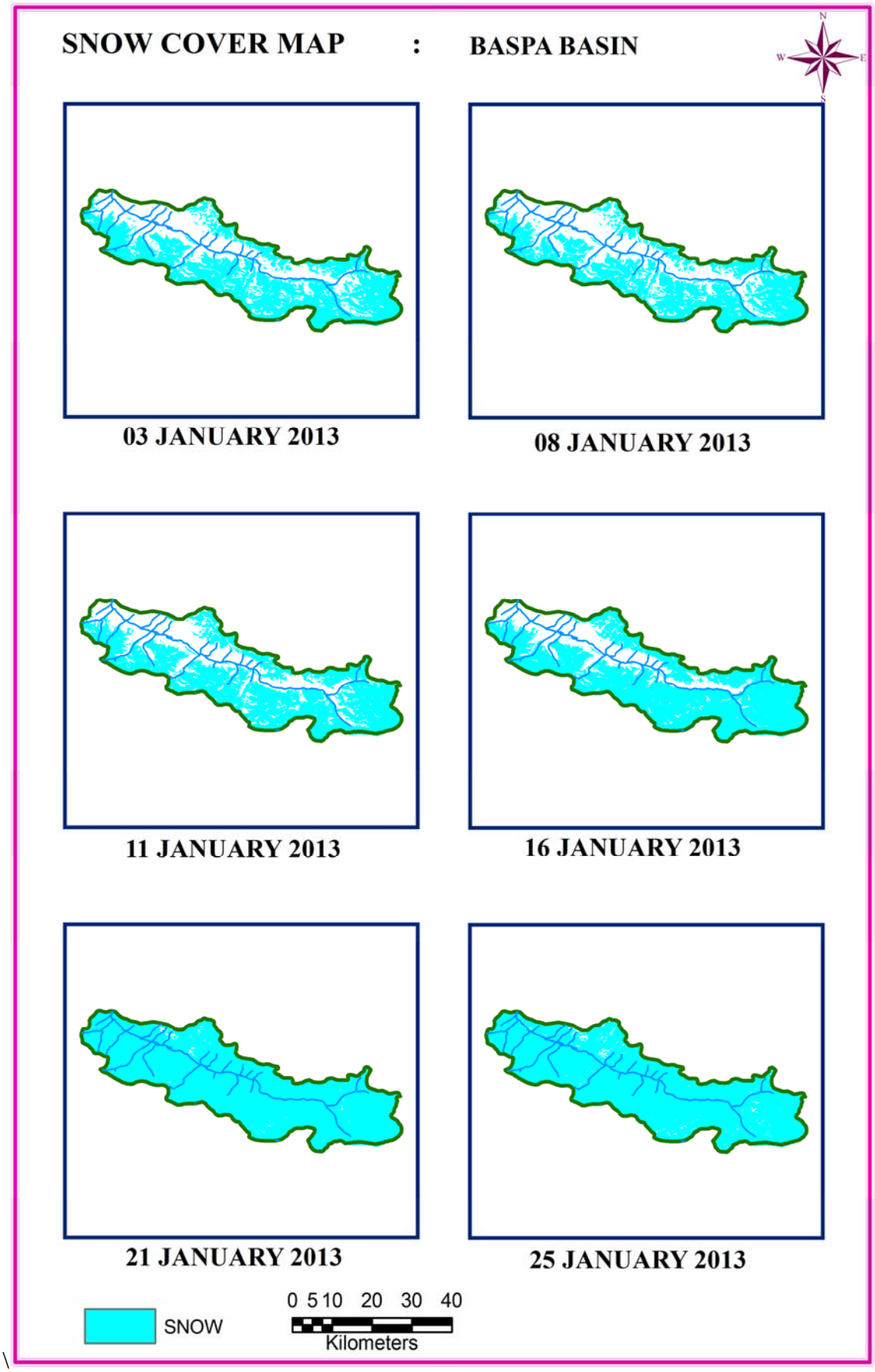
DATA USED
16 DECEMBER 2012
20 DECEMBER 2012



DATA USED
22 DECEMBER 2012
23 DECEMBER 2012
25 DECEMBER 2012

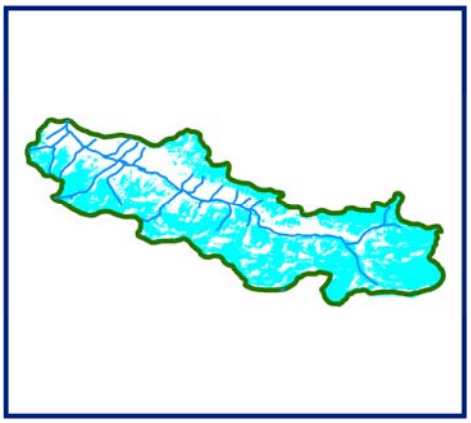
SNOW

0 5 10 20 30 40
Kilometers

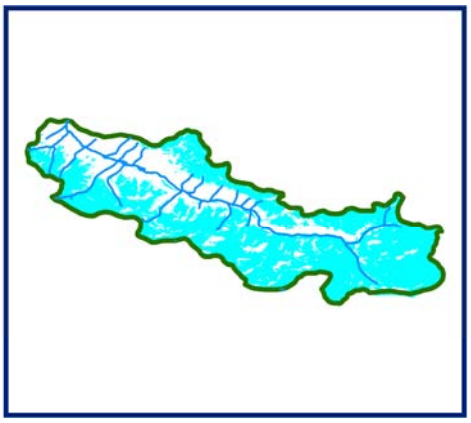

SNOW COVER MAP : BASPA BASIN
N
W
E
S
03 JANUARY 2013
08 JANUARY 2013
11 JANUARY 2013
16 JANUARY 2013
21 JANUARY 2013
25 JANUARY 2013
SNOW
0 5 10 20 30 40
Kilometers

\

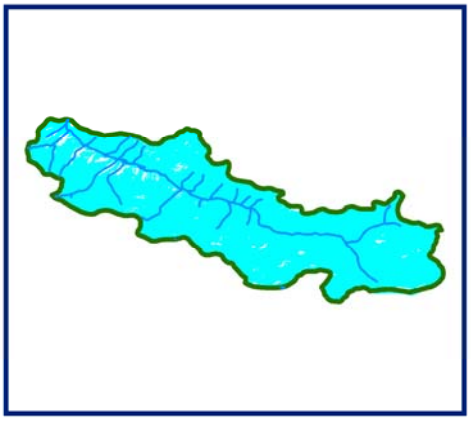
10 DAILY SNOW COVER MAP: BASPA BASIN



DATA USED
03 JANUARY 2013
06 JANUARY 2013
08 JANUARY 2013



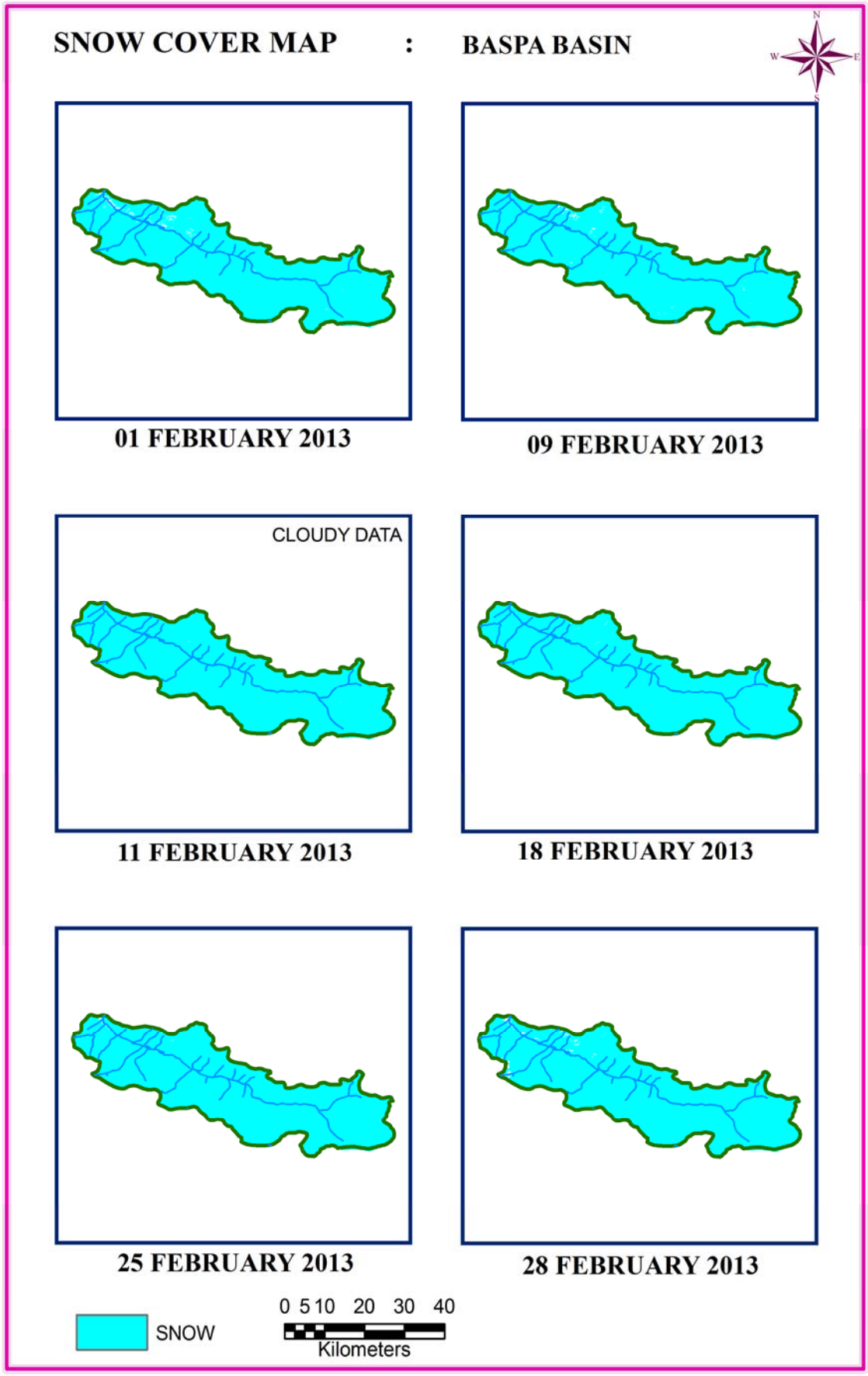
DATA USED
11 JANUARY 2013
16 JANUARY 2013
20 JANUARY 2013



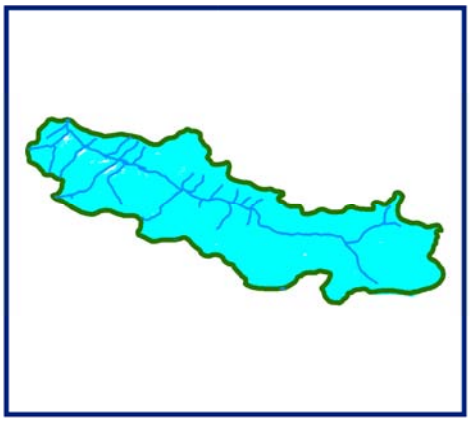
DATA USED
21 JANUARY 2013
25 JANUARY 2013
27 JANUARY 2013

SNOW

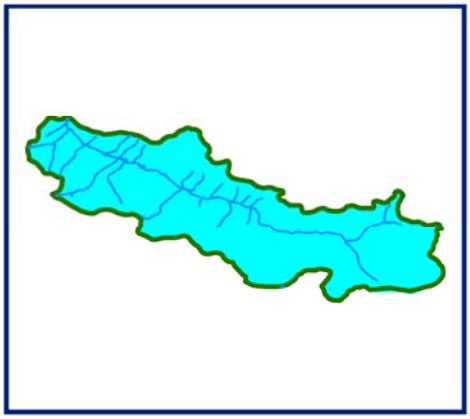
0 5 10 20 30 40
Kilometers


SNOW COVER MAP : BASPA BASIN
N
W
E
S
01 FEBRUARY 2013
09 FEBRUARY 2013
CLOUDY DATA
11 FEBRUARY 2013
18 FEBRUARY 2013
25 FEBRUARY 2013
28 FEBRUARY 2013
SNOW
0 5 10 20 30 40
Kilometers

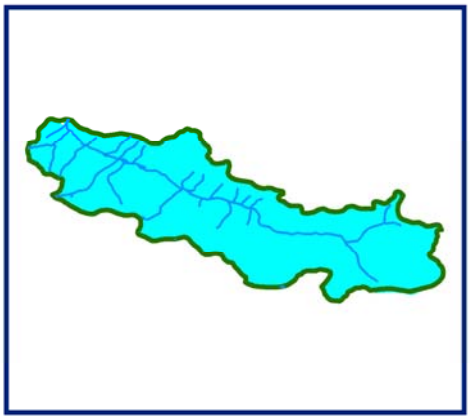
10 DAILY SNOW COVER MAP: BASPA BASIN



DATA USED
01 FEBRUARY 2013
08 FEBRUARY 2013
09 FEBRUARY 2013



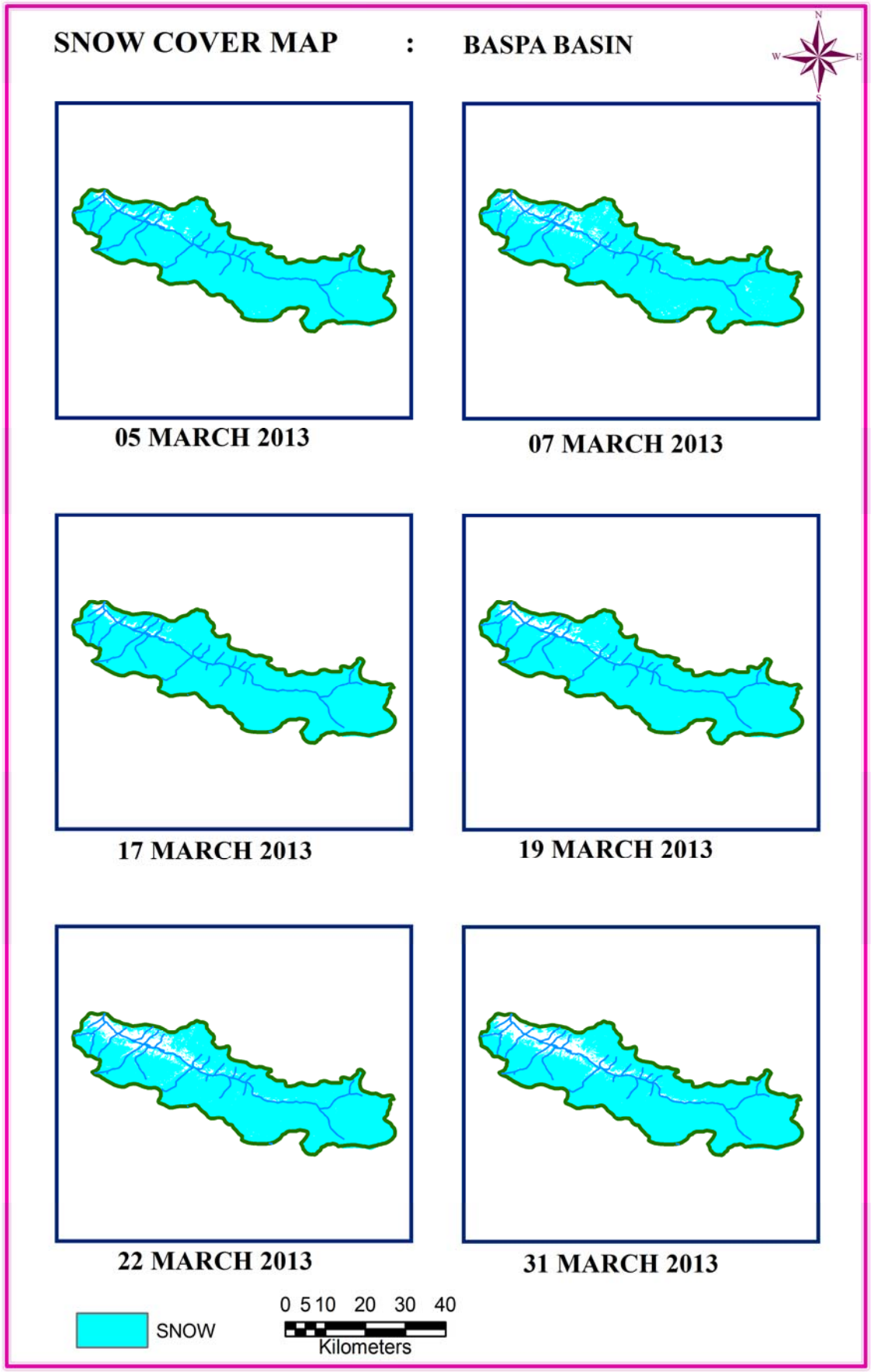
DATA USED
11 FEBRUARY 2013
18 FEBRUARY 2013



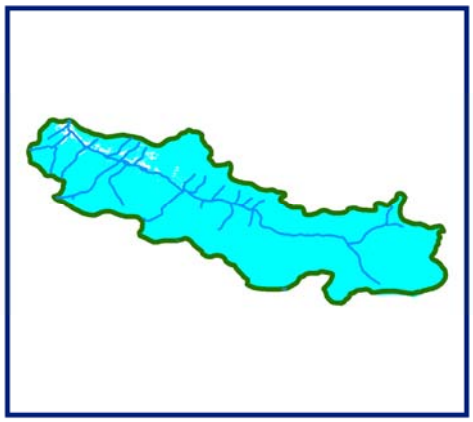
DATA USED
25 FEBRUARY 2013
28 FEBRUARY 2013

SNOW

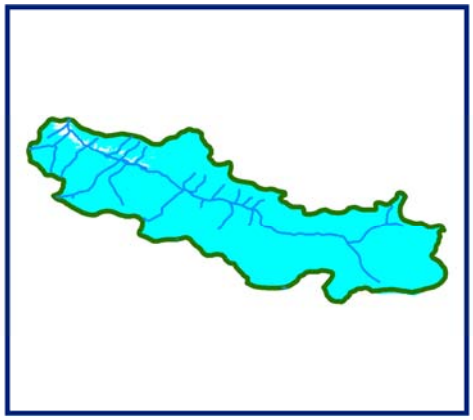
0 5 10 20 30 40
Kilometers


SNOW COVER MAP : BASPA BASIN
N
W
E
S
05 MARCH 2013
07 MARCH 2013
17 MARCH 2013
19 MARCH 2013
22 MARCH 2013
31 MARCH 2013
SNOW
0 5 10 20 30 40
Kilometers

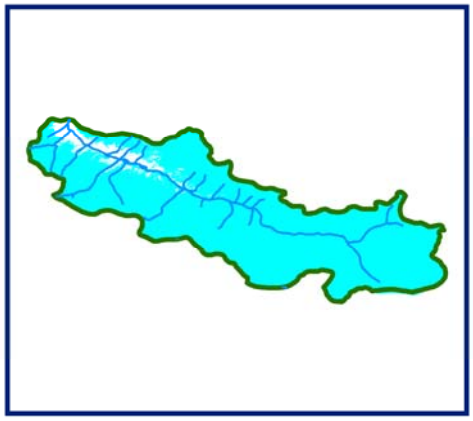
10 DAILY SNOW COVER MAP: BASPA BASIN



DATA USED
05 MARCH 2013
07 MARCH 2013



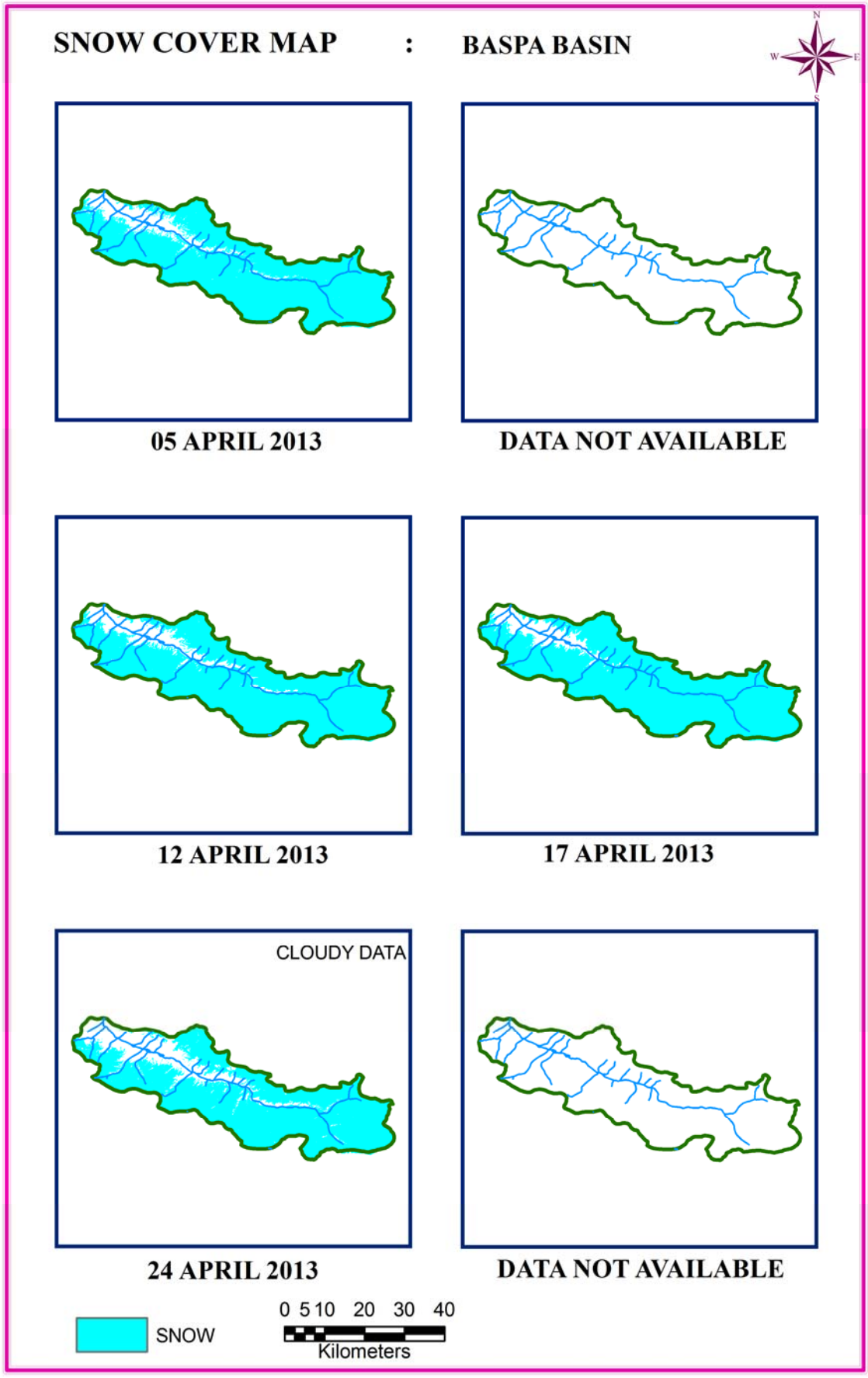
DATA USED
12 MARCH 2013
17 MARCH 2013
19 MARCH 2013



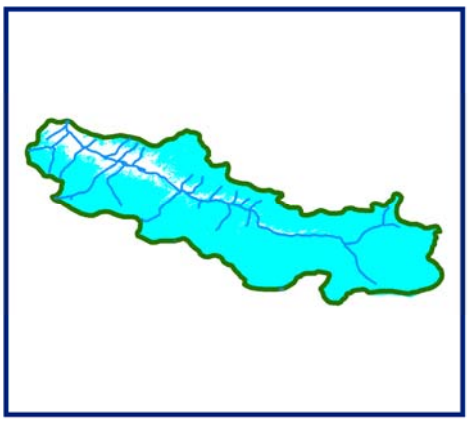
DATA USED
21 MARCH 2013
26 MARCH 2013
31 MARCH 2013

SNOW

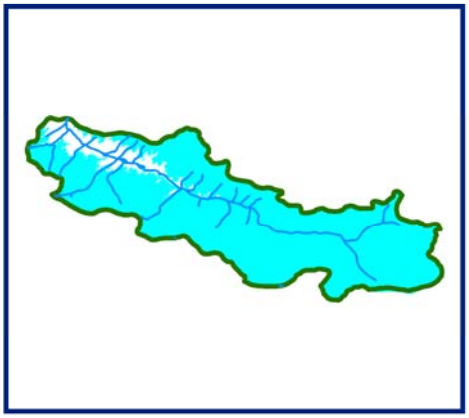
0 5 10 20 30 40
Kilometers


SNOW COVER MAP : BASPA BASIN
N
W
E
S
05 APRIL 2013
DATA NOT AVAILABLE
12 APRIL 2013
17 APRIL 2013
CLOUDY DATA
24 APRIL 2013
DATA NOT AVAILABLE
SNOW
0 5 10 20 30 40
Kilometers

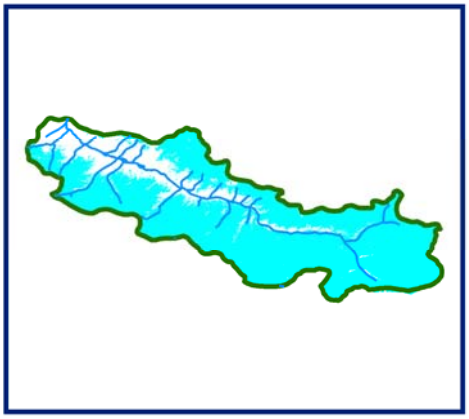
10 DAILY SNOW COVER MAP: BASPA BASIN



DATA USED
05 APRIL 2013



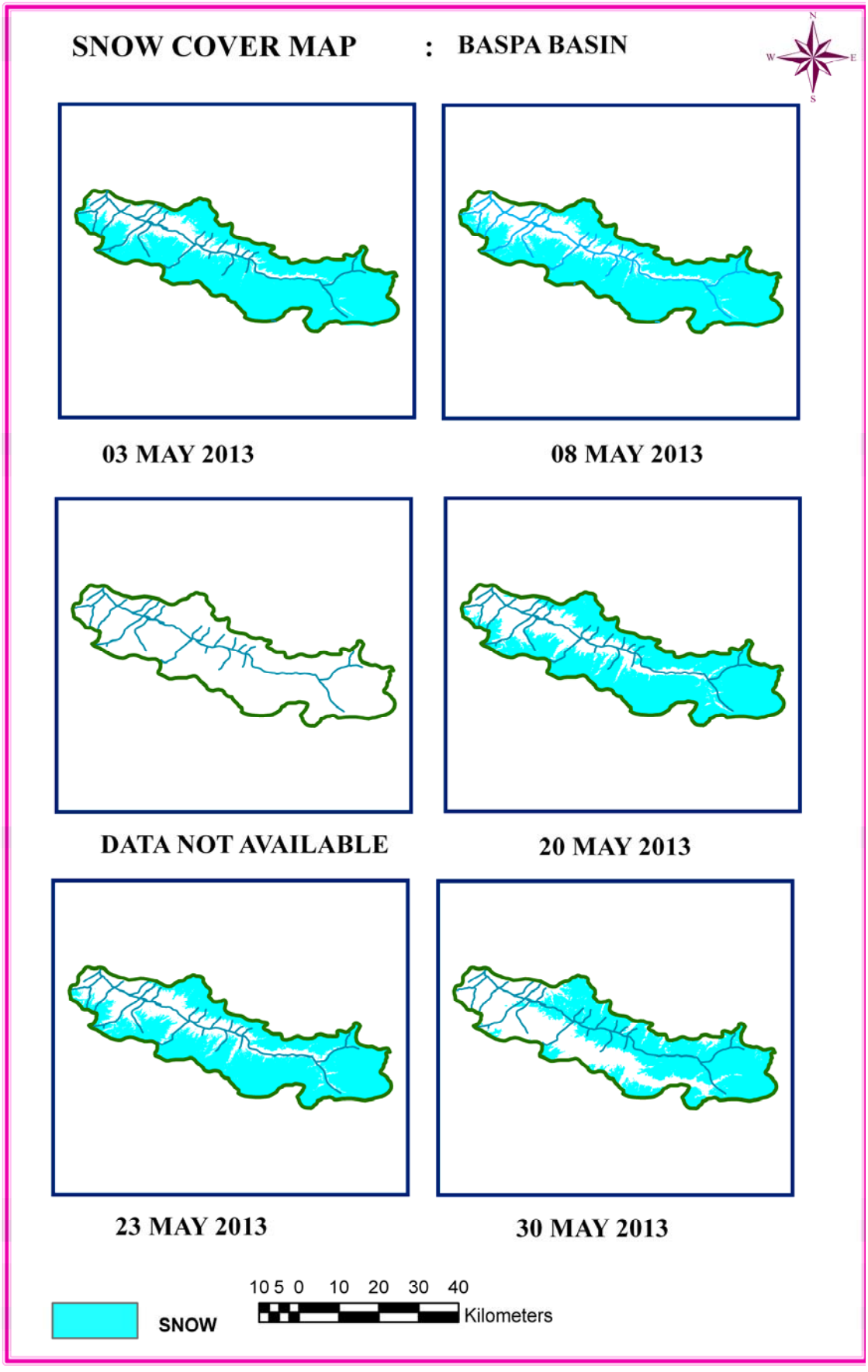
DATA USED
12 APRIL 2013
17 APRIL 2013
19 APRIL 2013



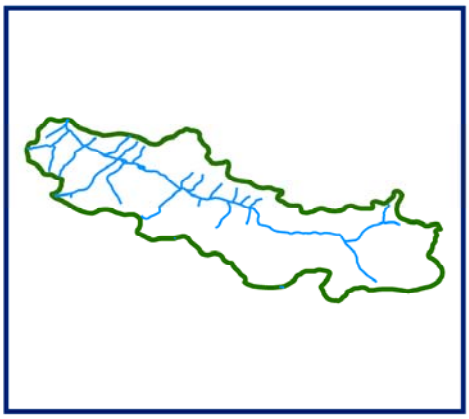
DATA USED
24 APRIL 2013

SNOW

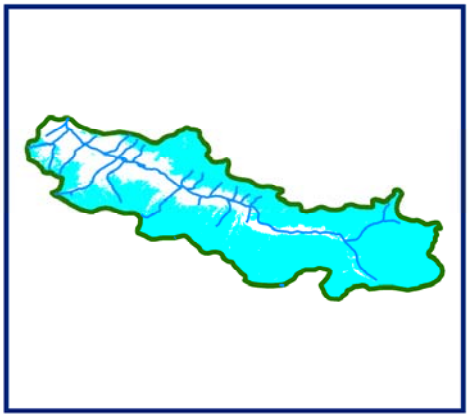
0 5 10 20 30 40
Kilometers


SNOW COVER MAP : BASPA BASIN
N
W
E
S
03 MAY 2013
08 MAY 2013
DATA NOT AVAILABLE
20 MAY 2013
23 MAY 2013
30 MAY 2013
10 5 0 10 20 30 40
Kilometers
SNOW

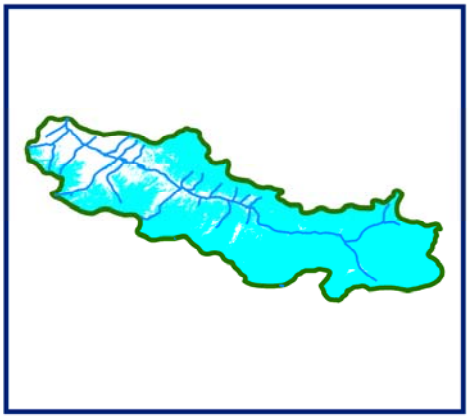
10 DAILY SNOW COVER MAP : BASPA BASIN



DATA USED
DATA NOT AVAILABLE



DATA USED
20 MAY 2013

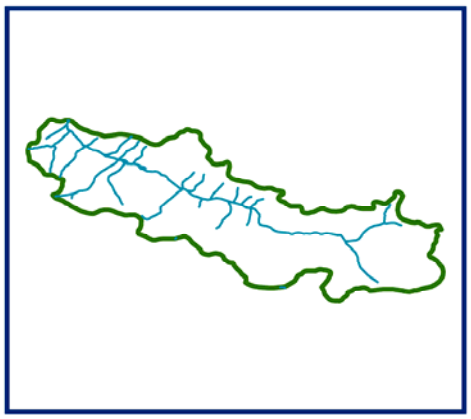


DATA USED
23 MAY 2013
23 MAY 2013

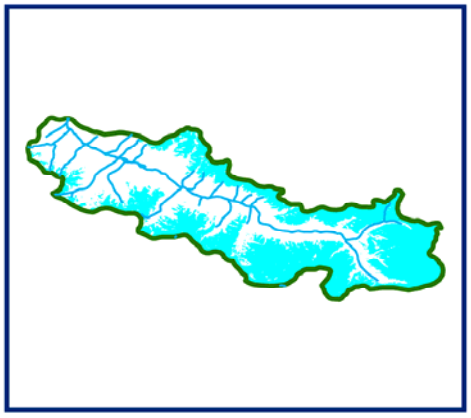
SNOW

10 5 0 10 20 30 40
Kilometers

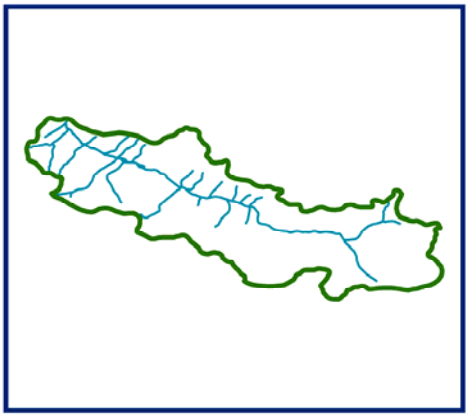
SNOW COVER MAP : BASPA BASIN



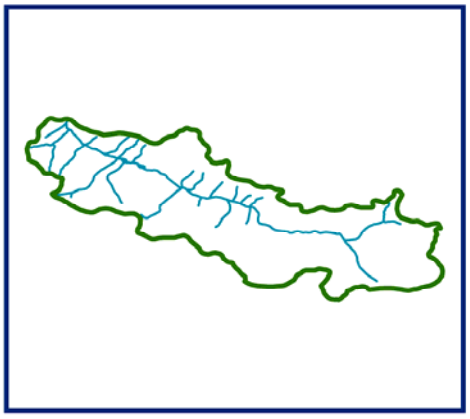
DATA NOT AVAILABLE



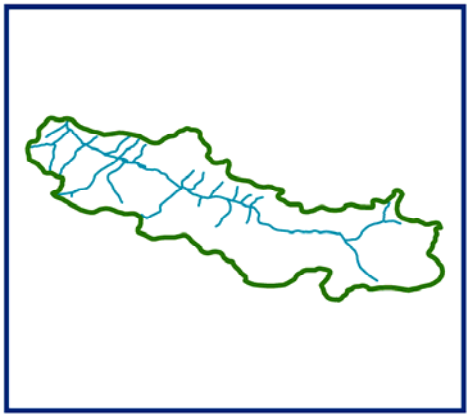
08 JUNE 2013



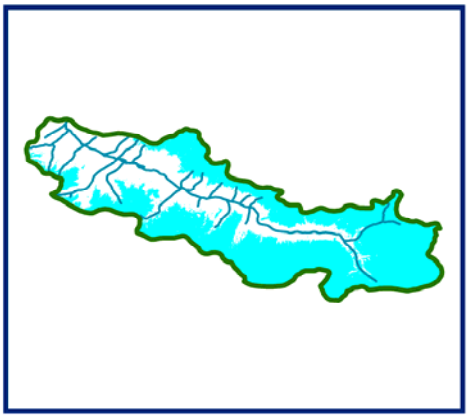
DATA NOT AVAILABLE



DATA NOT AVAILABLE



DATA NOT AVAILABLE

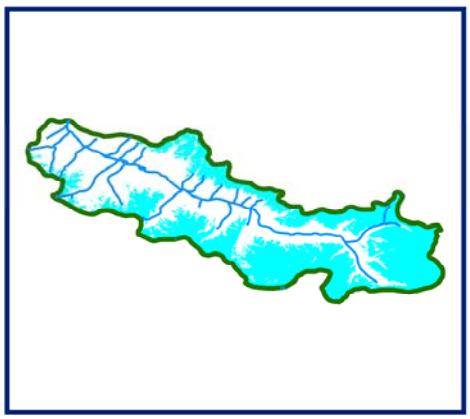


30 JUNE 2013

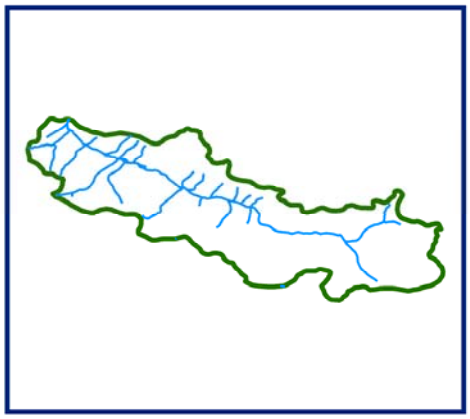
SNOW

10 5 0 10 20 30 40 Kilometers

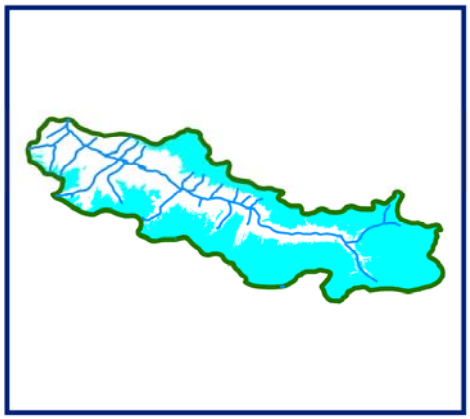
10 DAILY SNOW COVER MAP : BASPA BASIN



DATA USED
08 JUNE 2013



DATA USED
DATA NOT AVAILABLE



DATA USED
30 JUNE 2013

SNOW

10 5 0 10 20 30 40
Kilometers

JIWA BASIN

AREAL EXTENT OF SNOW (5 DAILY)

BASIN NAME: JIWA **BASIN AREA: 1445 sq km**

S No	DATE	Snow cover (sq km)	Snow cover (%)	Cloud Cover	S No	DATE	Snow cover (sq km)	Snow cover (%)	Cloud Cover
October 2012									
1	02-10-2012	133	9	Clear	**8**	19-10-2012	152	11	Clear
2	04-10-2012	199	14	10%	**9**	19-10-2012	161	11	Clear
3	06-10-2012	137	9	Clear	**10**	23-10-2012	68	5	45%
4	07-10-2012	125	9	Clear	**11**	24-10-2012	282	20	50%
5	11-10-2012	175	12	10%	**12**	28-10-2012	270	19	30%
6	14-10-2012	150	10	20%	**13**	30-10-2012	258	18	Clear
7	14-10-2012	150	10	20%	**14**	31-10-2012	207	14	Clear
November 2012									
1	04-11-2012	118	8	Clear	**7**	16-11-2012	142	10	Clear
2	05-11-2012	166	12	Clear	**8**	17-11-2012	138	10	Clear
3	07-11-2012	151	10	Clear	**9**	19-11-2012	179	12	Clear
4	07-11-2012	151	10	Clear	**10**	24-11-2012	227	16	30%
5	09-11-2012	101	7	Clear	**11**	26-11-2012	167	12	5%
6	12-11-2012	173	12	Clear					
December 2012									
1	01-12-2012	543	38	Clear	**4**	22-12-2012	515	37	Clear
2	17-12-2012	712	49	Clear	**5**	25-12-2012	470	33	Clear
3	22-12-2012	574	40	Clear	**6**	25-12-2012	470.6	33	Clear
January 2013									
1	03-01-2013	419	29	Clear	**7**	16-01-2013	142	10	Clear
2	06-01-2013	458	32	Clear	**8**	20-01-2013	1345	93	Clear
3	08-01-2013	398	28	Clear	**9**	25-01-2013	1038	72	Clear
4	10-01-2013	429	30	Clear	**10**	27-01-2013	541	37	Clear
5	11-01-2013	434	30	Clear					
6	13-01-2013	539	37	Clear					
February 2013									
1	01-02-2013	863	60	Clear	**5**	18-02-2013	1032	71	Clear
2	08-02-2013	1268	88	Clear	**6**	24-02-2013	912	63	Clear
3	09-02-2013	464	32	Clear	**7**	25-02-2013	912	63	Clear
4	11-02-2013	1051	73	70%	**8**	28-02-2013	615	43	25%
March 2013									
1	04-03-2013	645	45	25%	**7**	19-03-2013	653	45	Clear
2	05-03-2013	644	45	Clear	**8**	21-03-2013	318	22	60%
3	17-03-2013	767	53	15%					

4	07-03-2013	579	40	Clear	**10**	26-03-2013	594	41	Clear
5	12-03-2013	560	39	65%	**11**	31-03-2013	552	38	5%
6	16-03-2013	585	41	45%					
April 2013									
1	05-04-2013	537	37	Clear	**4**	17-04-2013	552	38	Clear
2	12-04-2013	552	38	Clear	**5**	19-04-2013	446	31	35%
3	14-04-2013	961	66	90%	**6**	24-04-2013	382	26	45%
May 2013									
1	03-05-2013	428	30	Clear	**5**	20-05-13	344	24	
2	04-05-2013	237	16	40%	**6**	23-05-13	357	25	
3	06-05-2013	493	34	85%	**7**	25-05-13	315	22	
4	08-05-2013	385	27	10%					
	June -2013								
1	08-06-2013	184	13			30-06-13	155	11	

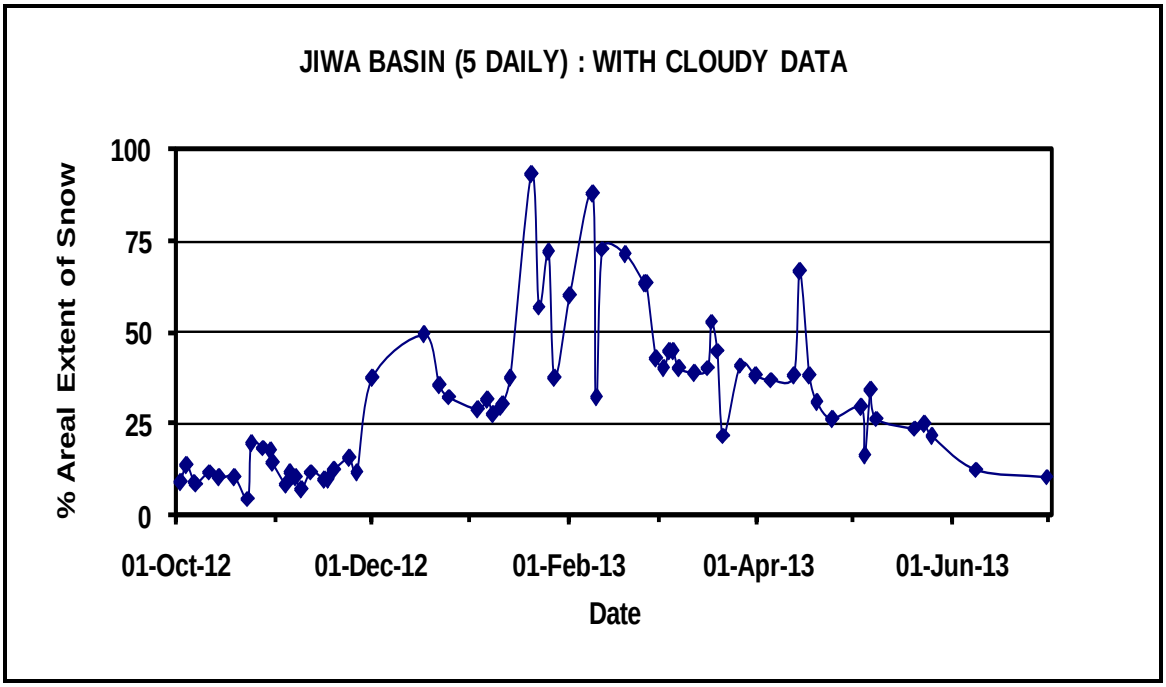
AREAL EXTENT OF SNOW (10 DAILY)

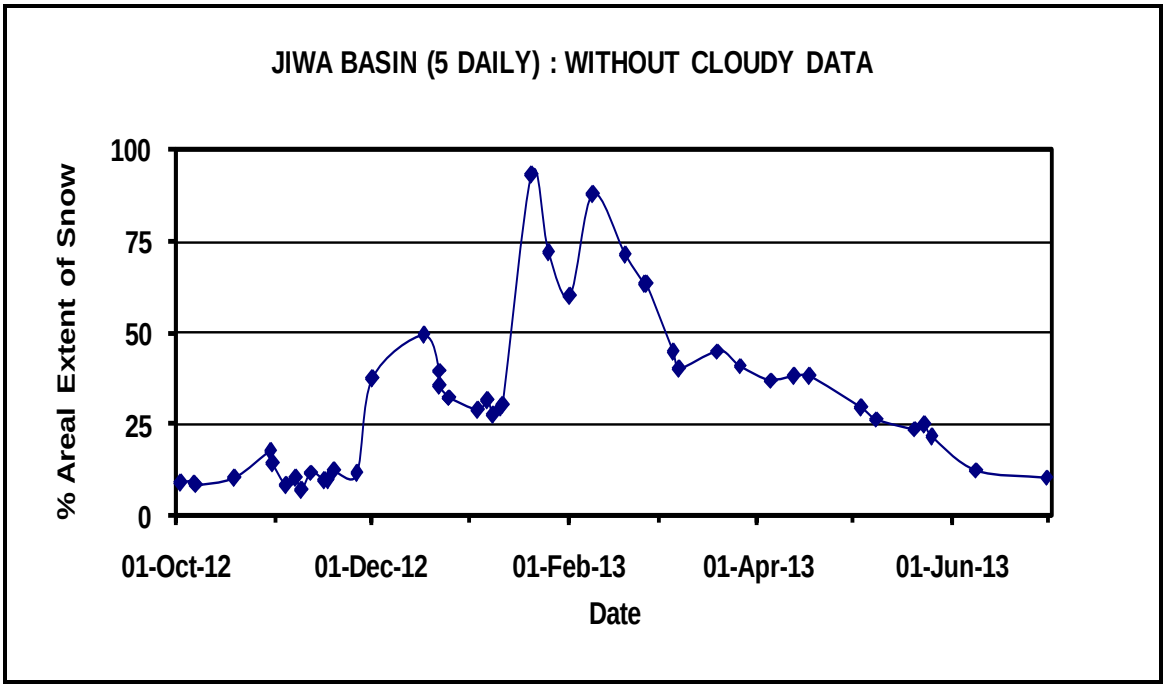
BASIN NAME: JIWA **BASIN AREA: 1445 sq km**

S No	Date	Snow cover (sq km)	Snow cover (%)	Cloud cover	S No	Date	Snow cover (sq km)	Snow cover (%)	Cloud cover
October 2012									
1.	02-Oct-12	145	10	Clear	7.	28-Oct-12	275	19	30%
2.	06-Oct-12			Clear	8.	30-Oct-12			Clear
3.	07-Oct-12			Clear	9.	31-Oct-12			Clear
4.	11-Oct-12	189	13	10%					
5.	14-Oct-12			20%					
6.	19-Oct-12			Clear					
November 2012									
1.	04-Nov-12	159	10	Clear	7.	24-Nov-12	217	11	30%
2.	07-Nov-12			Clear	8.	26-Nov-12			5%
3.	09-Nov-12			Clear					
4.	12-Nov-12	173	12	Clear					
5.	16-Nov-12			Clear					
6.	19-Nov-12			Clear					
December 2012									
1.	01-Dec-12	543	38	Clear	4.	22-Dec-12	578	40	Clear
2.	17-Dec-12	708	49	Clear	5.	25-Dec-12			Clear
3.	20-Dec-12								
January 2013									
1.	03-Jan-13	462	32	Clear	7.	25-Jan-13	1040	72	Clear
2.	06-Jan-13			Clear	8.	27-Jan-13			Clear
3.	08-Jan-13			Clear					
4.	11-Jan-13	1344	93	Clear					
5.	13-Jan-13			Clear					
6.	16-Jan-13			Clear					
February 2013									
1.	01-Feb-13	1272	88	Clear	5.	24-Feb-13	945	65	Clear
2.	08-Feb-13			Clear	6.	25-Feb-13			Clear
3.	09-Feb-13			Clear	7.	28-Feb-13			25%
4.	18-Feb-13	1032	71	Clear					

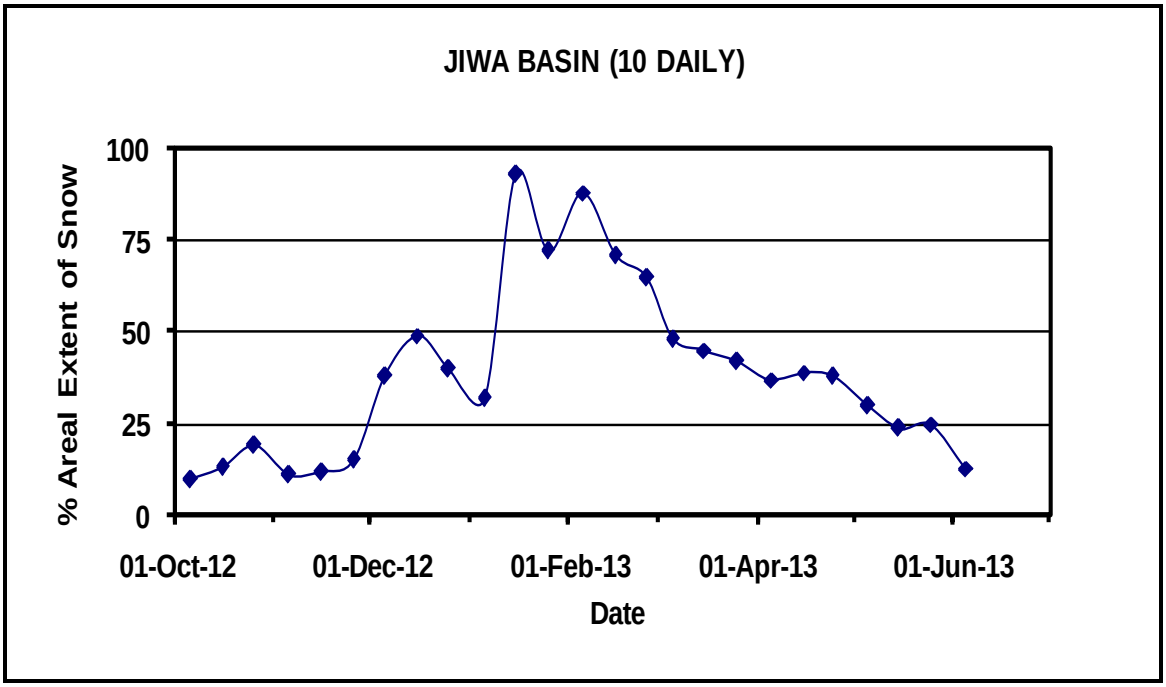
March 2013									
1.	04-Mar-13	697	48	25%	7.	26-Mar-13	611	42	Clear
2.	05-Mar-13			Clear	8.	31-Mar-13			5%
3.	07-Mar-13			Clear					
4.	12-Mar-13	656	45	65%					
5.	17-Mar-13			15%					
6.	19-Mar-13			Clear					
April 2013									
1.	05-Apr-13	537	37	Clear	5.	24-Apr-13	549	38	45%
2.	12-Apr-13	564	39	Clear					
3.	17-Apr-13			Clear					
4.	19-Apr-13			35%					
May 2013									
1.	03-May-13	434	30	Clear	5	23-may-13	316	22	
2.	04-May-13			40%		25-may-13			
3.	08-May-13			10%					
4	15-May-13	344	24						
June-2013									
1.	08-Jun-13	184	13						

Snow cover depletion curve



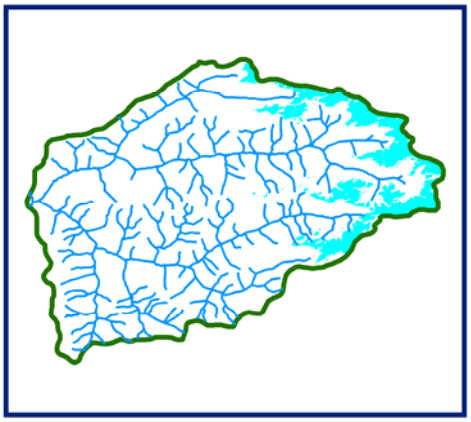


Snow cover depletion curve

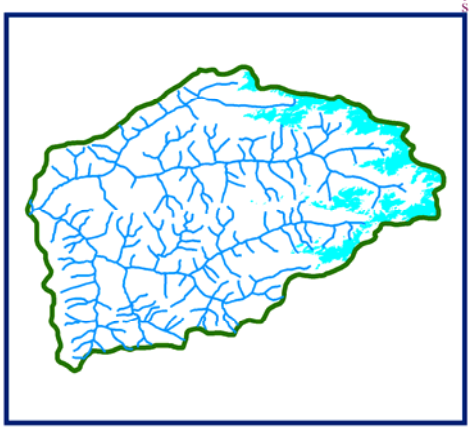


SNOW COVER MAP

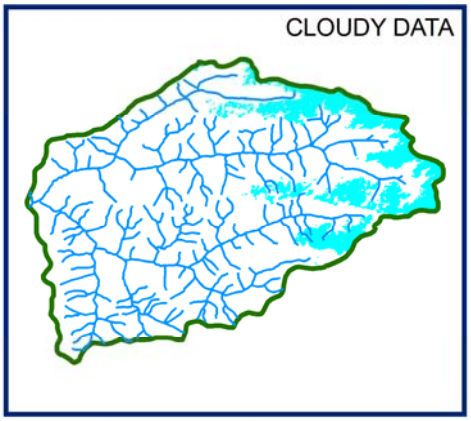
SNOW COVER MAP : JIWA BASIN



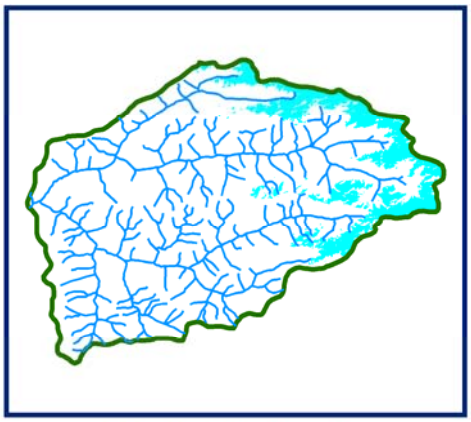
02 OCTOBER 2012



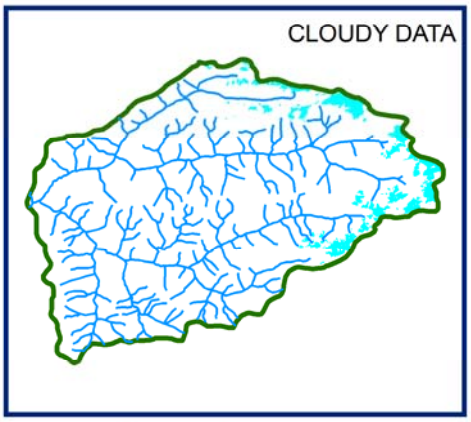
07 OCTOBER 2012



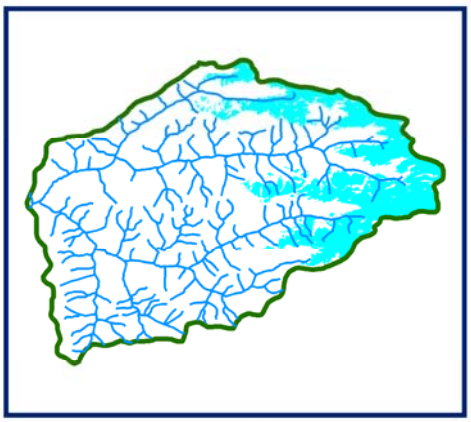
11 OCTOBER 2012



19 OCTOBER 2012



23 OCTOBER 2012



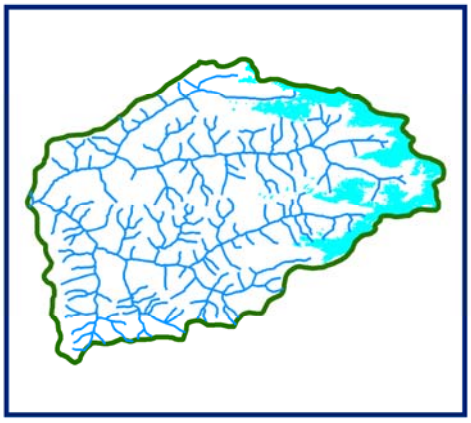
30 OCTOBER 2012

SNOW

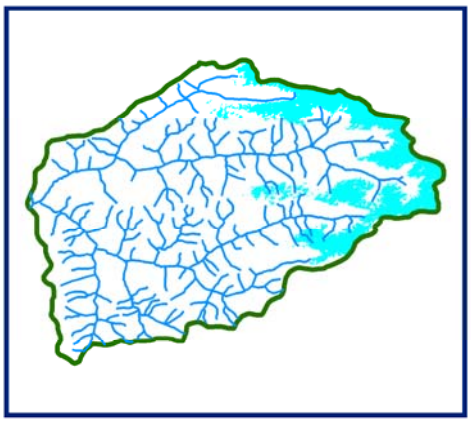
03.57 14 21 28

Kilometers

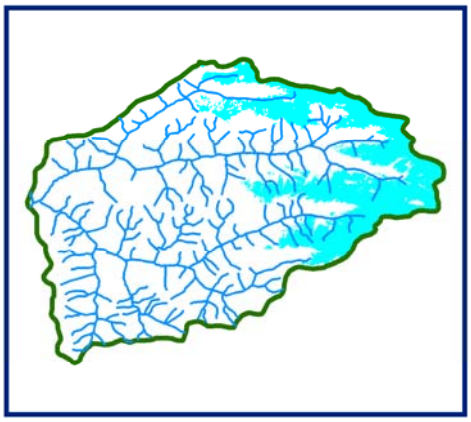
10 DAILY SNOW COVER MAP: JIWA BASIN



DATA USED
02 OCTOBER 2012
06 OCTOBER 2012
07 OCTOBER 2012



DATA USED
11 OCTOBER 2012
14 OCTOBER 2012
19 OCTOBER 2012

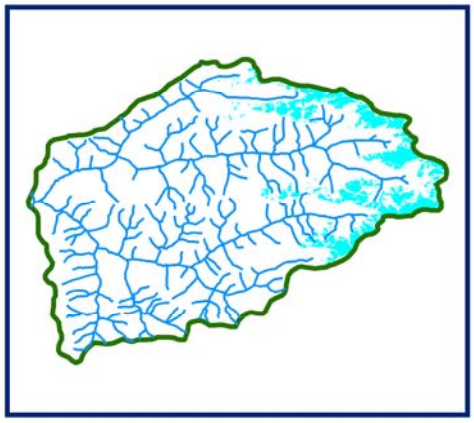


DATA USED
28 OCTOBER 2012
30 OCTOBER 2012
31 OCTOBER 2012

SNOW

0 3 6 9 12
Kilometers

SNOW COVER MAP : JIWA BASIN



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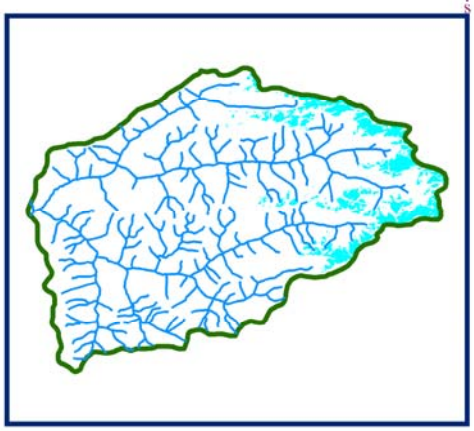
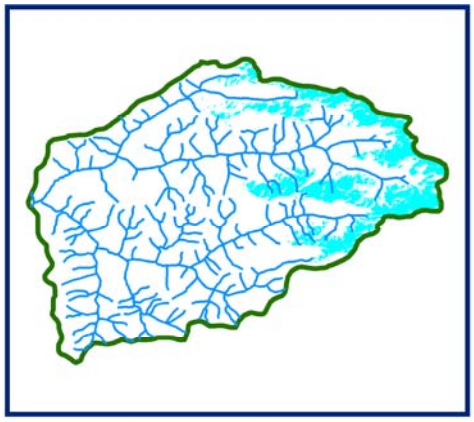
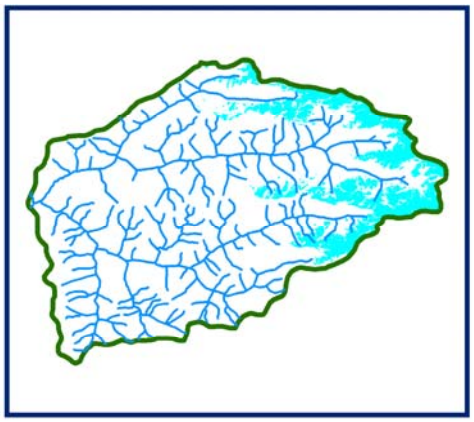


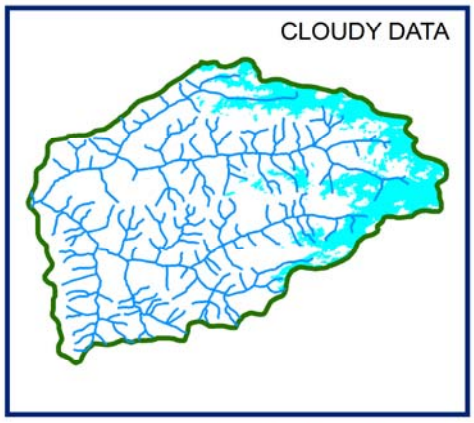
09 NOVEMBER 2012



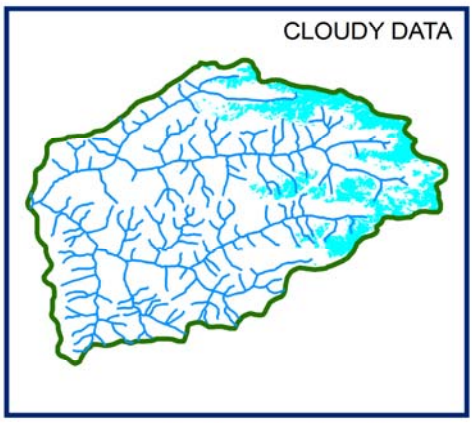
12 NOVEMBER 2012



19 NOVEMBER 2012



24 NOVEMBER 2012



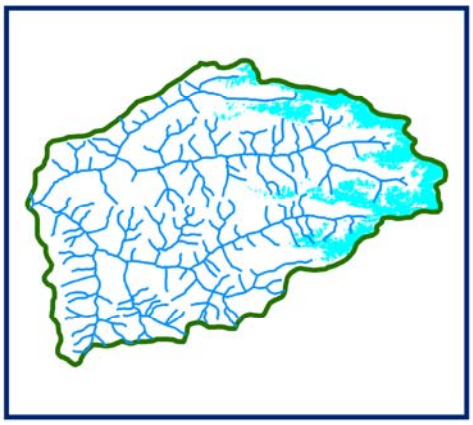
26 NOVEMBER 2012

SNOW

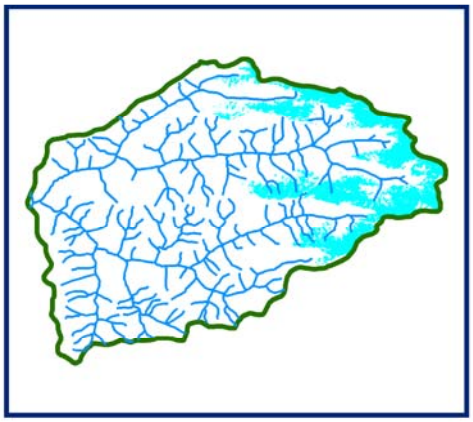
03.57 14 21 28

Kilometers

10 DAILY SNOW COVER MAP: JIWA BASIN



DATA USED
04 NOVEMBER 2012
07 NOVEMBER 2012
09 NOVEMBER 2012



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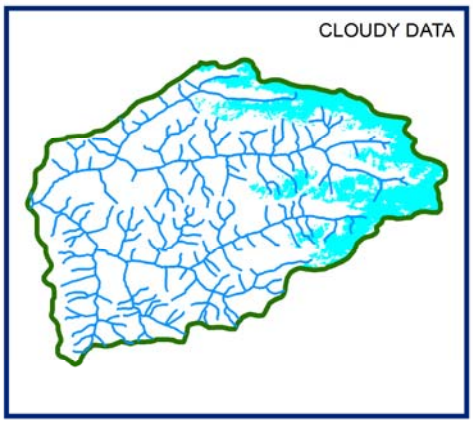
12 NOVEMBER 2012
16 NOVEMBER 2012
19 NOVEMBER 2012

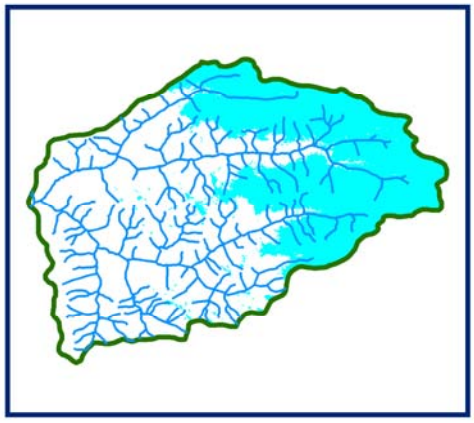


DATA USED
24 NOVEMBER 2012
26 NOVEMBER 2012

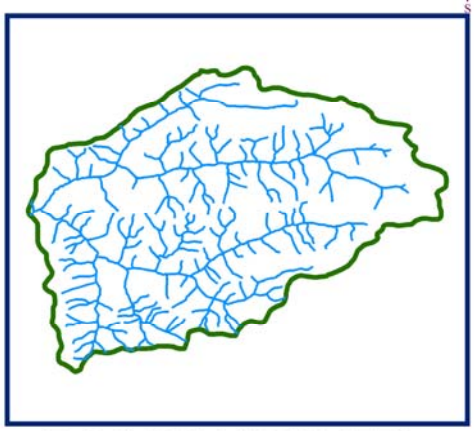
SNOW

0 3 6 912
Kilometers

SNOW COVER MAP : JIWA BASIN



01 DECEMBER 2012



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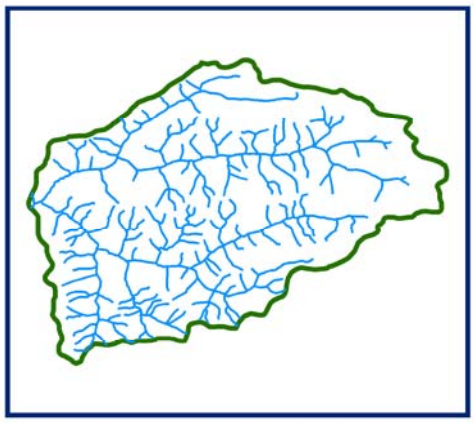

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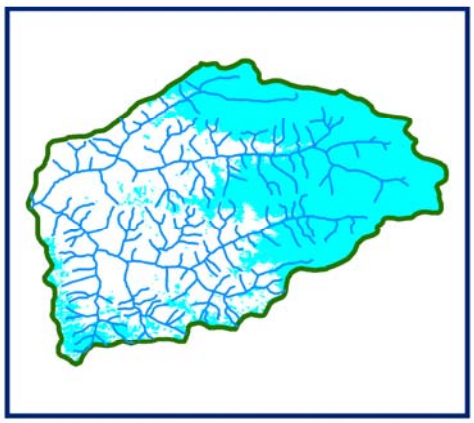
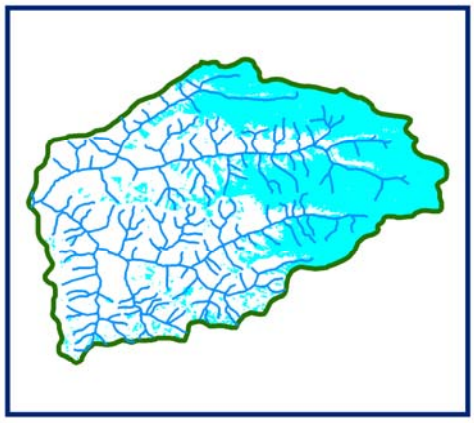
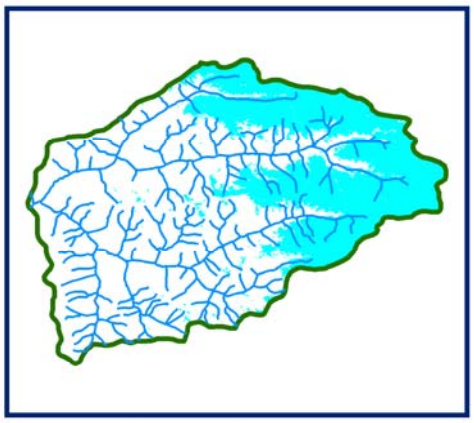


17 DECEMBER 2012



22 DECEMBER 2012



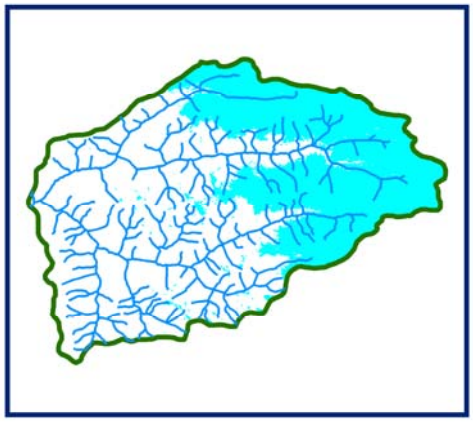
25 DECEMBER 2012

SNOW

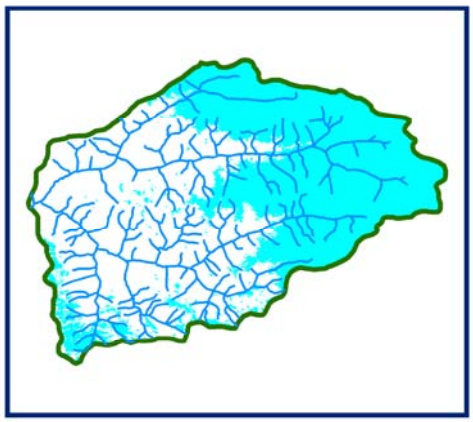
03.57 14 21 28

Kilometers

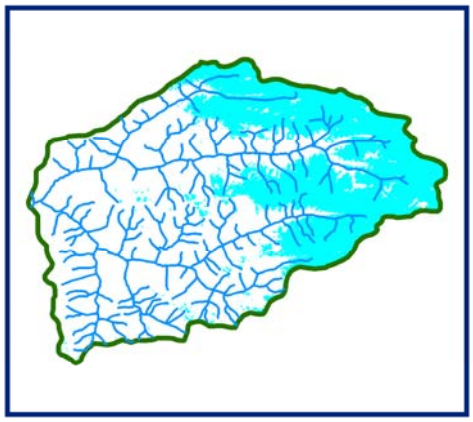
10 DAILY SNOW COVER MAP: JIWA BASIN



DATA USED
01 DECEMBER 2012



DATA USED
17 DECEMBER 2012
20 DECEMBER 2012

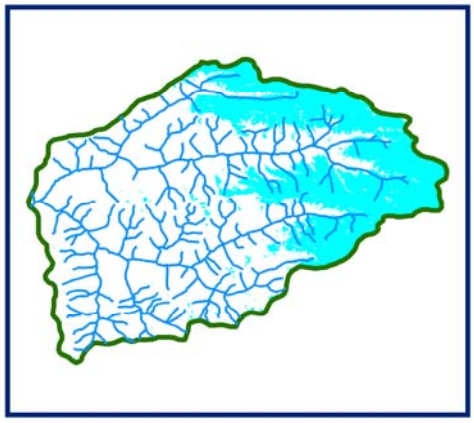


DATA USED
22 DECEMBER 2012
25 DECEMBER 2012

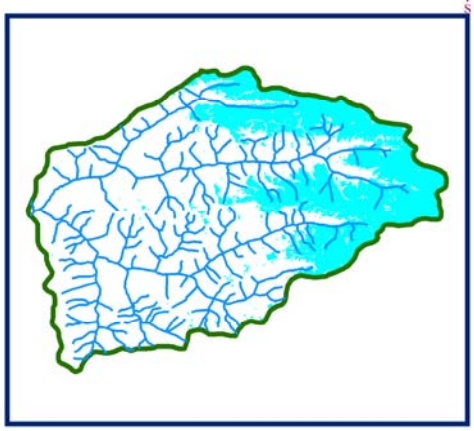
SNOW

0 3 6 912
Kilometers

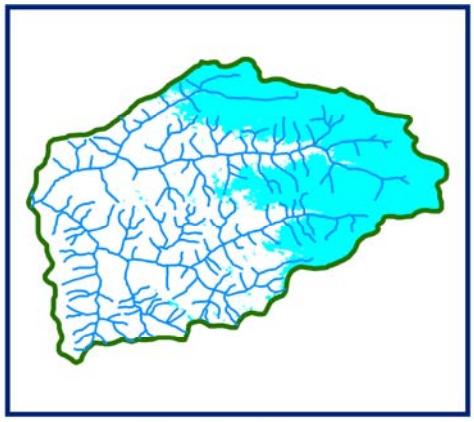
SNOW COVER MAP : JIWA BASIN



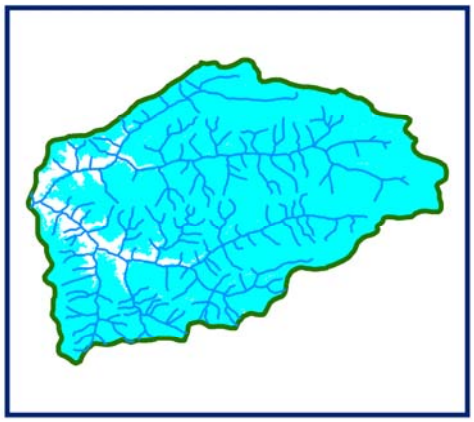
03 JANUARY 2013



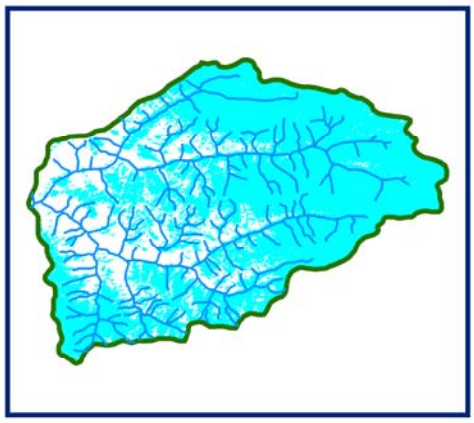
08 JANUARY 2013



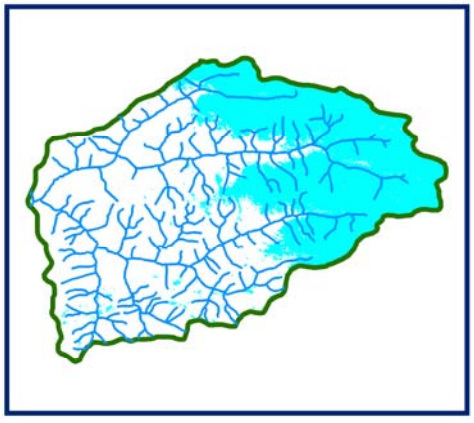
13 JANUARY 2013



20 JANUARY 2013



25 JANUARY 2013



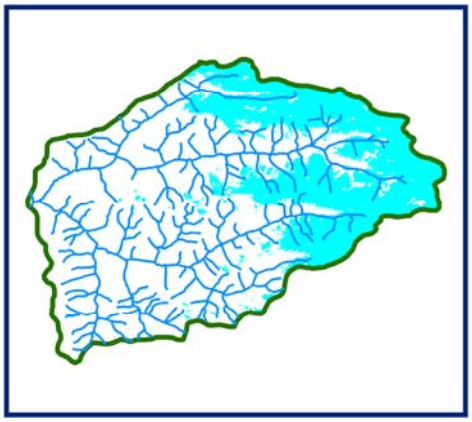
27 JANUARY 2013

SNOW

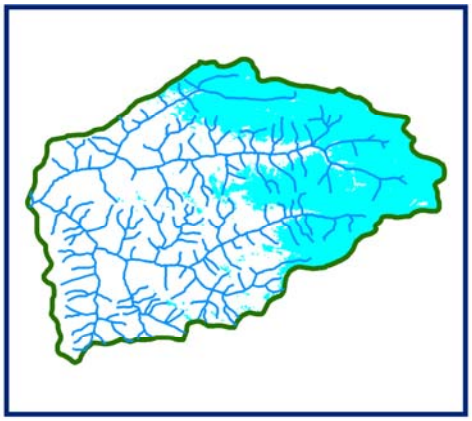
03.57 14 21 28

Kilometers

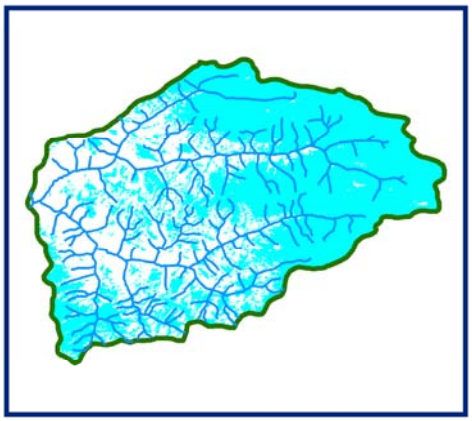
10 DAILY SNOW COVER MAP: JIWA BASIN



DATA USED
03 JANUARY 2013
06 JANUARY 2013
08 JANUARY 2013



DATA USED
11 JANUARY 2013
13 JANUARY 2013
16 JANUARY 2013

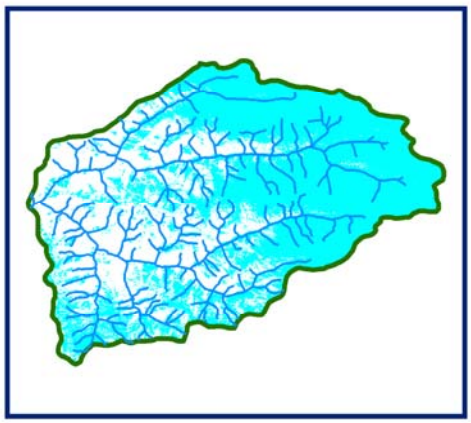


DATA USED
25 JANUARY 2013
27 JANUARY 2013

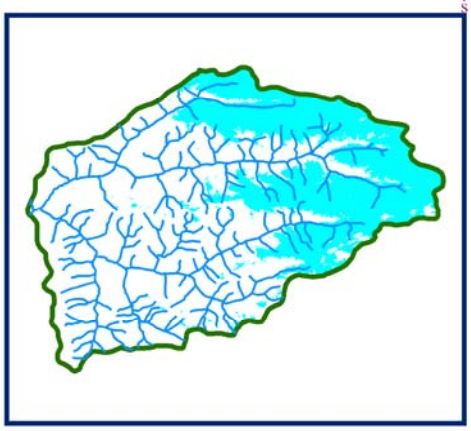
SNOW

0 3 6 9 12
Kilometers

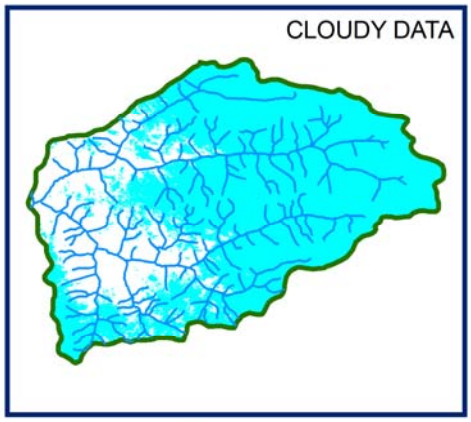
SNOW COVER MAP : JIWA BASIN



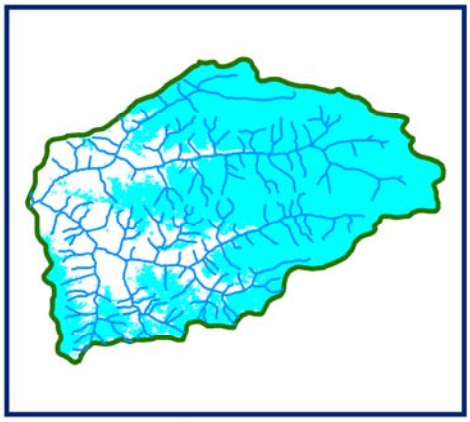
01 FEBRUARY 2013



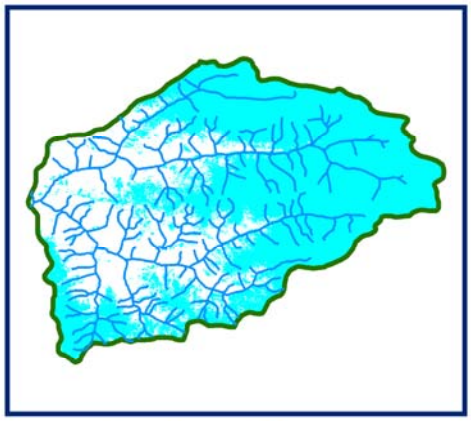
09 FEBRUARY 2013



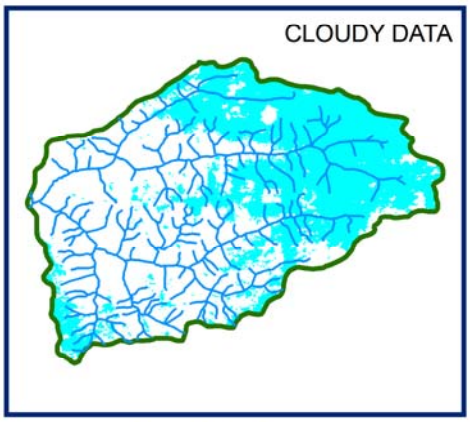
11 FEBRUARY 2013



18 FEBRUARY 2013



24 FEBRUARY 2013



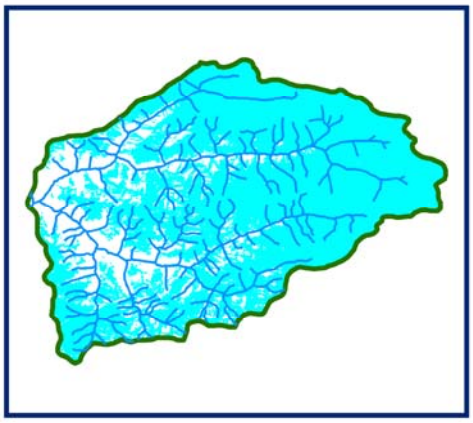
28 FEBRUARY 2013

SNOW

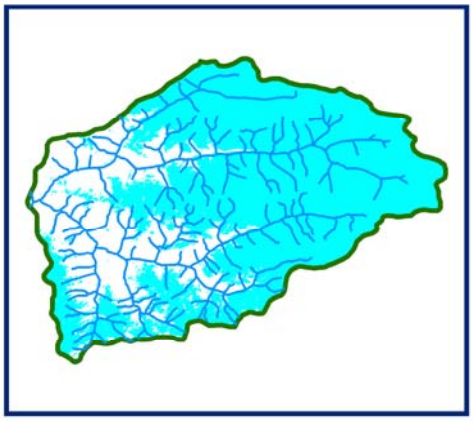
03.57 14 21 28

Kilometers

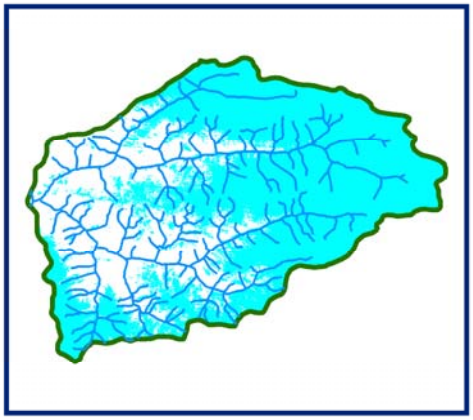
10 DAILY SNOW COVER MAP: JIWA BASIN



DATA USED
01 FEBRUARY 2013
08 FEBRUARY 2013
09 FEBRUARY 2013



DATA USED
18 FEBRUARY 2013

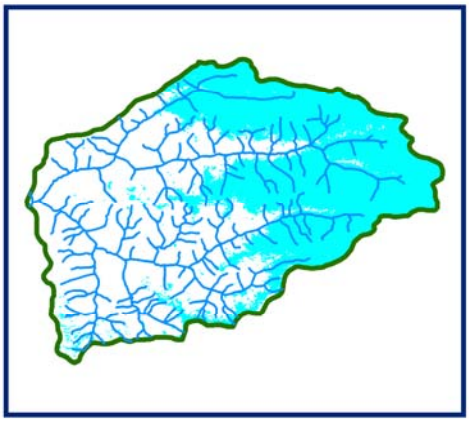


DATA USED
24 FEBRUARY 2013
25 FEBRUARY 2013
28 FEBRUARY 2013

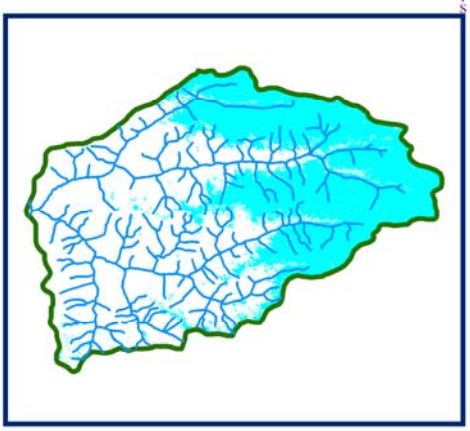
SNOW

0 3 6 912
Kilometers

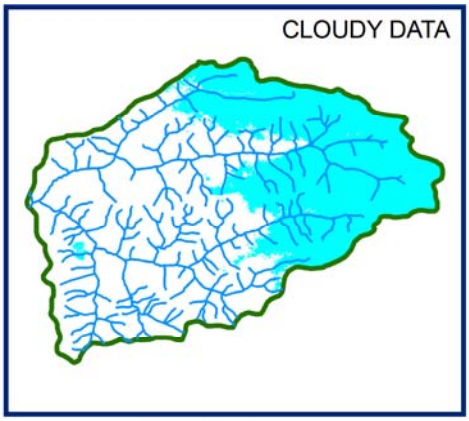
SNOW COVER MAP : JIWA BASIN



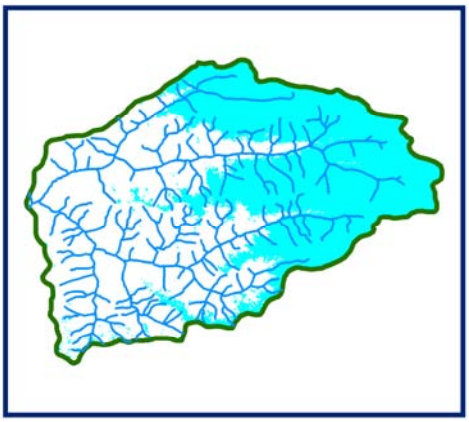
05 MARCH 2013



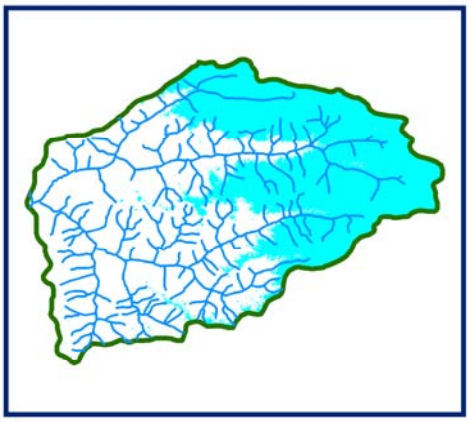
07 MARCH 2013



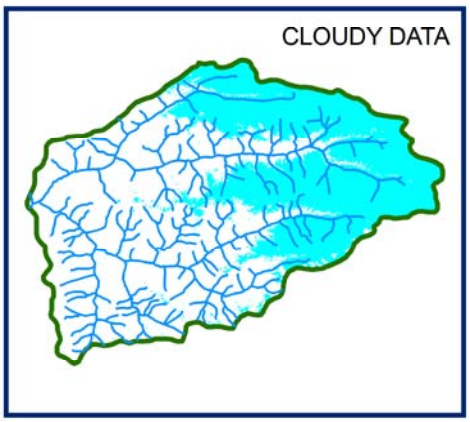
12 MARCH 2013



19 MARCH 2013



26 MARCH 2013



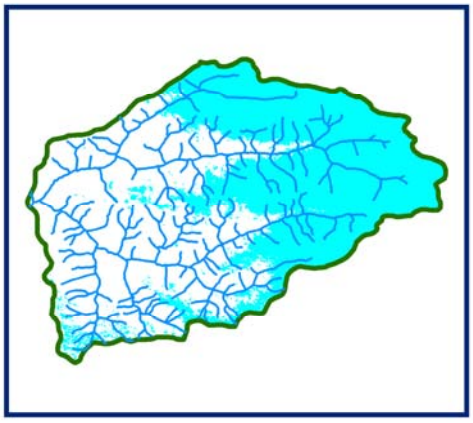
31 MARCH 2013

SNOW

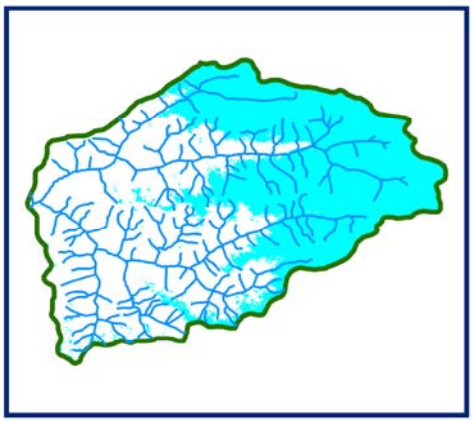
03.57 14 21 28

Kilometers

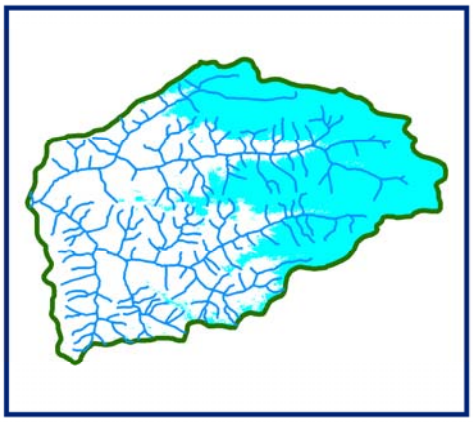
10 DAILY SNOW COVER MAP: JIWA BASIN



DATA USED
04 MARCH 2013
05 MARCH 2013
07 MARCH 2013



DATA USED
12 MARCH 2013
17 MARCH 2013
19 MARCH 2013

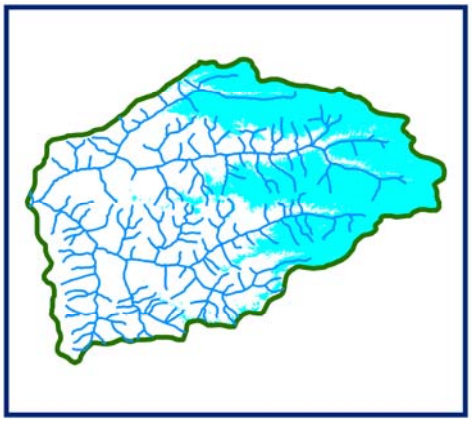


DATA USED
26 MARCH 2013
31 MARCH 2013

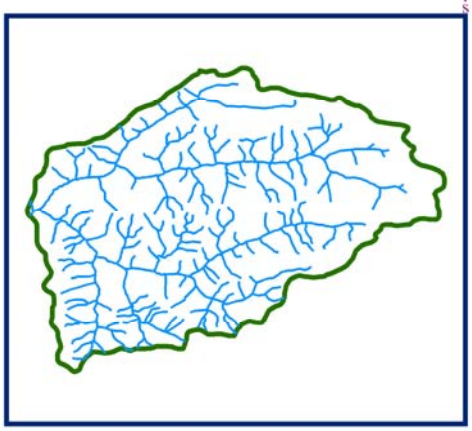
SNOW

0 3 6 9 12
Kilometers

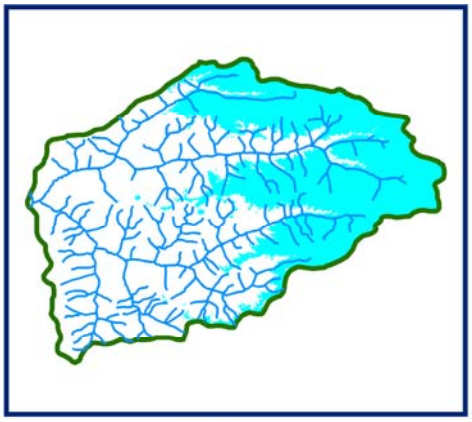
SNOW COVER MAP : JIWA BASIN



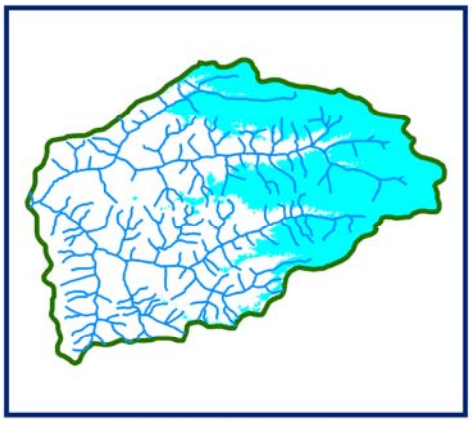
05 APRIL 2013



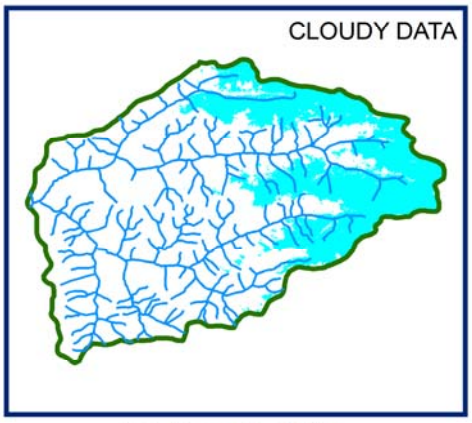
DATA NOT AVAILABLE



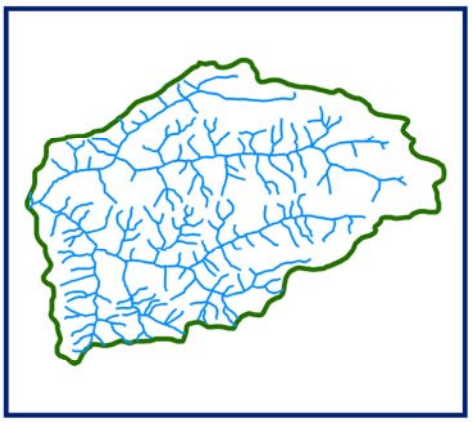
12 APRIL 2013



17 APRIL 2013



24 APRIL 2013

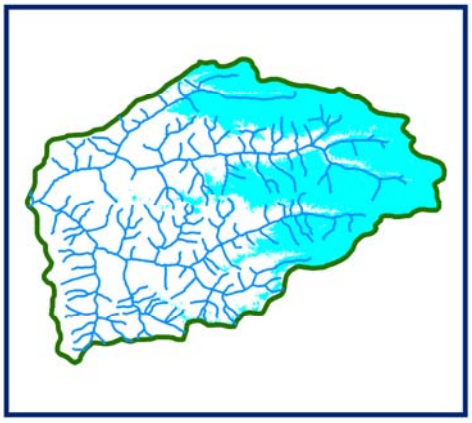


DATA NOT AVAILABLE

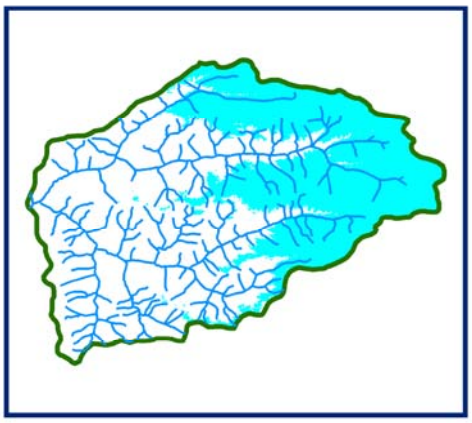
SNOW

03.57 14 21 28
Kilometers

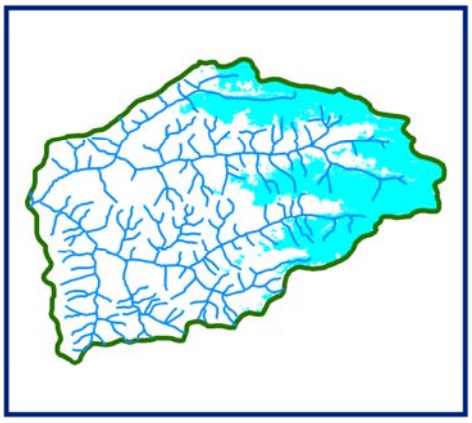
10 DAILY SNOW COVER MAP: JIWA BASIN



DATA USED
05 APRIL 2013



DATA USED
12 APRIL 2013
17 APRIL 2013
19 APRIL 2013

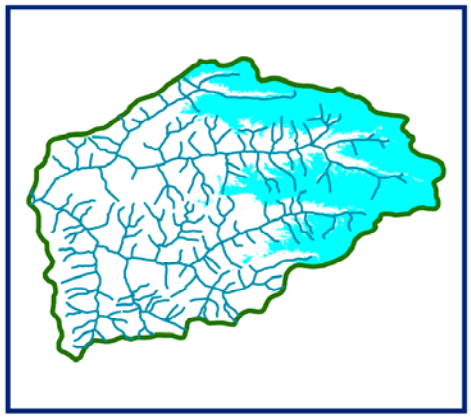


DATA USED
24 APRIL 2013

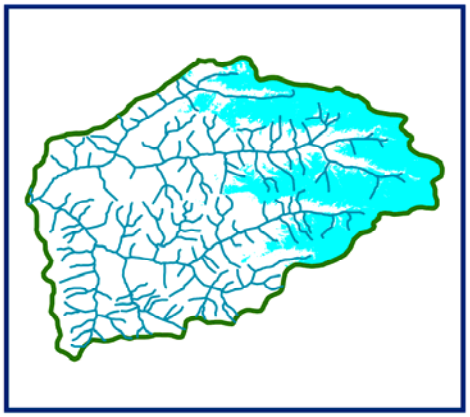
SNOW

0 3 6 9 12
Kilometers

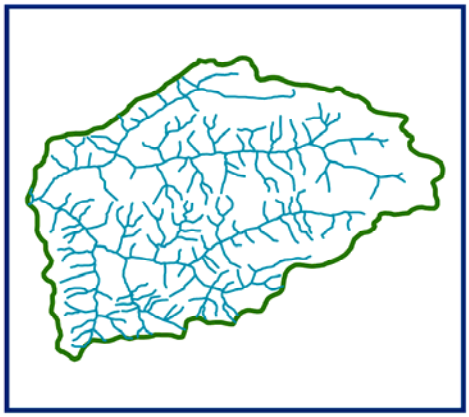
SNOW COVER MAP : JIWA BASIN



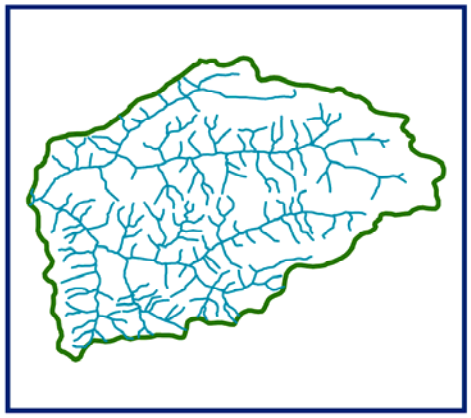
03 MAY 2013



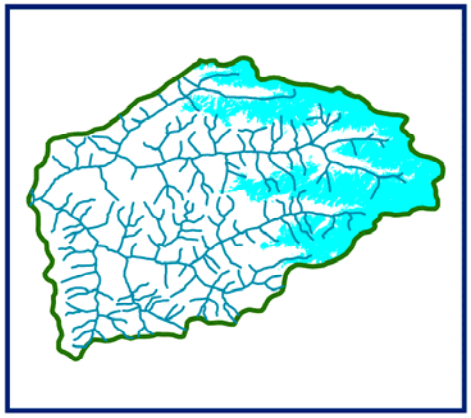
08 MAY 2013



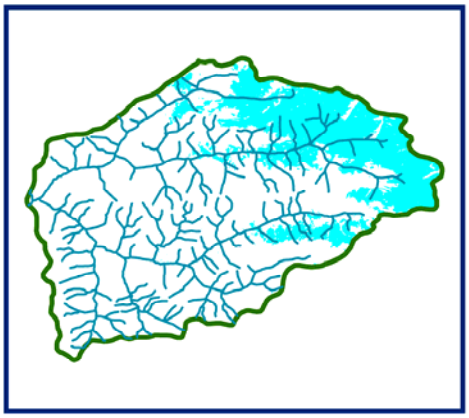
DATA NOT AVAILABLE



20 MAY 2013



23 MAY 2013

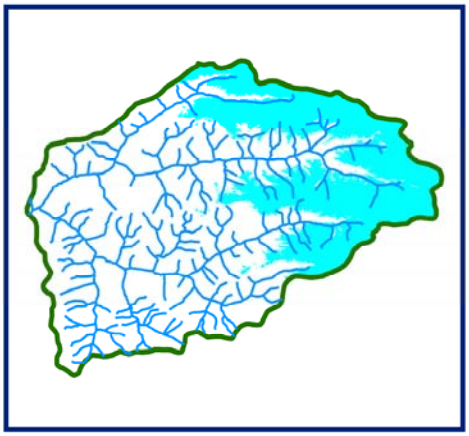


30 MAY 2013

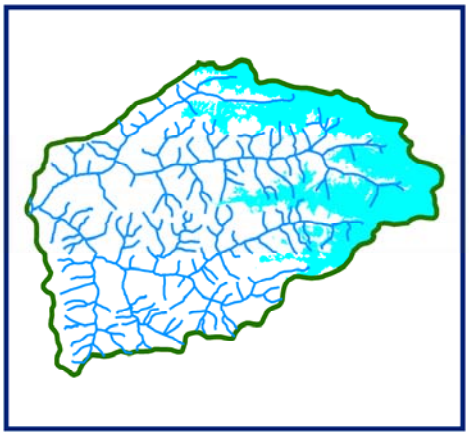
SNOW

73.50 7 14 21 28 Kilometers

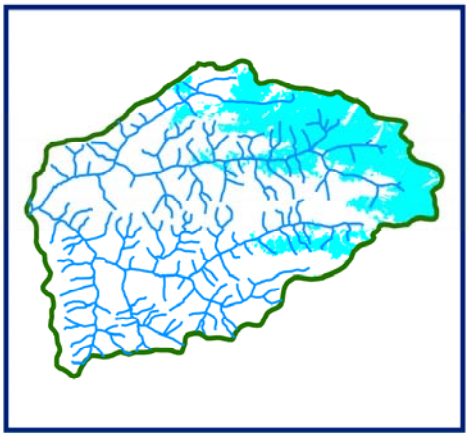
10 DAILY SNOW COVER MAP : JIWA BASIN



DATA USED
03 MAY 2013
04 MAY 2013
08 MAY 2013



DATA USED
20 MAY 2013

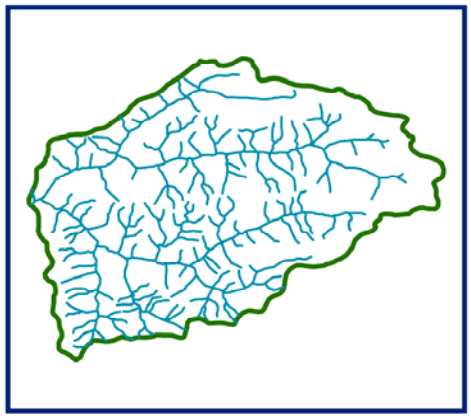


DATA USED
23 MAY 2013
25 MAY 2013

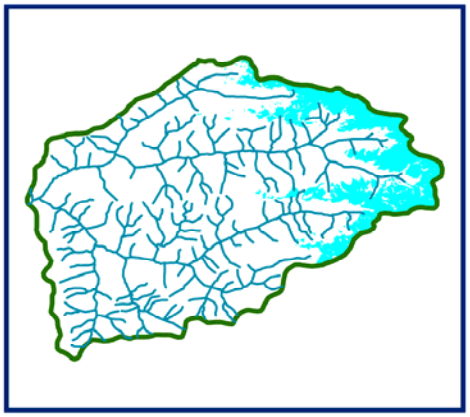
SNOW

9 4.5 0 9 18 27 36 Kilometers

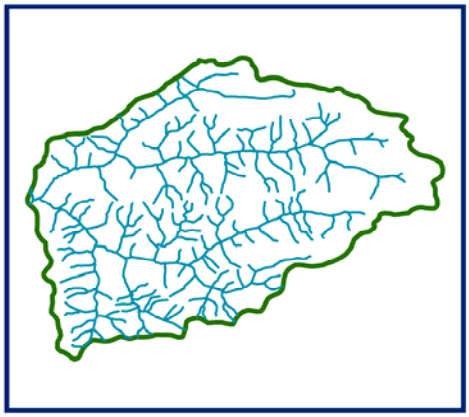
SNOW COVER MAP : JIWA BASIN



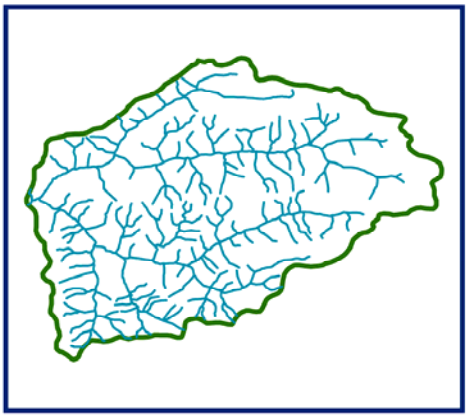
DATA NOT AVAILABLE



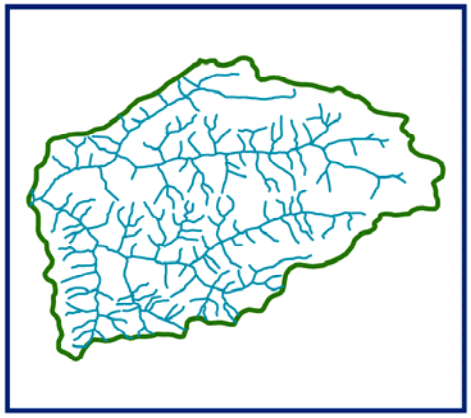
08 JUNE 2013



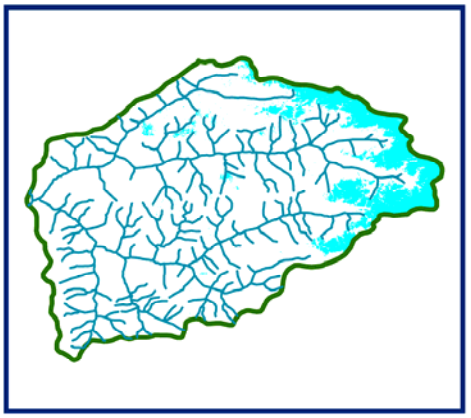
DATA NOT AVAILABLE



DATA NOT AVAILABLE



DATA NOT AVAILABLE

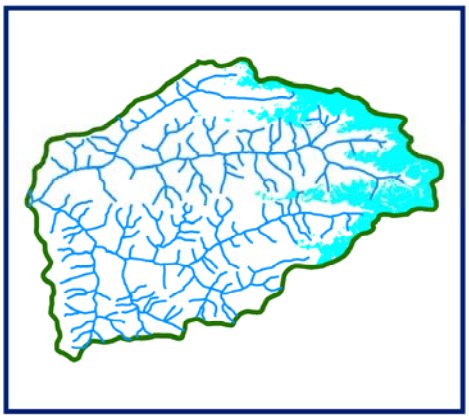


30 JUNE 2013

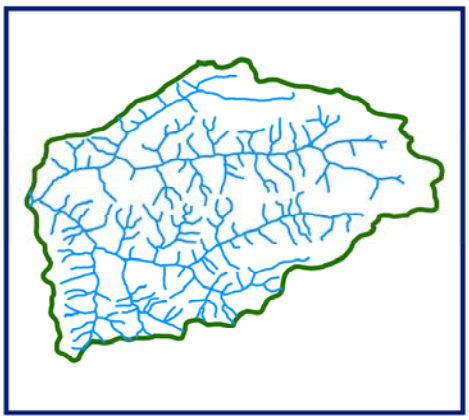
SNOW

10 5 0 10 20 30 40 Kilometers

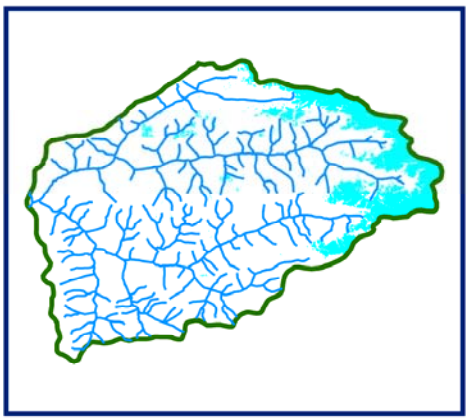
10 DAILY SNOW COVER MAP : JIWA BASIN



DATA USED
08 JUNE 2013



DATA USED
DATA NOT AVAILABLE



DATA USED
30 JUNE 2013

SNOW

10 5 0 10 20 30 40 Kilometers

PARBATI BASIN

AREAL EXTENT OF SNOW (5 DAILY)

BASIN NAME: PARBATI **BASIN AREA: 1773 sq km**

S No	DATE	Snow cover (sq km)	Snow cover (%)	Cloud Cover	S No	DATE	Snow cover (sq km)	Snow cover (%)	Cloud Cover
October 2012									
1	02-10-2012	555	31	Clear	**10**	19-10-2012	775	44	Clear
2	02-10-2012	554	31	Clear	**11**	19-10-2012	773	44	Clear
3	04-10-2012	917	52	Clear	**12**	23-10-2012	677	38	45%
4	06-10-2012	646	36	Clear	**13**	24-10-2012	1016	57	15%
5	07-10-2012	572	32	Clear	**14**	26-10-2012	846	48	5%
6	11-10-2012	864	49	Clear	**15**	28-10-2012	838	47	35%
7	12-10-2012	563	32	Clear	**16**	30-10-2012	805	45	Clear
8	14-10-2012	650	37	5%	**17**	31-10-2012	721	41	Clear
9	14-10-2012	652	37	5%					
November 2012									
1	04-11-2012	520	29	Clear	**8**	16-11-2012	568	32	Clear
2	05-11-2012	641	36	Clear	**9**	17-11-2012	520	29	Clear
3	07-11-2012	627	35	Clear	**10**	17-11-2012	518	29	Clear
4	07-11-2012	626	35	Clear	**11**	19-11-2012	666	38	Clear
5	09-11-2012	470	27	Clear	**12**	19-11-2012	773	44	Clear
6	12-11-2012	564	32	Clear	**13**	24-11-2012	1102	62	Clear
7	14-11-2012	619	35	Clear	**14**	26-11-2012	874	49	Clear
December 2012									
1	01-12-2012	1358	77	Clear	**5**	25-12-2012	1288	73	Clear
2	17-12-2012	1524	86	Clear	**6**	25-12-2012	1291	73	Clear
3	22-12-2012	1420	80	Clear	**7**	29-12-2012	1307	74	Clear
4	23-12-2012	1347	76	Clear					
January 2013									
1	03-01-2013	1233	70	Clear	**7**	13-01-2013	1407	79	5%
2	06-01-2013	1289	73	Clear	**8**	20-01-2013	1741	98	Clear
3	08-01-2013	1217	69	Clear	**9**	22-01-2013	1698	96	Clear
4	10-01-2013	1276	72	Clear	**10**	25-01-2013	1585	89	Clear
5	11-01-2013	1261	71	Clear	**11**	27-01-2013	1393	79	20%
6	13-01-2013	1405	79	5%					
February 2013									
1	01-02-2013	1532	86	Clear	**5**	18-02-2013	1613	91	Clear
2	08-02-2013	1706	96	Clear	**6**	20-02-2013	1469	83	Clear
3	09-02-2013	1625	92	Clear	**7**	25-02-2013	1587	90	Clear

4	11-02-2013	1645	93	80%	**8**	28-02-2013	1474	83	20%
March 2013									
1	02-03-2013	1528	86	Clear	**7**	17-03-2013	1495	84	Clear
2	04-03-2013	1443	81	80%	**8**	19-03-2013	1438	81	Clear
3	05-03-2013	1441	81	Clear	**9**	21-03-2013	1250	70	25%
4	07-03-2013	1384	78	Clear	**10**	26-03-2013	1413	80	Clear
5	12-03-2013	1395	79	50%	**11**	31-03-2013	1357	77	Clear
6	16-03-2013	1436	81	40%					
April 2013									
1	04-04-2013	1345	76	Clear	**7**	17-04-2013	1340	76	Clear
2	05-04-2013	1320	74	Clear	**8**	19-04-2013	1258	71	5%
3	07-04-2013	1378	78	Clear	**9**	19-04-2013	1258	71	5%
4	12-04-2013	1334	75	Clear	**10**	24-04-2013	1165	66	Clear
5	14-04-2013	1264	71	30%					
May 2013									
1	03-05-2013	1218	69	Clear	**5**	20-05-13	1123	63	Clear
2	04-05-2013	1129	64	20%	**6**	23-05-13	1092	62	Clear
3	06-05-2013	1147	65	35%	**7**	25-05-13	959	54	Clear
4	08-05-2013	1136	64	15%					
June-2013									
1	08-06-13	825	47	Clear	**2**	30-06-13	728	41	Clear

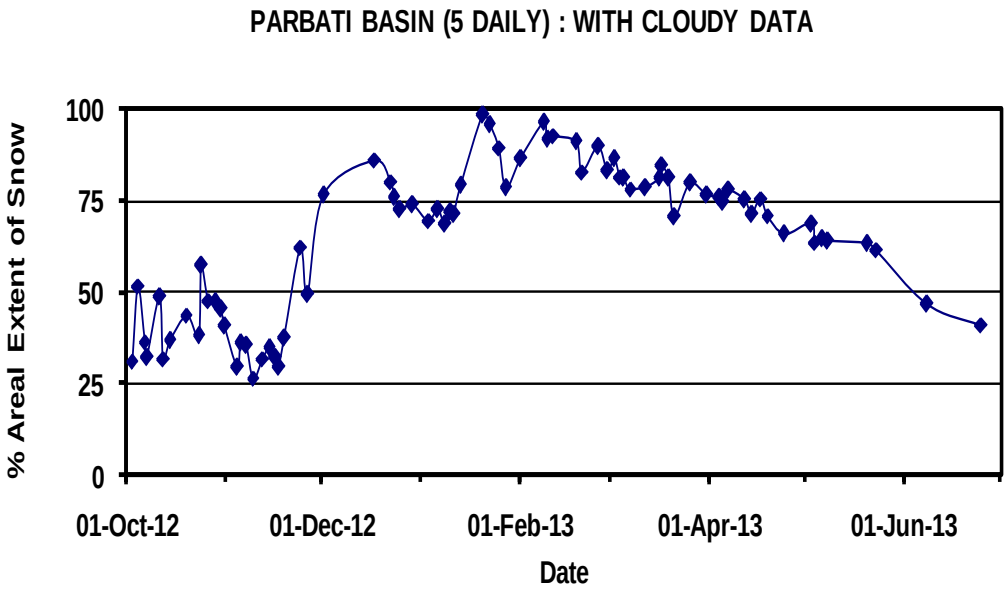
AREAL EXTENT OF SNOW (10 DAILY)

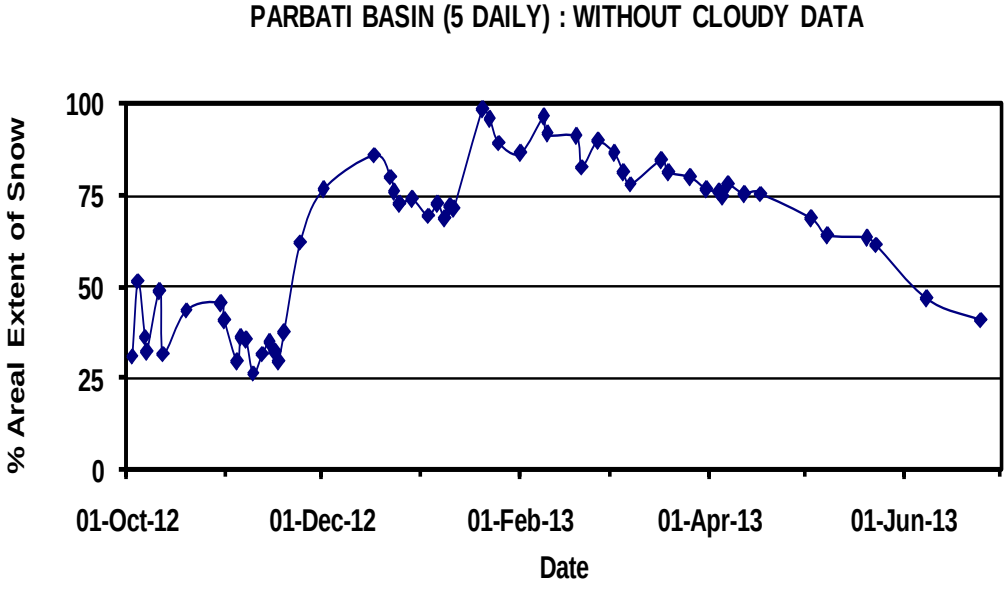
BASIN NAME: PARBATI **BASIN AREA: 1773 sq km**

S No	Date	Snow cover (sq km)	Snow cover (%)	Cloud cover	S No	Date	Snow cover (sq km)	Snow cover (%)	Cloud cover
October 2012									
1.	02-Oct-12	922	52	Clear	7.	24-Oct-12	798	45	15%
2.	04-Oct-12			Clear	8.	26-Oct-12			5%
3.	07-Oct-12			Clear	9.	30-Oct-12			Clear
4.	11-Oct-12	869	49	Clear					
5.	12-Oct-12			Clear					
6.	19-Oct-12			Clear					
November 2012									
1.	04-Nov-12	647	36	Clear	7.	24-Nov-12	1099	62	Clear
2.	07-Nov-12			Clear	8.	26-Nov-12			Clear
3.	09-Nov-12			Clear					
4.	12-Nov-12	674	38	Clear					
5.	16-Nov-12			Clear					
6.	19-Nov-12			Clear					
December 2012									
1.	01-Dec-12	1358	77	Clear	3.	22-Dec-12	1418	80	Clear
2.	17-Dec-12	1524	86	Clear	4.	25-Dec-12			Clear
					5.	29-Dec-12			Clear
January 2013									
1.	03-Jan-13	1294	73	Clear	5.	22-Jan-13	1702	96	Clear
2.	06-Jan-13			Clear	6.	25-Jan-13			Clear
3.	10-Jan-13			Clear	7.	27-Jan-13			20%
4.	11-Jan-13	1737	98	Clear					
5.	13-Jan-13			5%					
6.	20-Jan-13			Clear					
February 2013									
1.	01-Feb-13	1702	96	Clear	6.	25-Feb-13	1596	90	Clear
2.	08-Feb-13			Clear	7.	28-Feb-13			20%
3.	09-Feb-13			Clear					
4.	18-Feb-13	1613	91	Clear					
5.	20-Feb-13			Clear					
March 2013									
1.	02-Mar-13	1525	86	Clear					

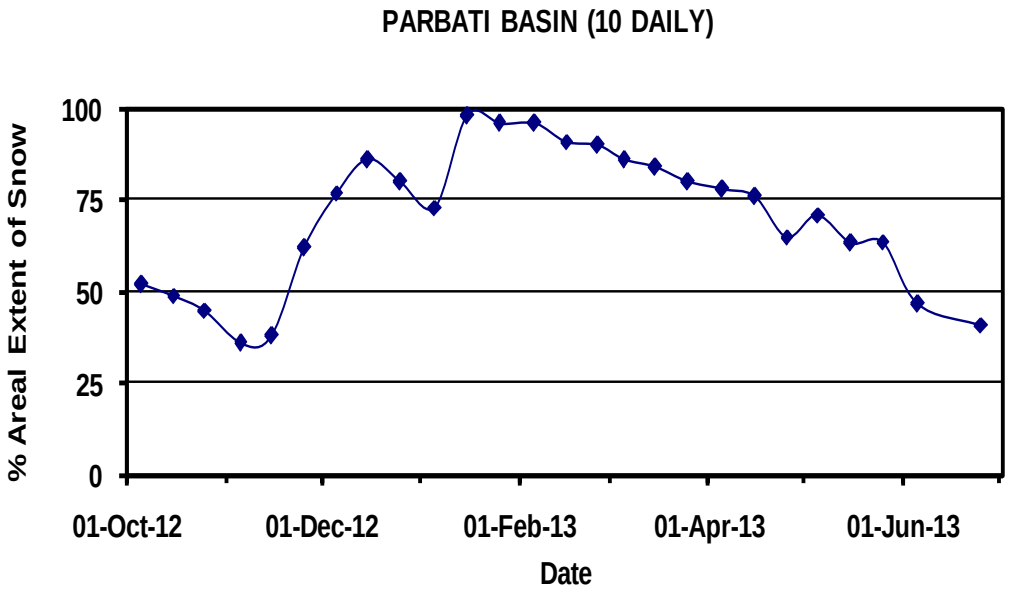
2.	05-Mar-13			Clear					
3.	07-Mar-13			Clear	7.	21-Mar-13			25%
4.	12-Mar-13			50%	8.	26-Mar-13	1418	80	Clear
5.	17-Mar-13	1489	84	Clear	9.	31-Mar-13			Clear
6.	19-Mar-13			Clear					
April 2013									
1.	04-Apr-13			Clear	7.	24-Apr-13	1152	65	Clear
2.	05-Apr-13	1383	78	Clear					
3.	07-Apr-13			Clear					
4..	12-Apr-13			Clear					
5.	17-Apr-13	1347	76	Clear					
6.	19-Apr-13			5%					
May 2013									
1.	03-May-13			Clear					
2.	06-May-13	1259	71	35%					
3.	08-May-13			15%					
4.	15-may-13	1123	63		.				
5.	23-May-13	1128	64						
	25-May-13								
June-2013									
1.	8-Jun-13	825	47	2.	30-Jun-13	727.95	41		

Snow cover depletion curve

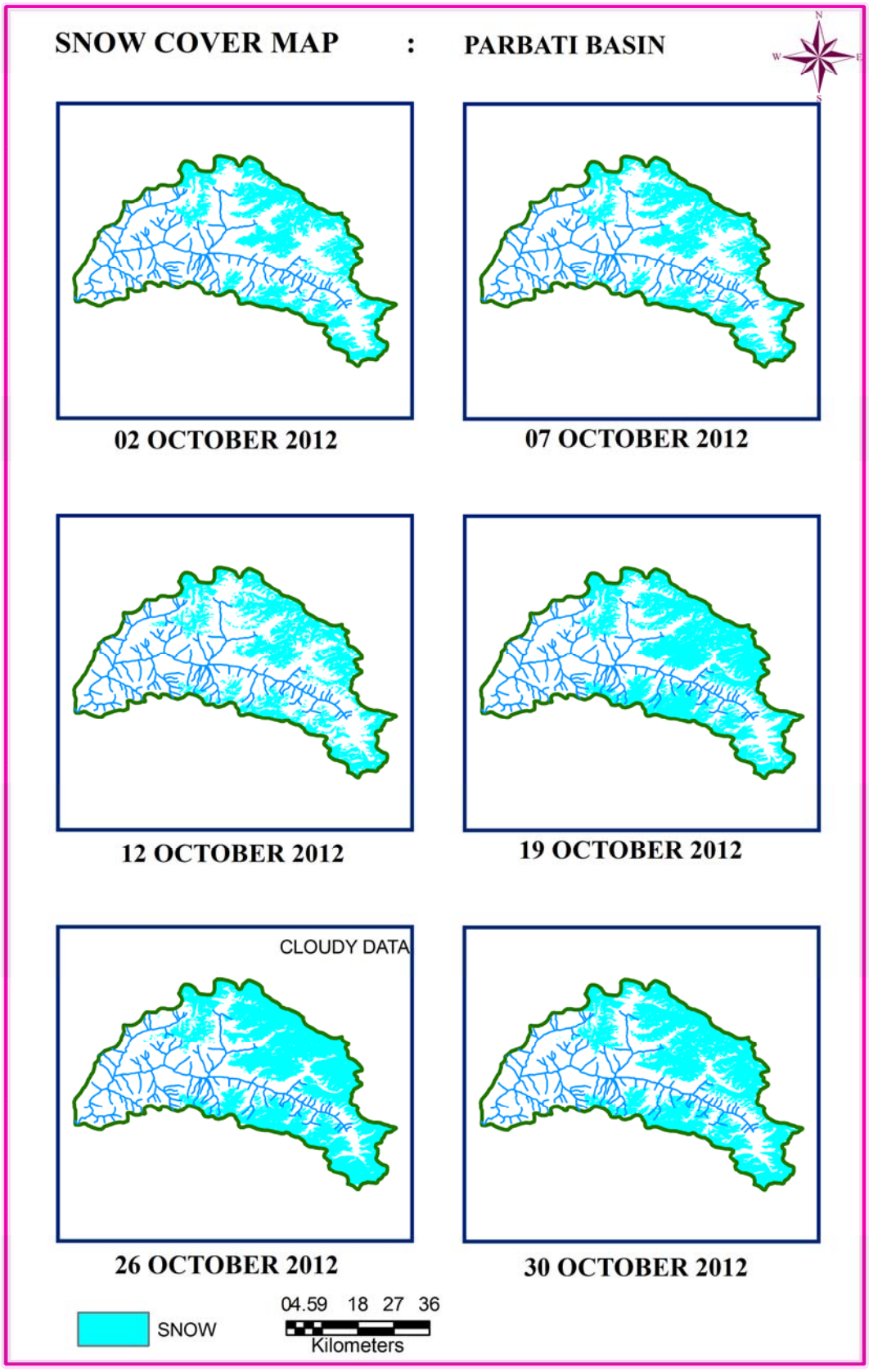




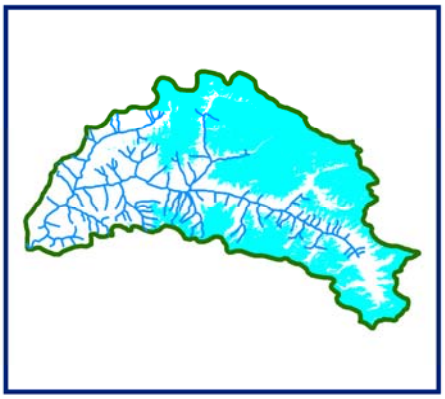
Snow cover depletion curve



SNOW COVER MAP


SNOW COVER MAP : PARBATI BASIN
N
W
E
S
02 OCTOBER 2012
07 OCTOBER 2012
12 OCTOBER 2012
19 OCTOBER 2012
CLOUDY DATA
26 OCTOBER 2012
30 OCTOBER 2012
SNOW
04.59 18 27 36
Kilometers

10 DAILY SNOW COVER MAP: PARBATI BASIN



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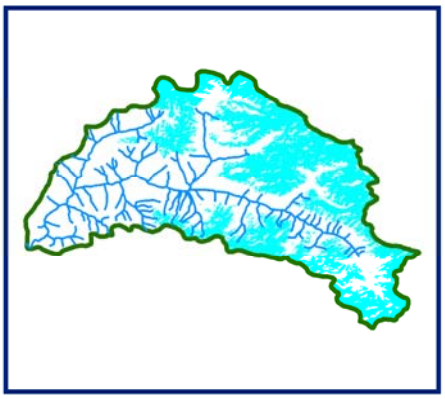
07 OCTOBER 2012



DATA USED
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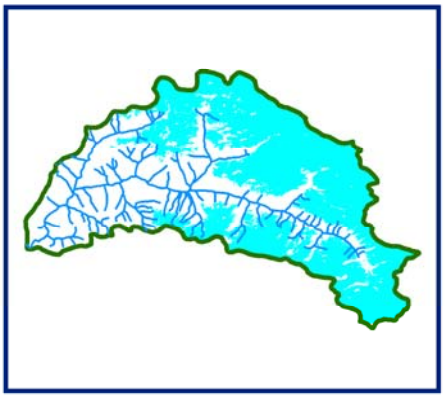
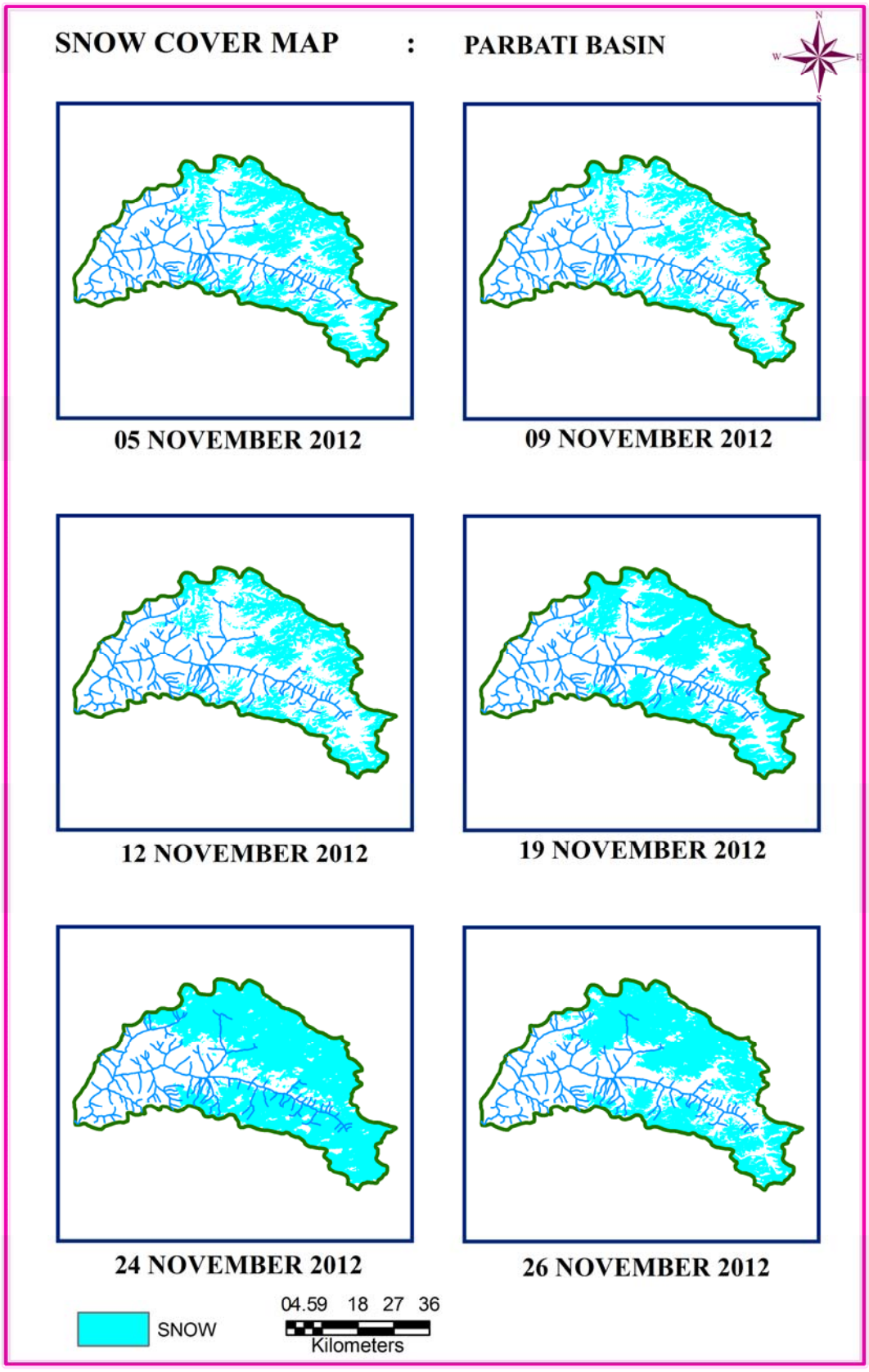
12 OCTOBER 2012
19 OCTOBER 2012



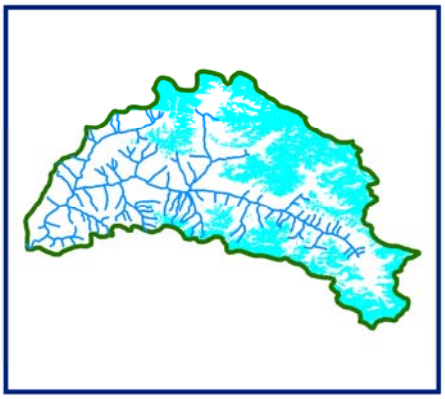
DATA USED
24 OCTOBER 2012
26 OCTOBER 2012
30 OCTOBER 2012

SNOW

04.59 18 27 36
Kilometers


SNOW COVER MAP : PARBATI BASIN
N
W
E
S
05 NOVEMBER 2012
09 NOVEMBER 2012
12 NOVEMBER 2012
19 NOVEMBER 2012
24 NOVEMBER 2012
26 NOVEMBER 2012
SNOW
04.59 18 27 36
Kilometers

10 DAILY SNOW COVER MAP: PARBATI BASIN



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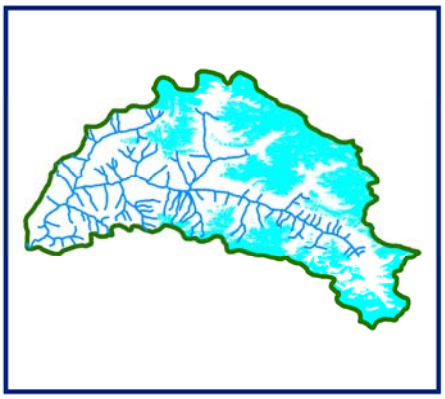
09 NOVEMBER 2012



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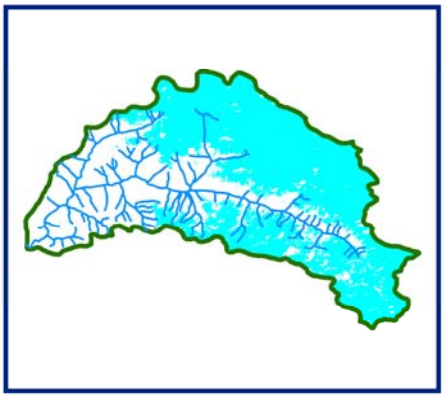
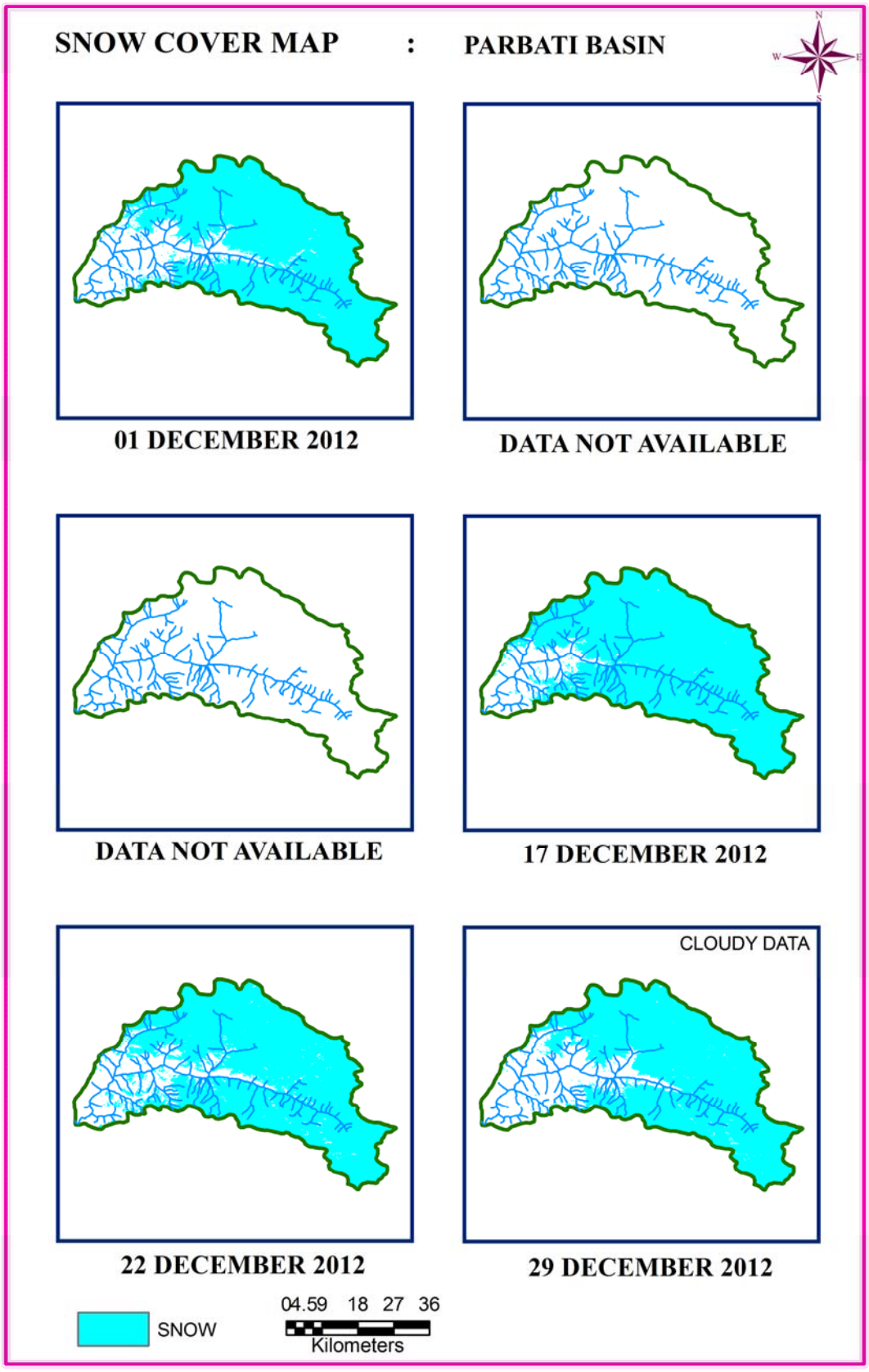
19 NOVEMBER 2012



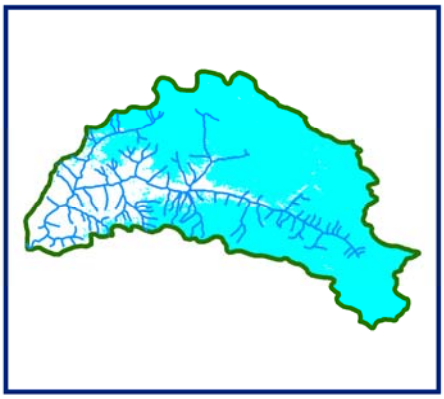
DATA USED
24 NOVEMBER 2012
26 NOVEMBER 2012

SNOW

04.59 18 27 36
Kilometers


SNOW COVER MAP : PARBATI BASIN
N
W
E
S
01 DECEMBER 2012
DATA NOT AVAILABLE
DATA NOT AVAILABLE
17 DECEMBER 2012
CLOUDY DATA
22 DECEMBER 2012
29 DECEMBER 2012
SNOW
04.59 18 27 36
Kilometers

10 DAILY SNOW COVER MAP: PARBATI BASIN



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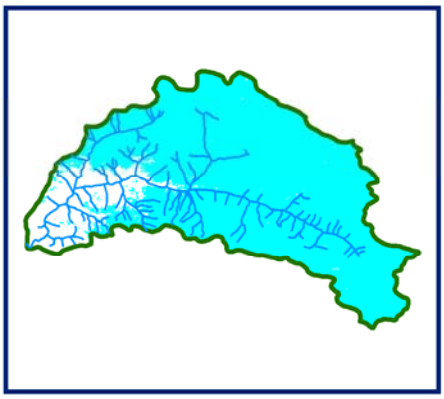

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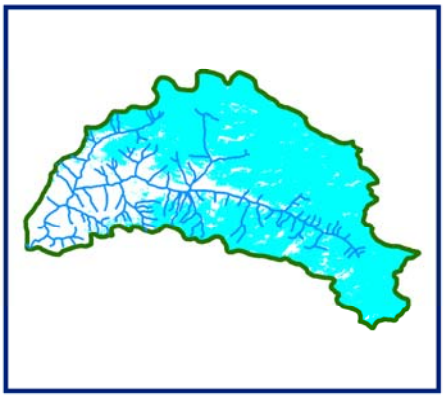
17 DECEMBER 2012

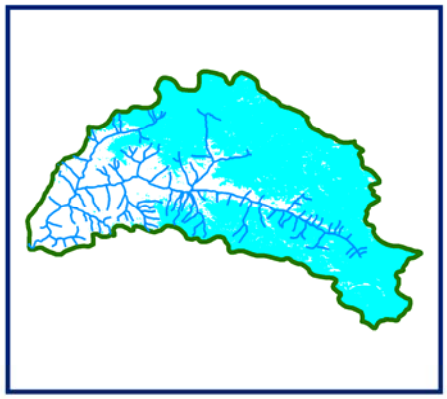


DATA USED
22 DECEMBER 2012
25 DECEMBER 2012
29 DECEMBER 2012

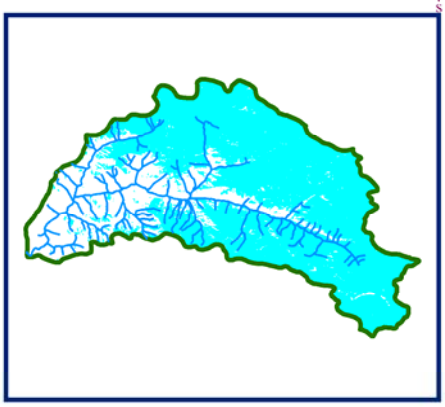
SNOW

04.59 18 27 36
Kilometers

SNOW COVER MAP : PARBATI BASIN



03 JANUARY 2013



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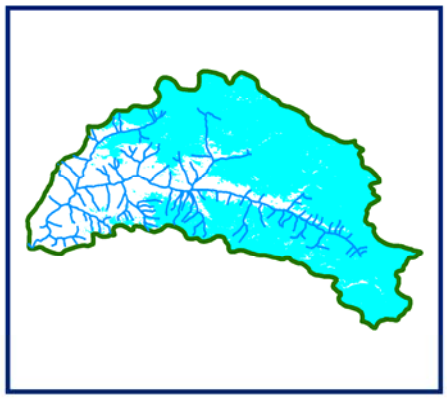

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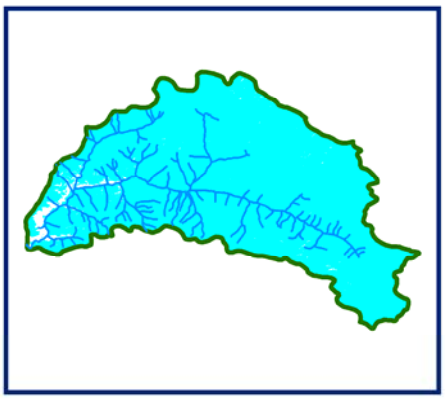

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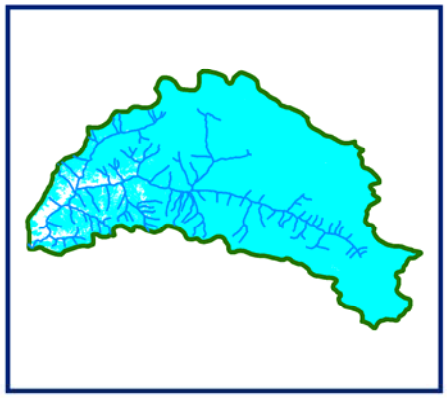

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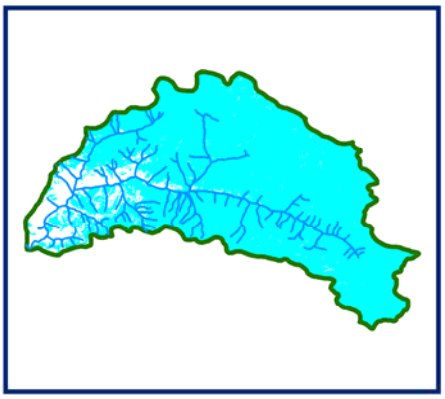


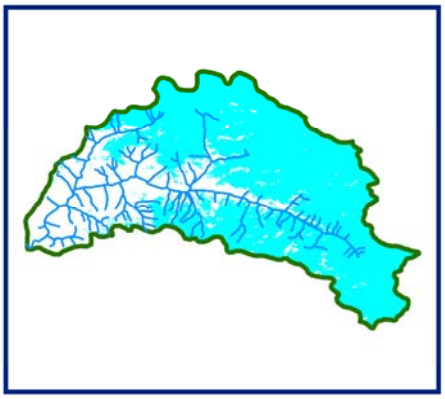
25 JANUARY 2013

SNOW

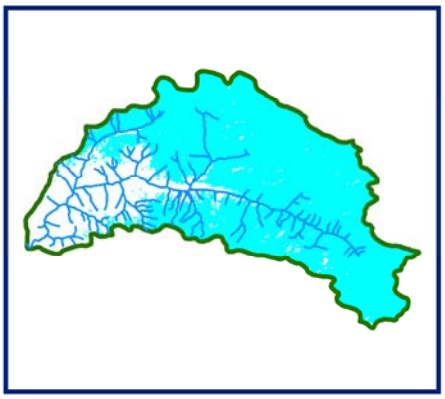
04.59 18 27 36

Kilometers

10 DAILY SNOW COVER MAP: PARBATI BASIN



DATA USED
03 JANUARY 2013
06 JANUARY 2013
10 JANUARY 2013



DATA USED
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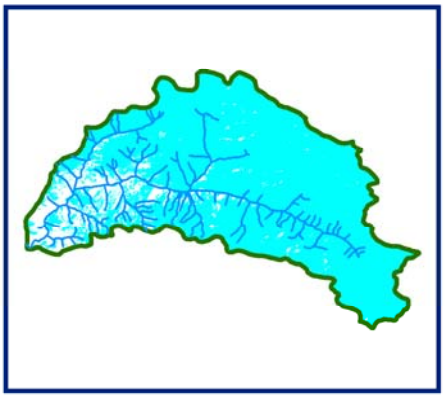
13 JANUARY 2013
20 JANUARY 2013

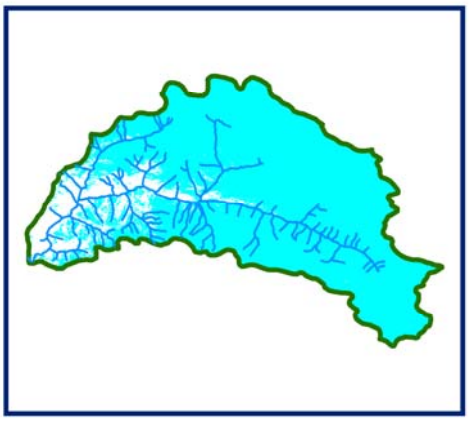


DATA USED
22 JANUARY 2013
25 JANUARY 2013
27 JANUARY 2013

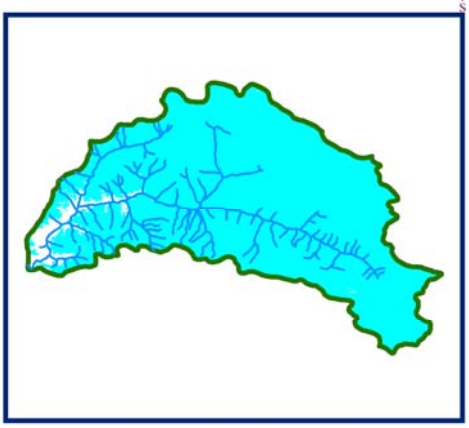
SNOW

04.59 18 27 36
Kilometers

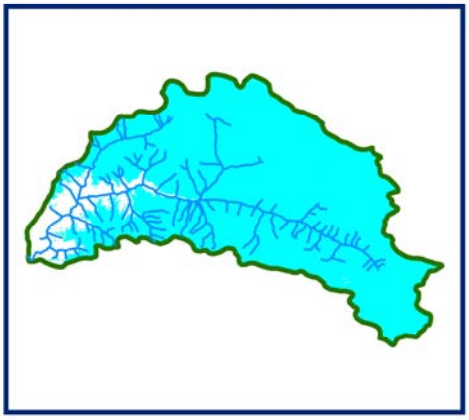
SNOW COVER MAP : PARBATI BASIN



01 FEBRUARY 2013



08 FEBRUARY 2013



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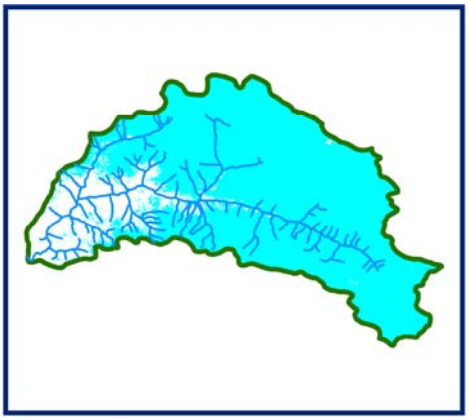

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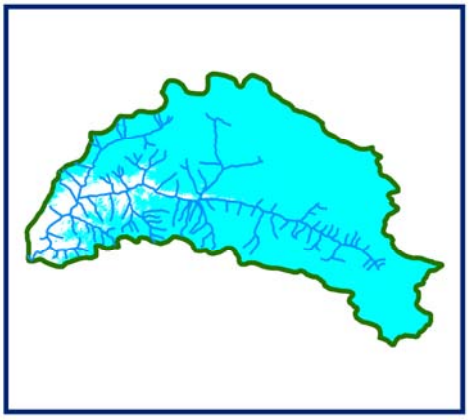

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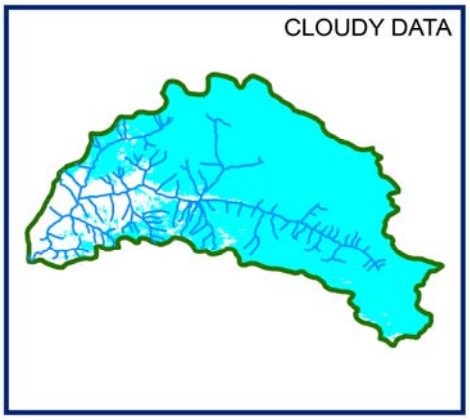


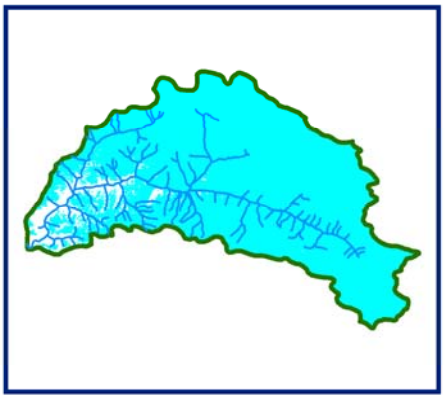
28 FEBRUARY 2013

SNOW

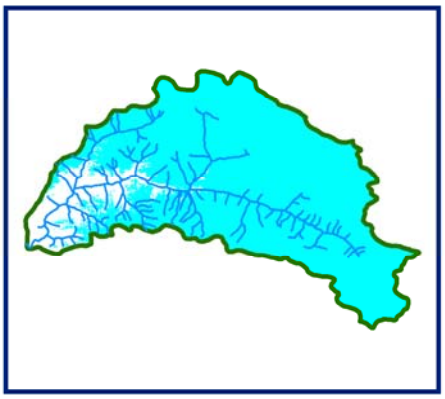
04.59 18 27 36

Kilometers

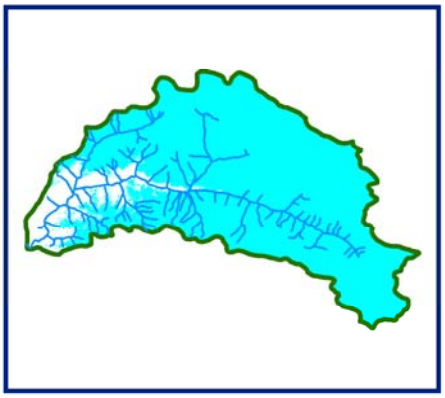
10 DAILY SNOW COVER MAP: PARBATI BASIN



DATA USED
01 FEBRUARY 2013
08 FEBRUARY 2013
09 FEBRUARY 2013



DATA USED
18 FEBRUARY 2013
20 FEBRUARY 2013

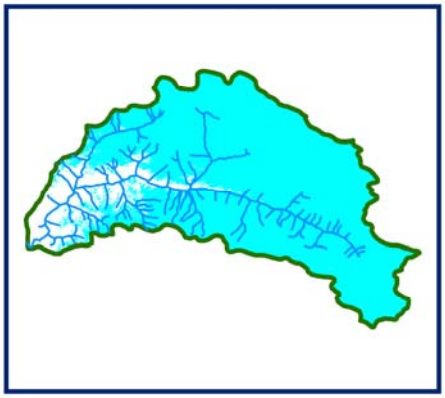


DATA USED
25 FEBRUARY 2013
28 FEBRUARY 2013

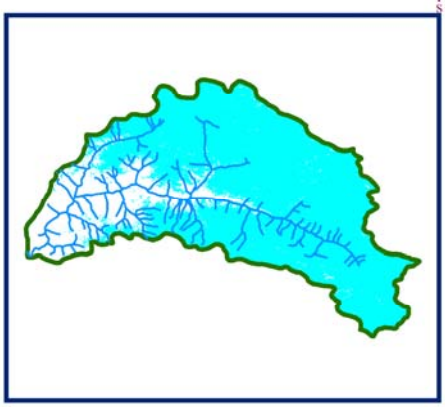
SNOW

04.59 18 27 36
Kilometers

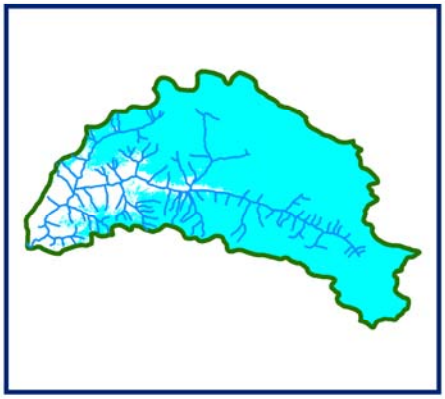
SNOW COVER MAP : PARBATI BASIN



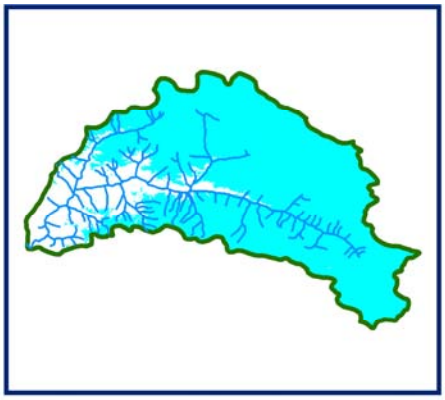
02 MARCH 2013



07 MARCH 2013



17 MARCH 2013



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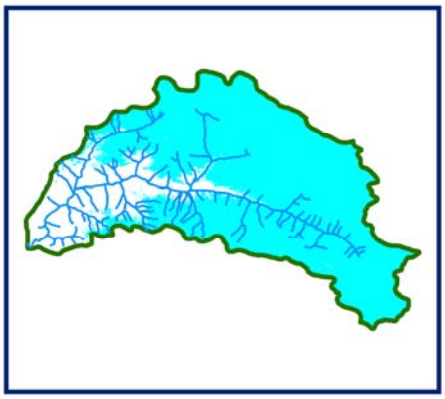

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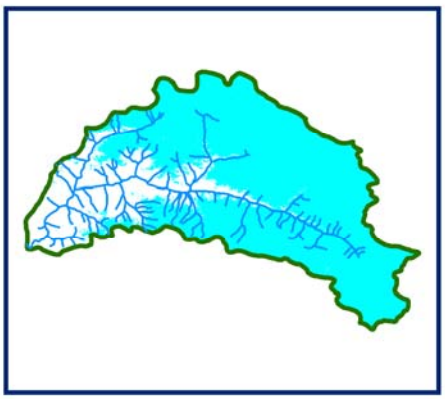


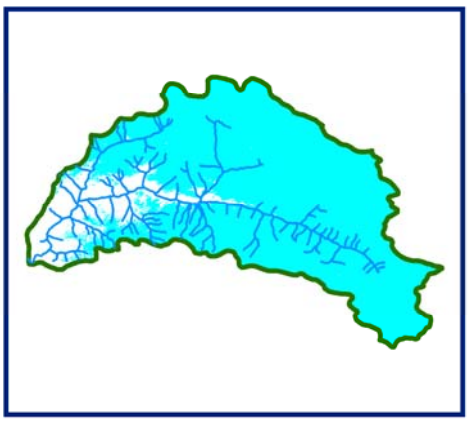
31 MARCH 2013

SNOW

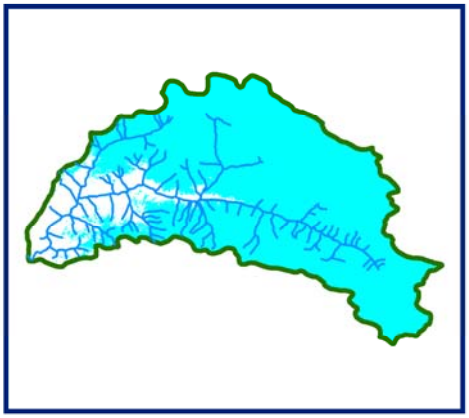
04.59 18 27 36

Kilometers

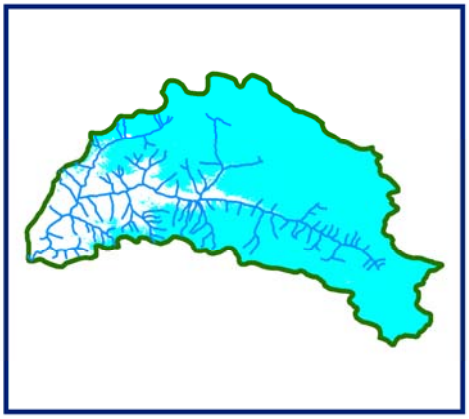
10 DAILY SNOW COVER MAP: PARBATI BASIN



DATA USED
02 MARCH 2013
05 MARCH 2013
07 MARCH 2013



DATA USED
12 MARCH 2013
17 MARCH 2013
19 MARCH 2013

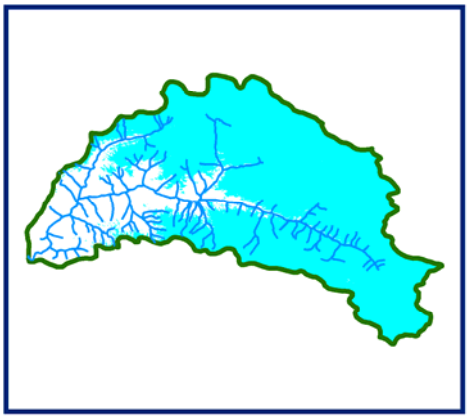


DATA USED
21 MARCH 2013
26 MARCH 2013
31 MARCH 2013

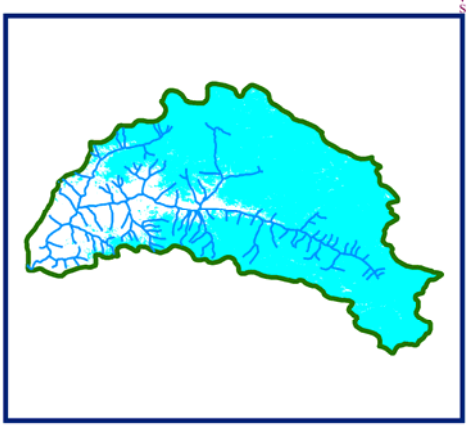
SNOW

04.59 18 27 36
Kilometers

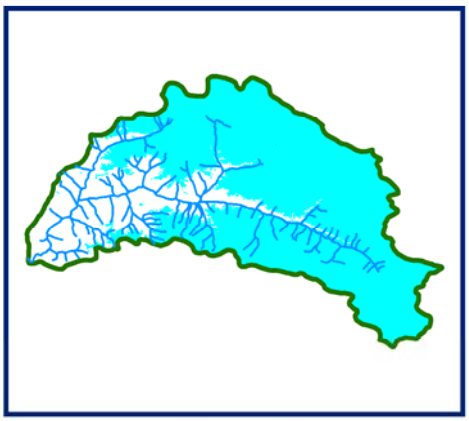
SNOW COVER MAP : PARBATI BASIN



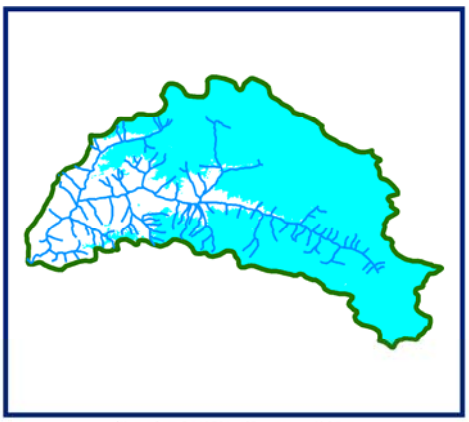
04 APRIL 2013



07 APRIL 2013



12 APRIL 2013



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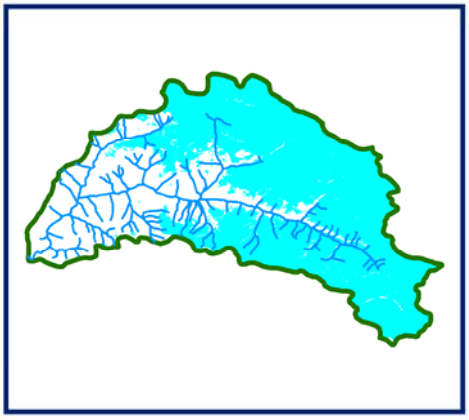

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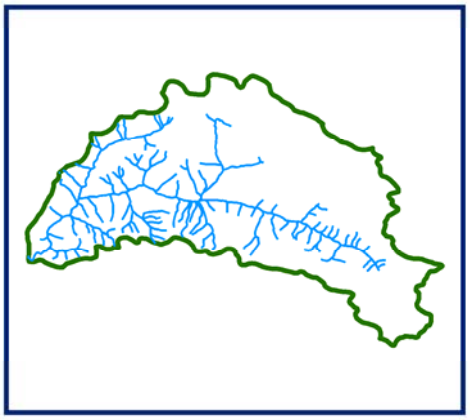


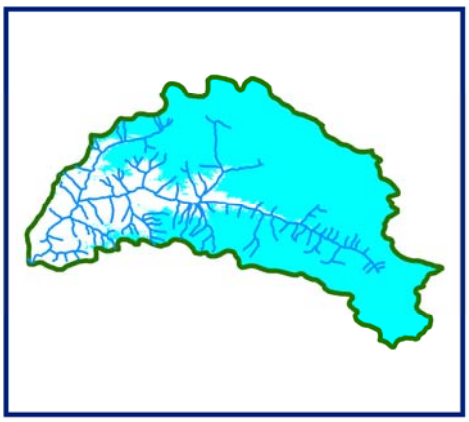
DATA NOT AVAILABLE

SNOW

04.59 18 27 36

Kilometers

10 DAILY SNOW COVER MAP: PARBATI BASIN



DATA USED
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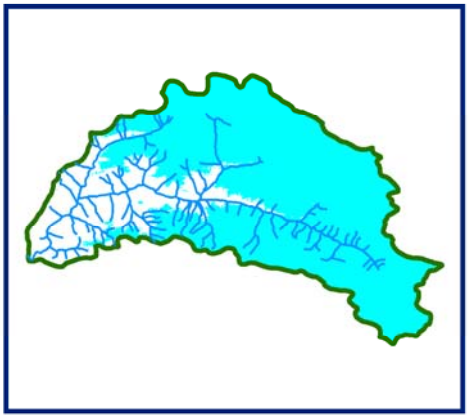
05 APRIL 2013
07 APRIL 2013



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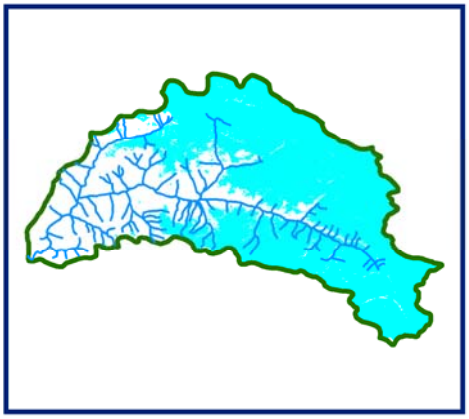
19 APRIL 2013

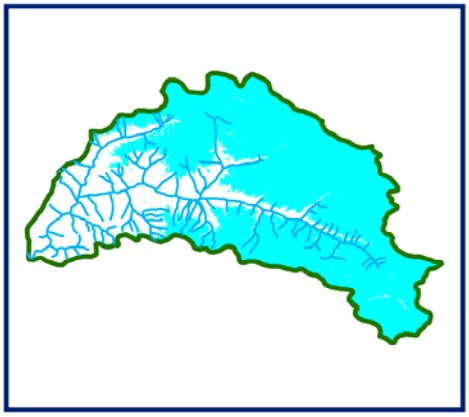


DATA USED
24 APRIL 2013

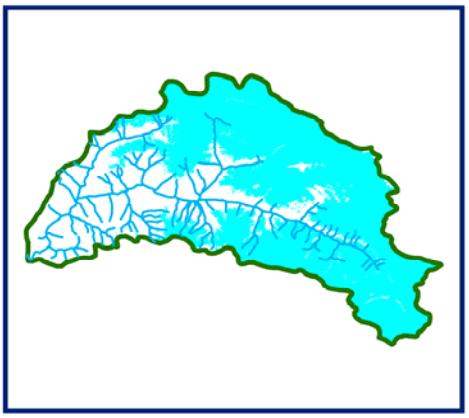
SNOW

04.59 18 27 36
Kilometers

SNOW COVER MAP : PARBATI BASIN



3 MAY 2013



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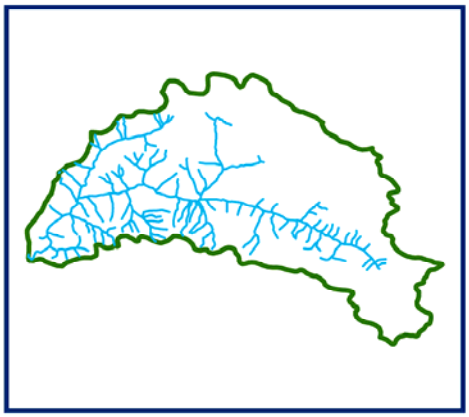

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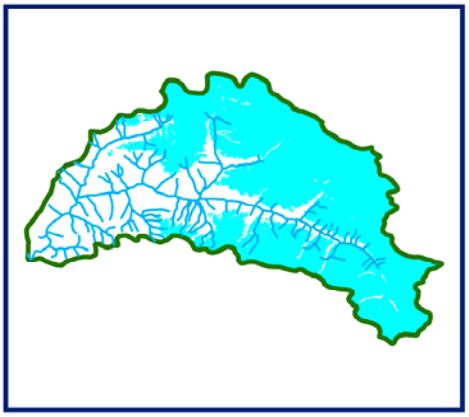

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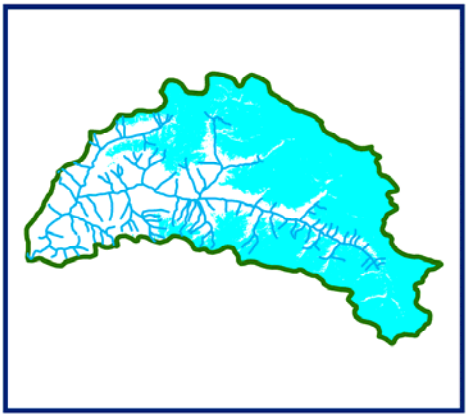

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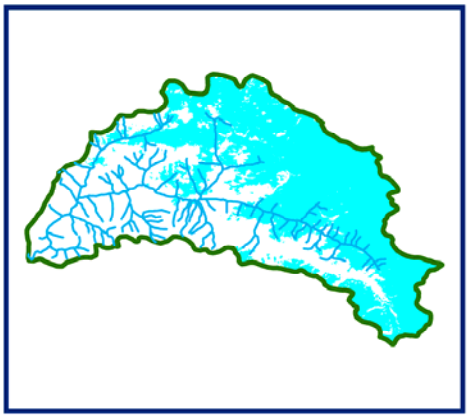
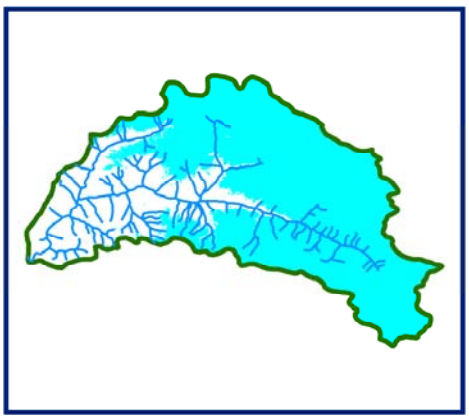


25 MAY 2013

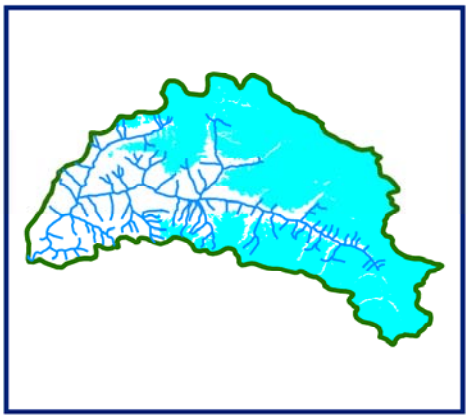
SNOW

10 5 0 10 20 30 40 Kilometers

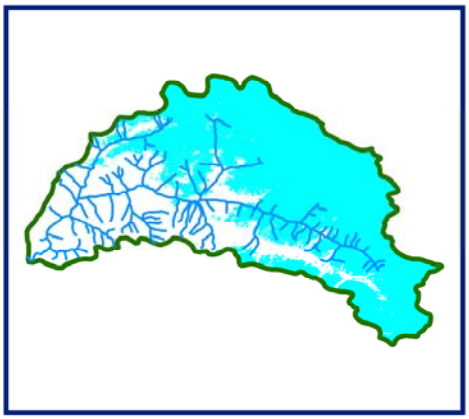
10 DAILY SNOW COVER MAP : PARBATI BASIN



DATA USED
03 MAY 2013
06 MAY 2013
08 MAY 2013



DATA USED
20 MAY 2013

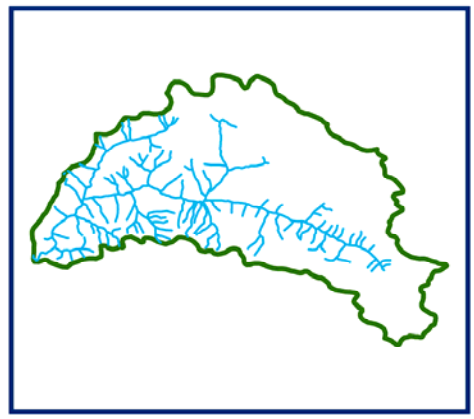


DATA USED
23 MAY 2013
25 MAY 2013

SNOW

94.50 9 18 27 36 Kilometers

SNOW COVER MAP : PARBATI BASIN



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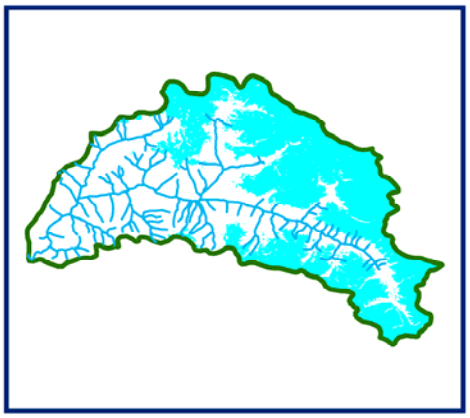
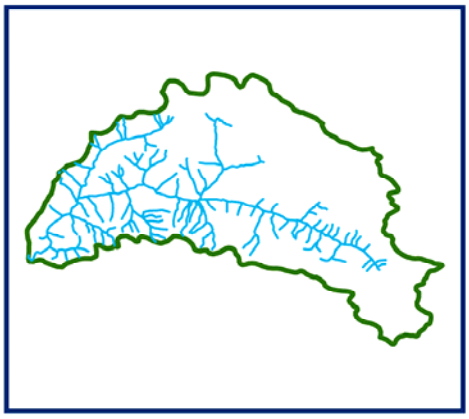


8 JUNE 2013



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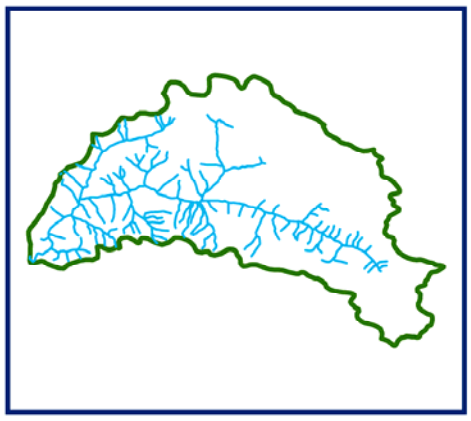

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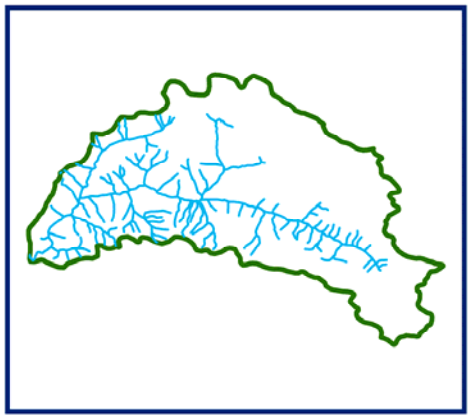

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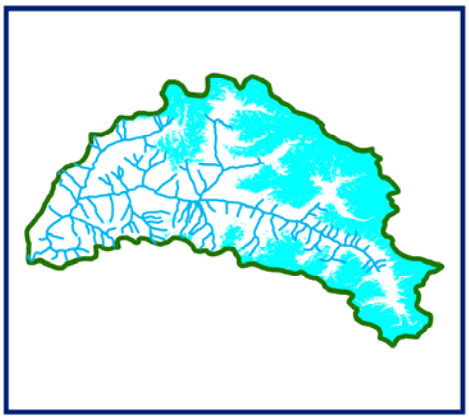
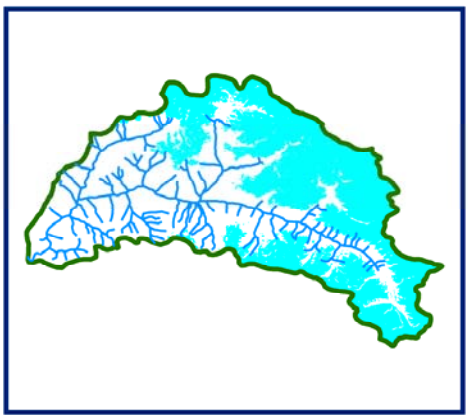


30 JUNE 2013

SNOW

10 5 0 10 20 30 40 Kilometers

10 DAILY SNOW COVER MAP : PARBATI BASIN



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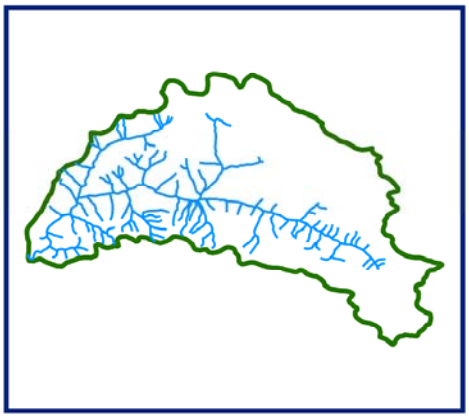
08 JUNE 2013



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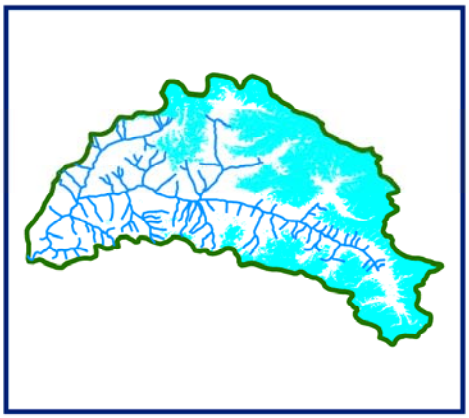


DATA USED
30 JUNE 2013

SNOW

10 5 0 10 20 30 40 Kilometers

BEAS BASIN

AREAL EXTENT OF SNOW (5 DAILY)

BASIN NAME: BEAS **BASIN AREA: 1132 sq km**

S No	Date	Snow cover (sq km)	Snow cover (%)	Cloud Cover	S No	Date	Snow cover (sq km)	Snow cover (%)	Cloud Cover
October 2012									
1	02-10-2012	82	7	Clear	**9**	14-10-2012	97	9	35%
2	02-10-2012	86	8	Clear	**10**	19-10-2012	129	11	Clear
3	04-10-2012	140	12	5%	**11**	23-10-2012	63	6	80%
4	06-10-2012	68	6	20%	**12**	24-10-2012	383	34	30%
5	07-10-2012	70	6	Clear	**13**	26-10-2012	183	16	40%
6	11-10-2012	86	8	40%	**14**	28-10-2012	193	17	35%
7	12-10-2012	90	8	Clear	**15**	30-10-2012	184	16	Clear
8	14-10-2012	94	8	35%	**16**	31-10-2012	142	13	Clear
November 2012									
1	04-11-2012	81	7	Clear	**8**	16-11-2012	72	6	5%
2	05-11-2012	100	9	5%	**9**	17-11-2012	79	7	Clear
3	07-11-2012	134	12	Clear	**10**	17-11-2012	79	7	Clear
4	07-11-2012	136	12	Clear	**11**	19-11-2012	124	11	Clear
5	09-11-2012	70	6	Clear	**12**	19-11-2012	147	13	Clear
6	12-11-2012	90	8	Clear	13	24-11-2012	251	22	45%
7	14-11-2012	109	10	Clear	14	26-11-2012	147	13	30%
December 2012									
1	01-12-2012	636	56	Clear	**5**	22-12-2012	662	59	Clear
2	01-12-2012	636	56	Clear	**6**	25-12-2012	623	55	Clear
3	17-12-2012	897	79	Clear	**7**	25-12-2012	626	55	Clear
4	22-12-2012	776	69	Clear	**8**	29-12-2012	292	26	75%
January 2013									
1	03-01-2013	571	50	Clear	**7**	13-01-2013	582	51	40%
2	06-01-2013	591	52	Clear	**8**	20-01-2013	1109	98	5%
3	08-01-2013	545	48	Clear	**9**	22-01-2013	1089	96	Clear
4	10-01-2013	630	56	Clear	**10**	25-01-2013	975	86	Clear
5	11-01-2013	543	48	5%	**11**	27-01-2013	734	65	10%
6	13-01-2013	581	51	40%					
February 2013									
1	01-02-2013	862	76	Clear	**5**	18-02-2013	940	83	Clear
2	08-02-2013	1049	93	Clear	**6**	20-02-2013	792	70	Clear
3	09-02-2013	988	87	Clear	**7**	25-02-2013	934	83	Clear
4	11-02-2013	1033	91	85%	**8**	28-02-2013	584	52	75%

March 2013									
1	02-03-2013	865	76	Clear	**7**	16-03-2013	719	63	70%
2	03-03-2013	865	76	Clear	**8**	17-03-2013	801	71	35%
3	04-03-2013	805	71	95%	**9**	19-03-2013	740	65	Clear
4	05-03-2013	756	67	Clear	**10**	21-03-2013	449	40	75%
5	07-03-2013	695	61	Clear	**11**	26-03-2013	729	64	Clear
6	12-03-2013	692	61	65%	**12**	31-03-2013	654	58	Clear
April 2013									
1	04-04-2013	589	52	10%	**6**	17-04-2013	513	45	20%
2	05-04-2013	599	53	Clear	**7**	19-04-2013	483	43	10%
3	07-04-2013	690	61	Clear	**8**	19-04-2013	482	43	10%
4	12-04-2013	611	54	Clear	**9**	24-04-2013	382	34	40%
5	14-04-2013	390	34	50%					
May 2013									
1	03-05-2013	498	44	Clear	**5**	20-05-2013	372	33	Clear
2	04-05-2013	182	16	60%	**6**	23-05-2013	347	31	Clear
3	06-05-2013	326	29	95%	**7**	25-05-2013	279	25	Clear
4	08-05-2013	370	33	20%					
JUNE-2013									
1	8-06-2013	163	14	Clear	**2**	30-06-2013	104	9	Clear

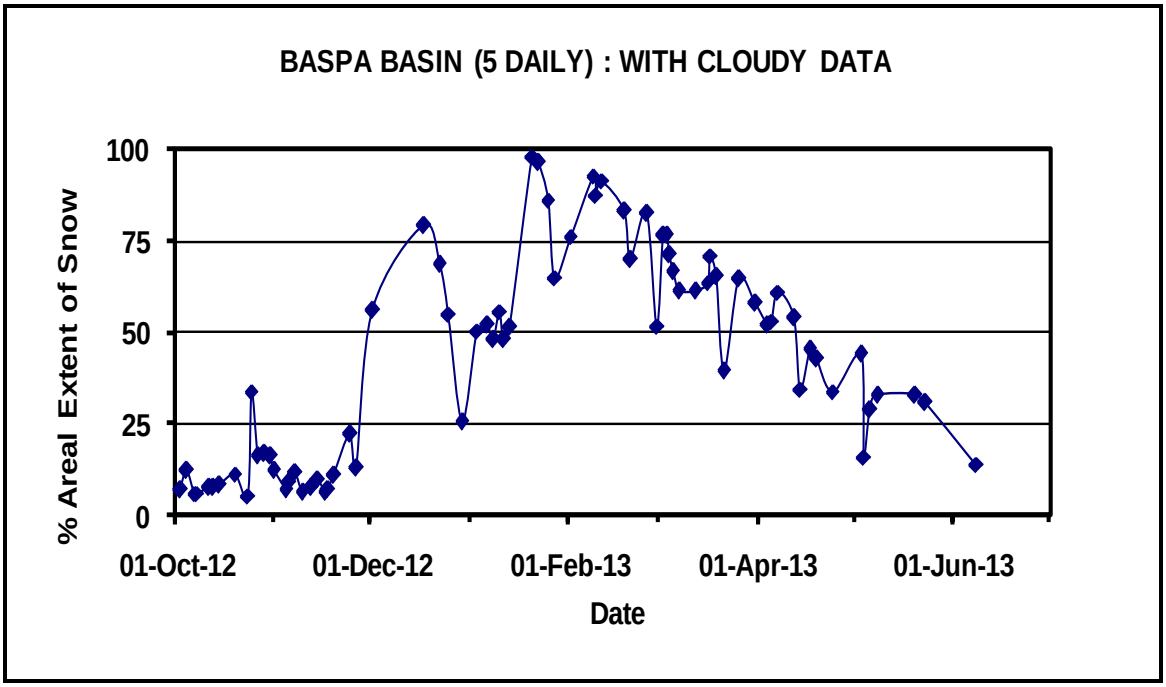
AREAL EXTENT OF SNOW (10 DAILY)

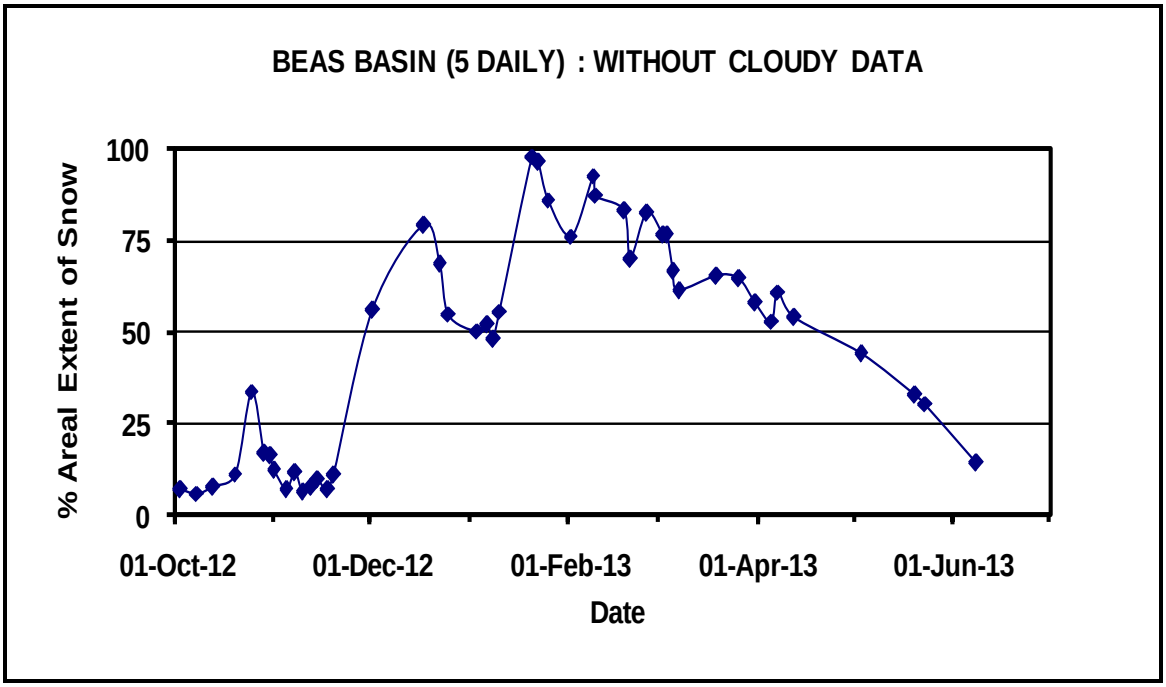
BASIN NAME: BEAS **BASIN AREA: 1132 sq km**

S No	Date	Snow cover (sq km)	Snow cover (%)	Cloud cover	S No	Date	Snow cover (sq km)	Snow cover (%)	Cloud cover
October 2012									
1.	02-Oct-12	155	14	Clear	6.	28-Oct-12	202	18	35%
2.	04-Oct-12			5%	7.	30-Oct-12			Clear
3.	07-Oct-12			Clear	8.	31-Oct-12			Clear
4.	12-Oct-12	120	11	Clear					
5.	19-Oct-12			Clear					
November 2012									
1.	04-Nov-12	138	12	Clear	4.	12-Nov-12	93	8	Clear
2.	07-Nov-12			Clear	5.	17-Nov-12			Clear
3.	09-Nov-12			Clear	6.	19-Nov-12			Clear
					7.	24-Nov-12	217	19	50%
					8.	26-Nov-12			40%
December 2012									
1.	01-Dec-12	636	56	Clear	3.	22-Dec-12	688	61	Clear
2.	17-Dec-12	897	79	Clear	4.	25-Dec-12			Clear
January 2013									
1.	03-Jan-13	582	51	Clear	6.	22-Jan-13	984	87	Clear
2.	06-Jan-13			Clear	7.	25-Jan-13			Clear
3.	10-Jan-13			Clear	8.	27-Jan-13			10%
4.	11-Jan-13	668	59	5%					
5.	20-Jan-13			5%					
February 2013									
1.	01-Feb-13	1025	91	Clear	4.	18-Feb-13	927	82	Clear
2.	08-Feb-13			Clear	5.	20-Feb-13			Clear
3.	09-Feb-13			Clear	6.	25-Feb-13	934	83	Clear
March2013									
1.	02-Mar-13	850	75	Clear	7.	26-Mar-13	741	65	Clear
2.	05-Mar-13			Clear	8.	31-Mar-13			Clear
3.	07-Mar-13			Clear					
4.	12-Mar-13	750	66	65%					
5.	16-Mar-13			70%					
6.	19-Mar-13			Clear					

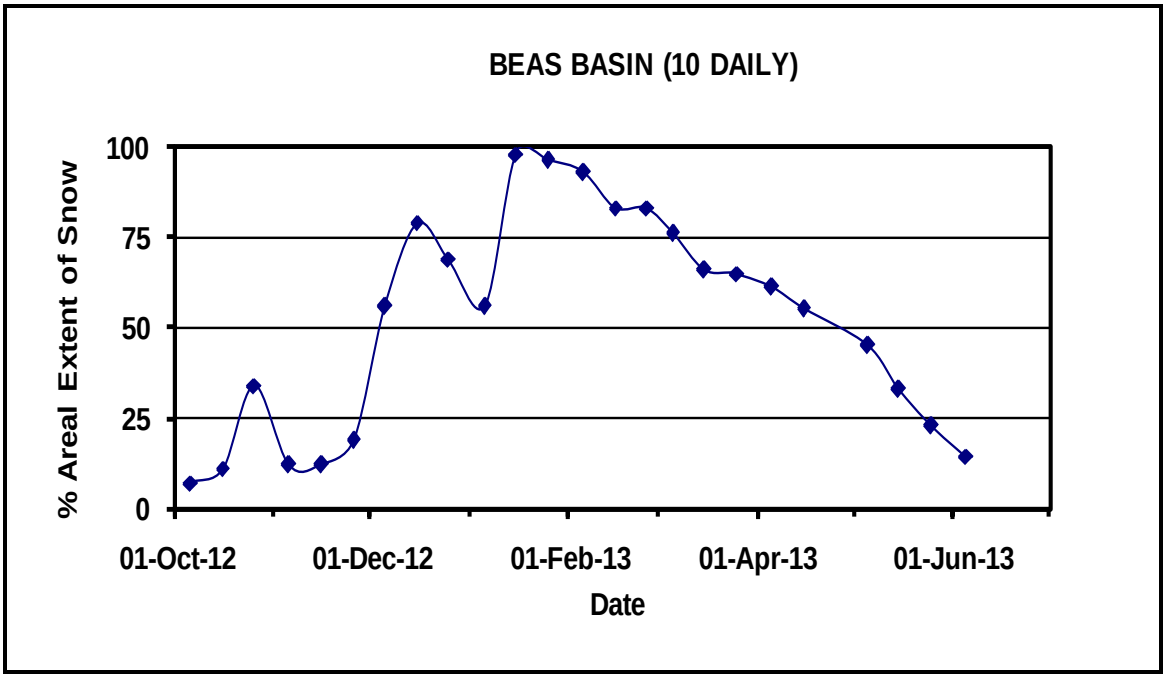
April 2013									
1.	04-Apr-13	650	57	10%	7.	24-Apr-13	382	34	40%
2.	05-Apr-13			Clear					
3.	07-Apr-13			Clear					
4.	12-Apr-13	630	56	Clear					
5.	17-Apr-13			20%					
6.	19-Apr-13			10%					
May 2013									
1.	03-May-13	510	45	Clear	4.	23-May-13	300	23	
2.	08-May-13			20%		25-May-13			
3.	20-May-13	372	33						
	June-2013								
1.	8-June-13	164	14			30-June-13	104	9	

Snow cover depletion curve

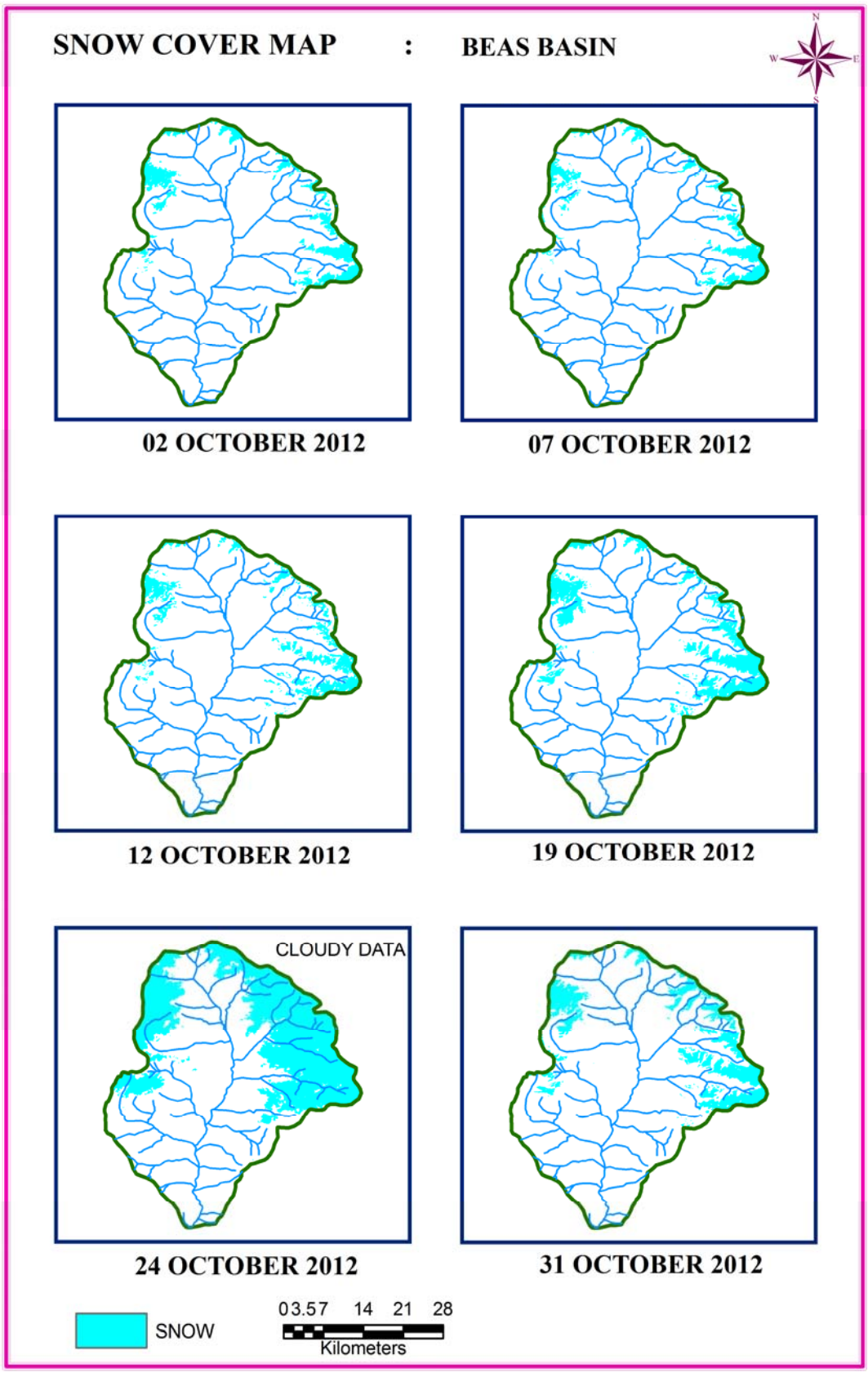




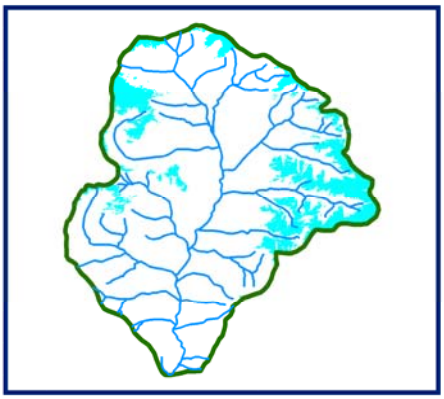
Snow cover depletion curve



SNOW COVER MAP


SNOW COVER MAP : BEAS BASIN
02 OCTOBER 2012
07 OCTOBER 2012
12 OCTOBER 2012
19 OCTOBER 2012
CLOUDY DATA
24 OCTOBER 2012
31 OCTOBER 2012
SNOW
0 3.5 7 14 21 28
Kilometers

10 DAILY SNOW COVER MAP: BEAS BASIN



DATA USED
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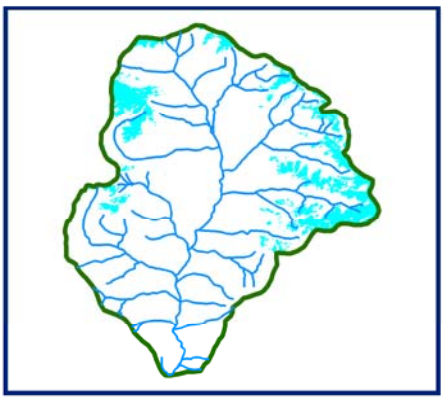
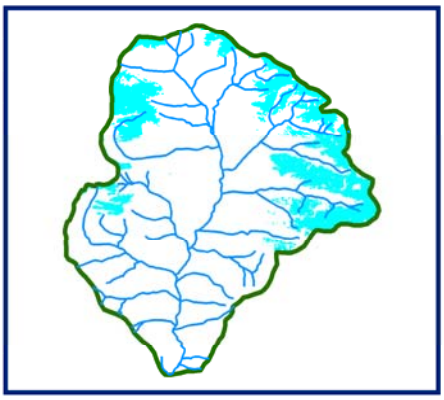
04 OCTOBER 2012
07 OCTOBER 2012



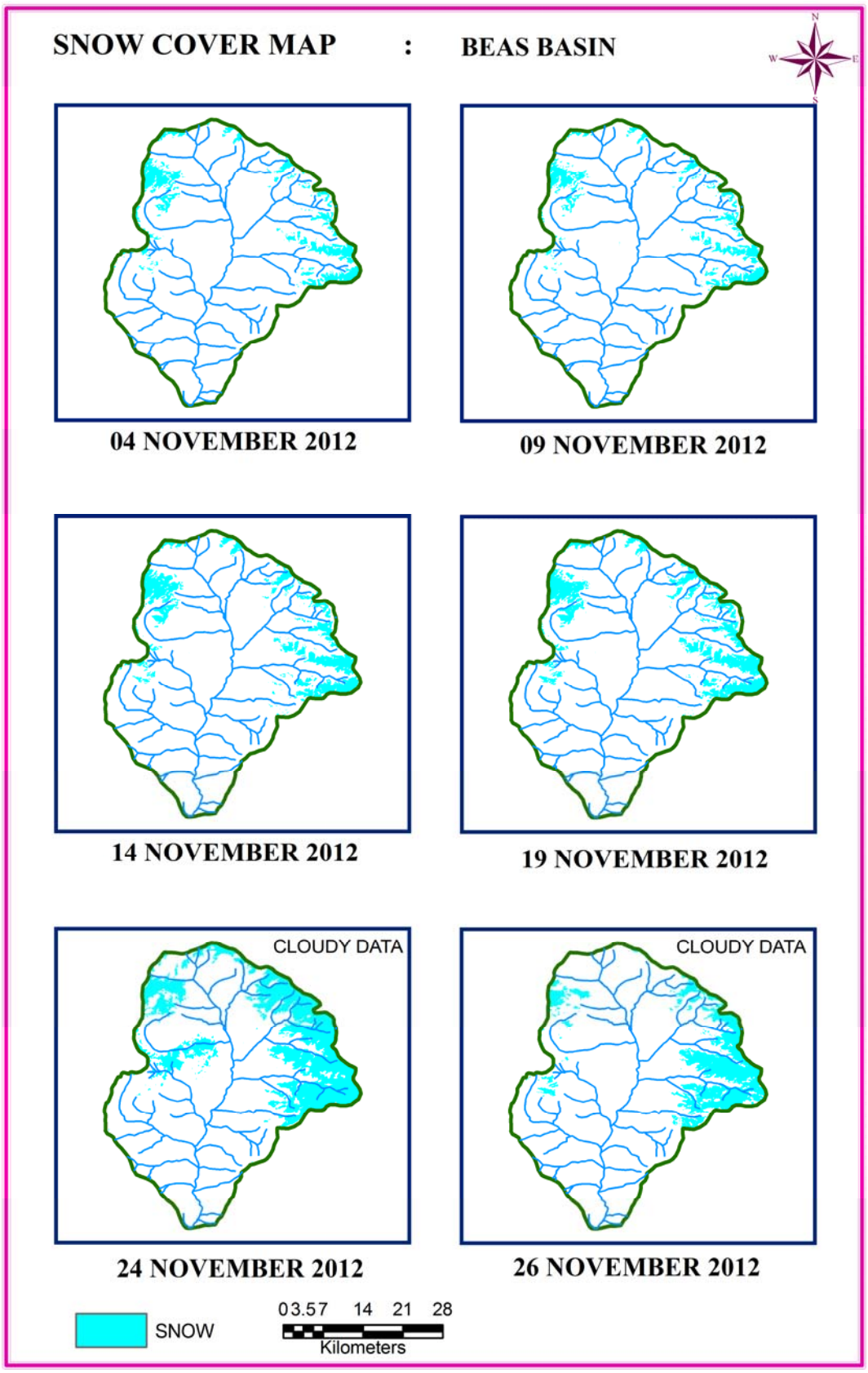
DATA USED
12 OCTOBER 2012
19 OCTOBER 2012



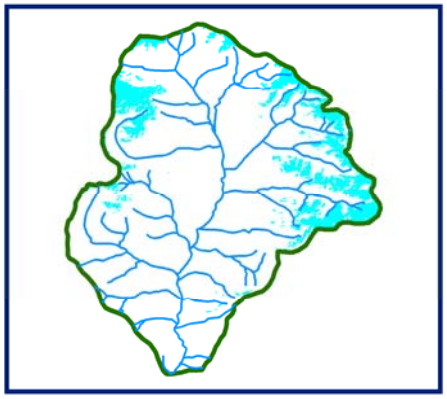
DATA USED
28 OCTOBER 2012
30 OCTOBER 2012
31 OCTOBER 2012

SNOW

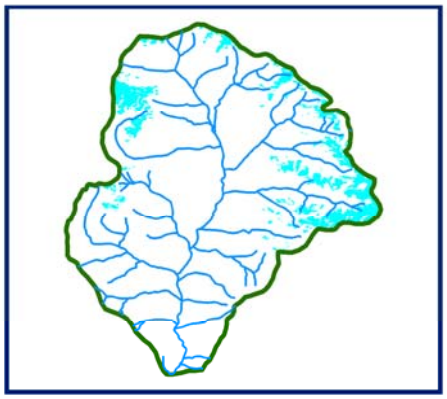
03.57 14 21 28
Kilometers


SNOW COVER MAP : BEAS BASIN
N
W
E
S
04 NOVEMBER 2012
09 NOVEMBER 2012
14 NOVEMBER 2012
19 NOVEMBER 2012
CLOUDY DATA
CLOUDY DATA
24 NOVEMBER 2012
26 NOVEMBER 2012
SNOW
0 3.5 7 14 21 28
Kilometers

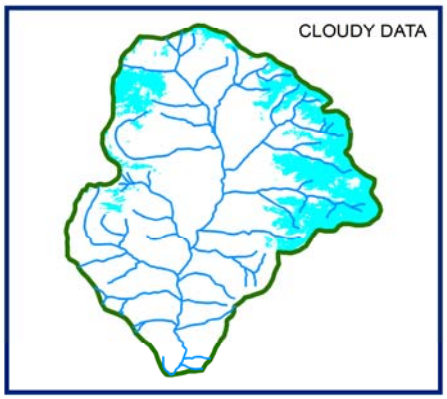
10 DAILY SNOW COVER MAP: BEAS BASIN



DATA USED
04 NOVEMBER 2012
07 NOVEMBER 2012
09 NOVEMBER 2012



DATA USED
12 NOVEMBER 2012
17 NOVEMBER 2012
19 NOVEMBER 2012

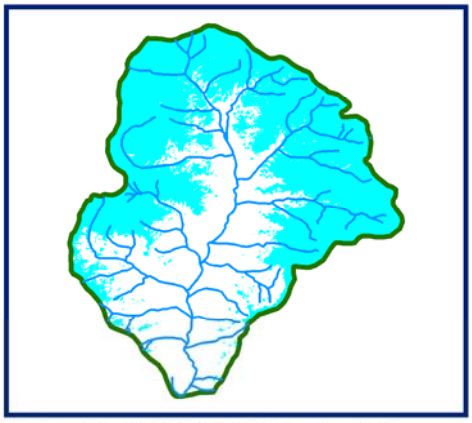


DATA USED
24 NOVEMBER 2012
26 NOVEMBER 2012

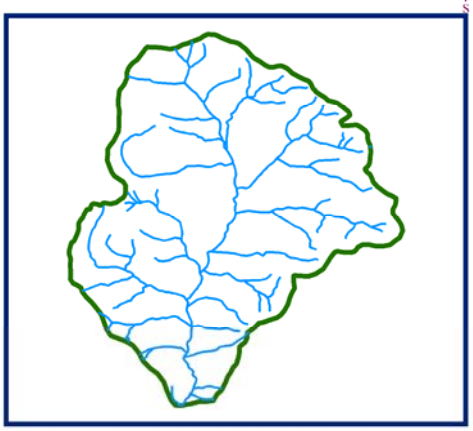
SNOW

03.57 14 21 28
Kilometers

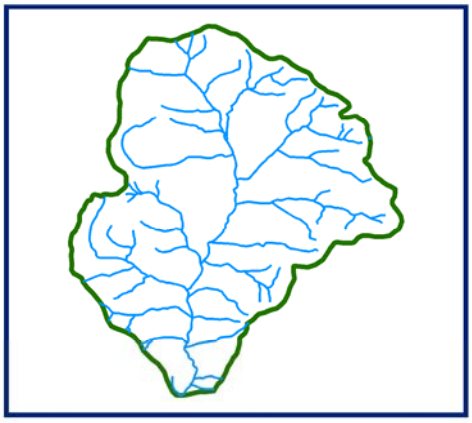
SNOW COVER MAP : BEAS BASIN



01 DECEMBER 2012



DATA NOT AVAILABLE



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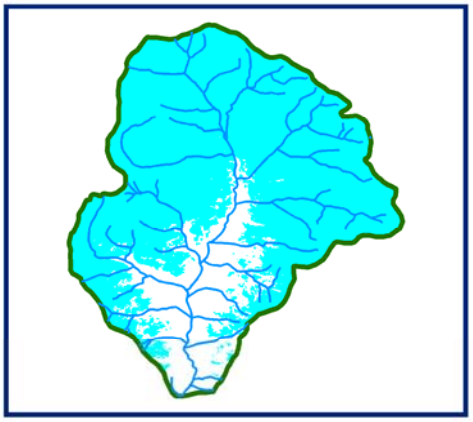
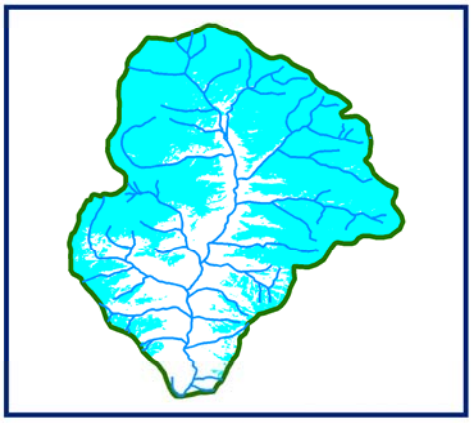
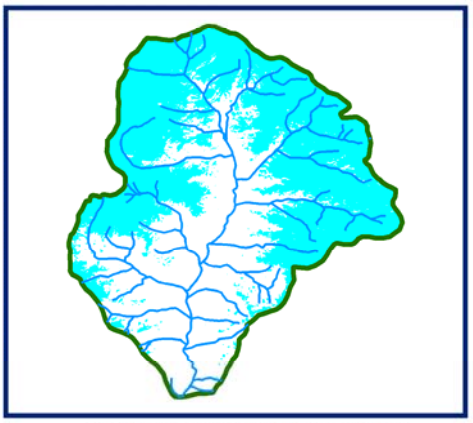


17 DECEMBER 2012



22 DECEMBER 2012



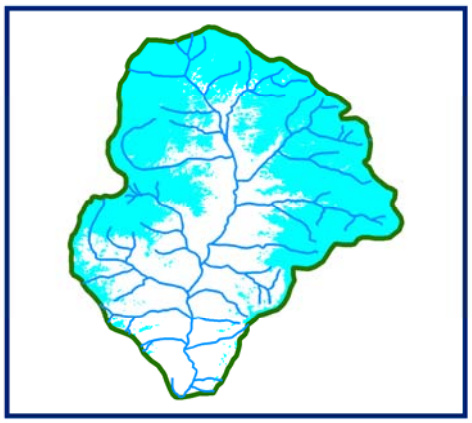
25 DECEMBER 2012

SNOW

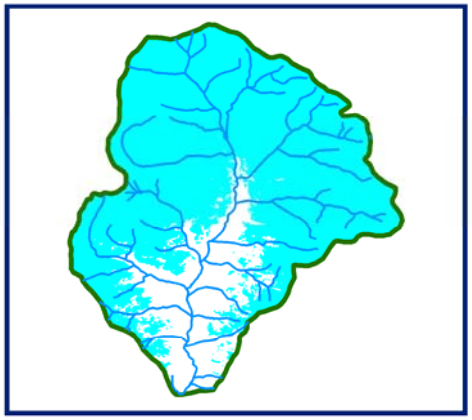
03.57 14 21 28

Kilometers

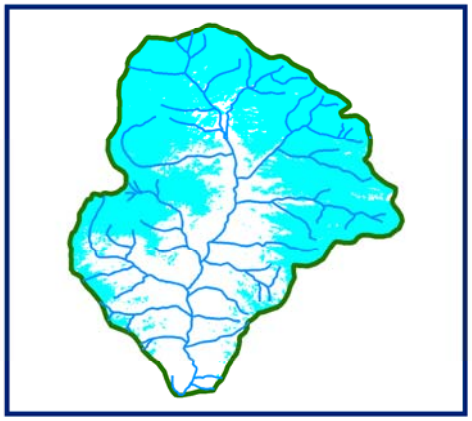
10 DAILY SNOW COVER MAP: BEAS BASIN



DATA USED
01 DECEMBER 2012



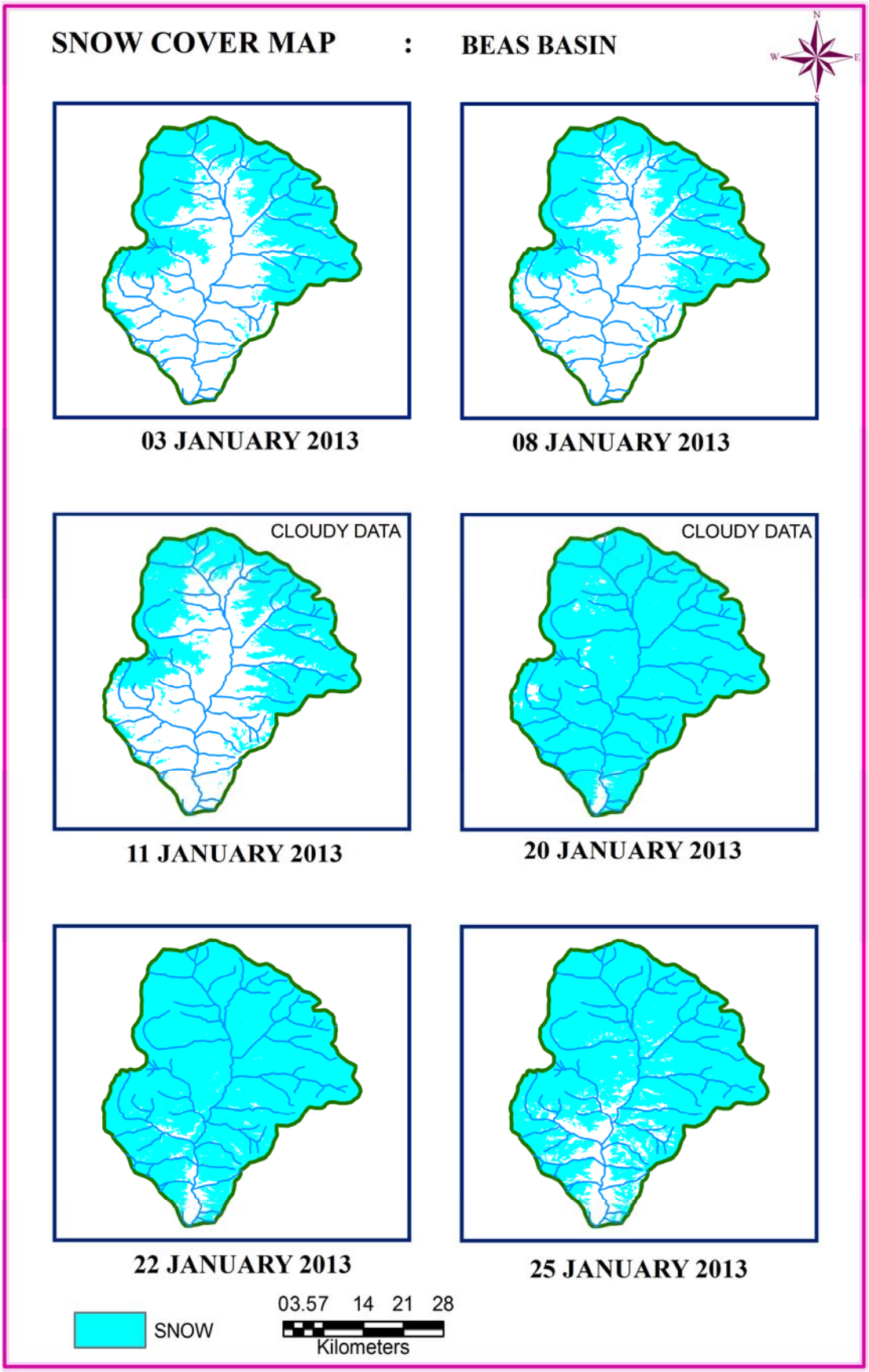
DATA USED
17 DECEMBER 2012



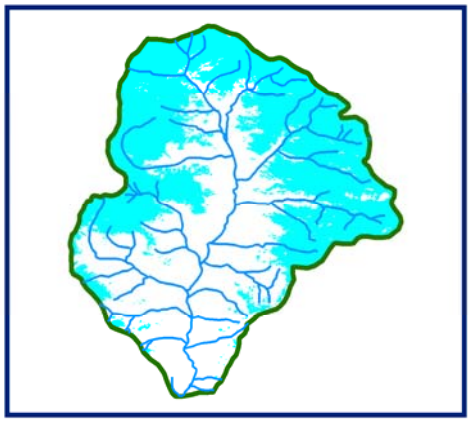
DATA USED
22 DECEMBER 2012
25 DECEMBER 2012

SNOW

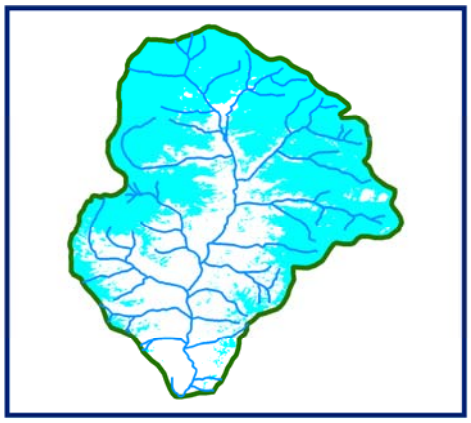
03.57 14 21 28
Kilometers


SNOW COVER MAP : BEAS BASIN
N
W
E
S
03 JANUARY 2013
08 JANUARY 2013
CLOUDY DATA
11 JANUARY 2013
CLOUDY DATA
20 JANUARY 2013
22 JANUARY 2013
25 JANUARY 2013
SNOW
03.57 14 21 28
Kilometers

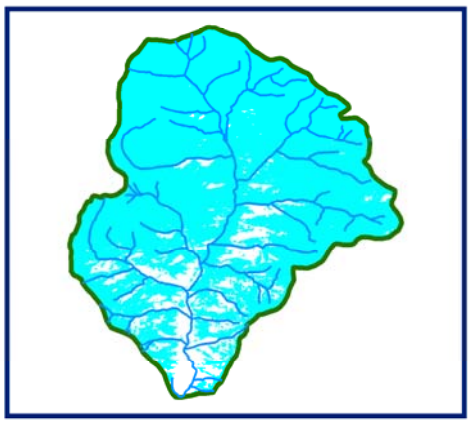
10 DAILY SNOW COVER MAP: BEAS BASIN



DATA USED
03 JANUARY 2013
06 JANUARY 2013
10 JANUARY 2013



DATA USED
11 JANUARY 2013
20 JANUARY 2013

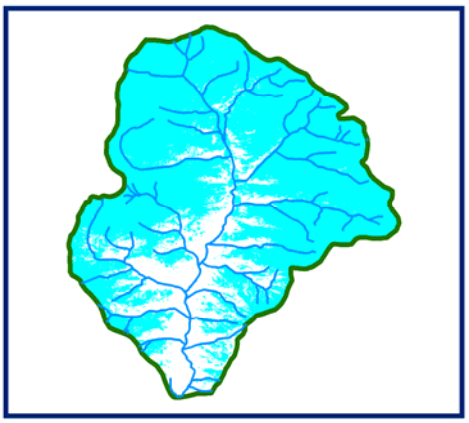


DATA USED
22 JANUARY 2013
25 JANUARY 2013
27 JANUARY 2013

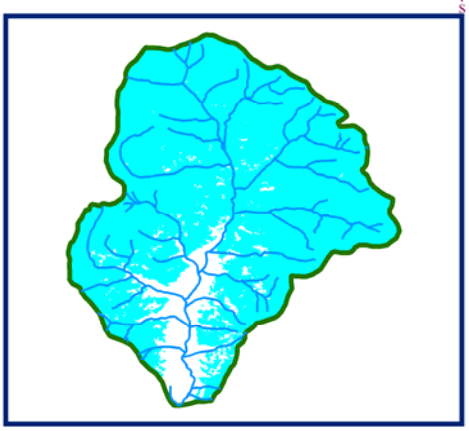
SNOW

03.57 14 21 28
Kilometers

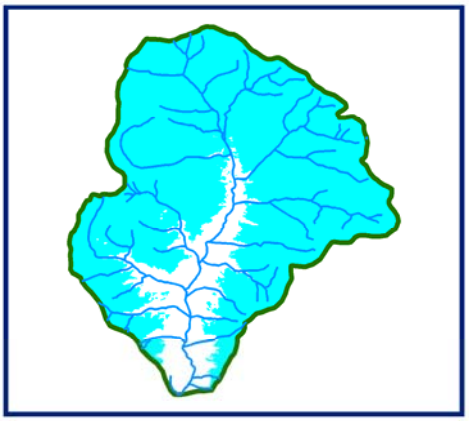
SNOW COVER MAP : BEAS BASIN



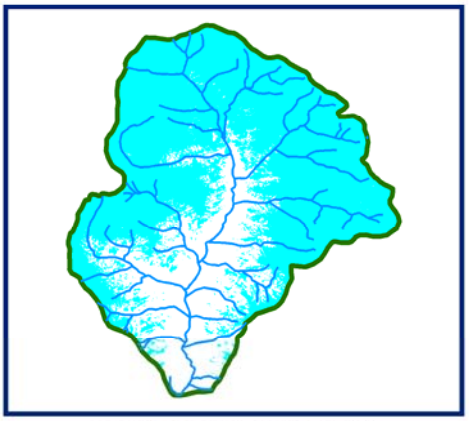
01 FEBRUARY 2013



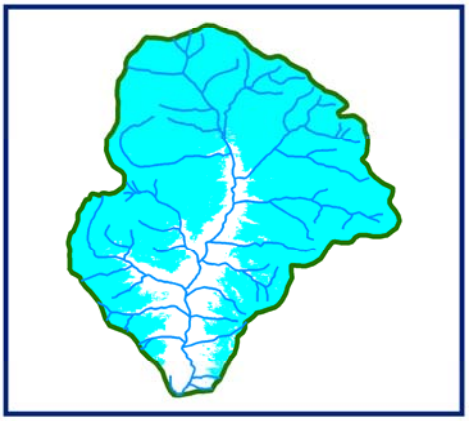
09 FEBRUARY 2013



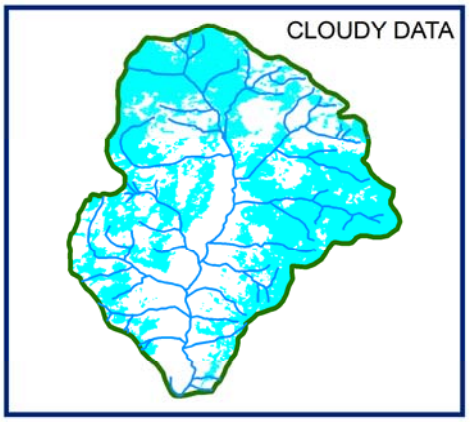
18 FEBRUARY 2013



20 FEBRUARY 2013



25 FEBRUARY 2013



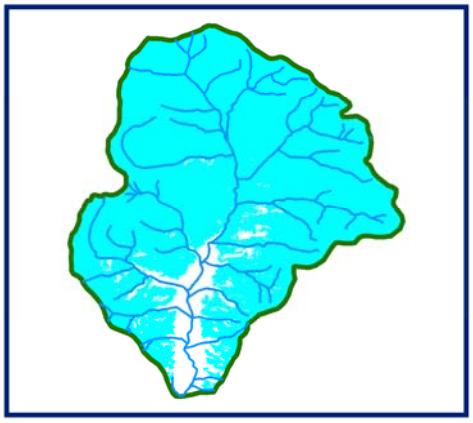
28 FEBRUARY 2013

SNOW

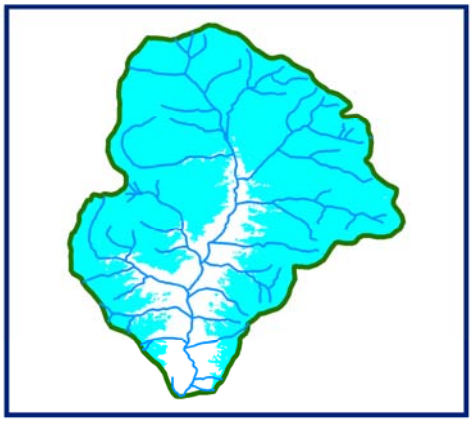
03.57 14 21 28

Kilometers

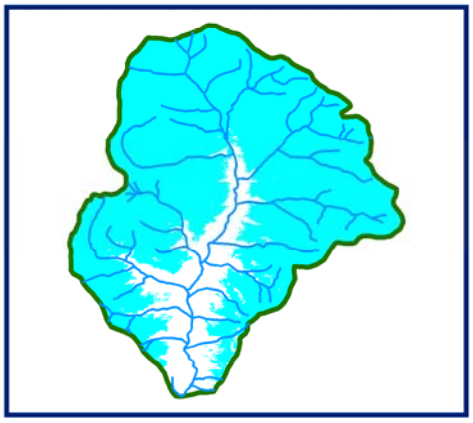
10 DAILY SNOW COVER MAP: BEAS BASIN



DATA USED
01 FEBRUARY 2013
08 FEBRUARY 2013
09 FEBRUARY 2013



DATA USED
18 FEBRUARY 2013
20 FEBRUARY 2013

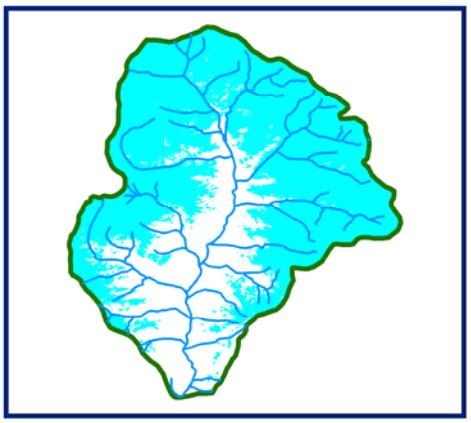


DATA USED
25 FEBRUARY 2013

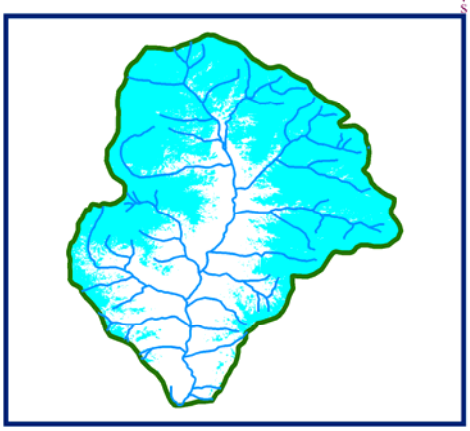
SNOW

03.57 14 21 28
Kilometers

SNOW COVER MAP : BEAS BASIN



05 MARCH 2013



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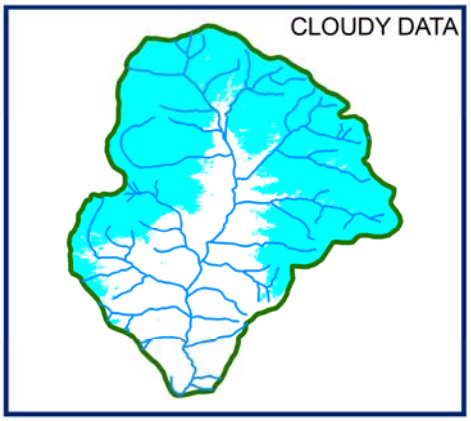
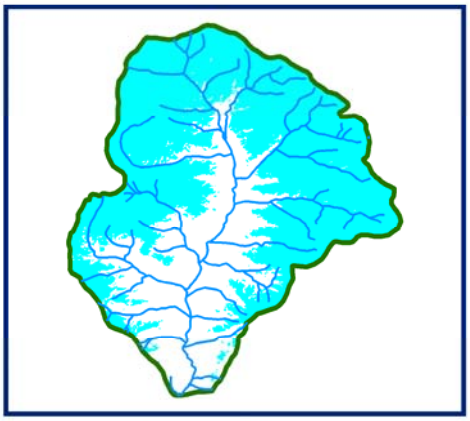
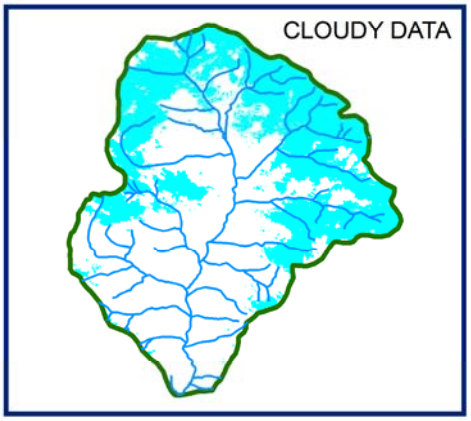


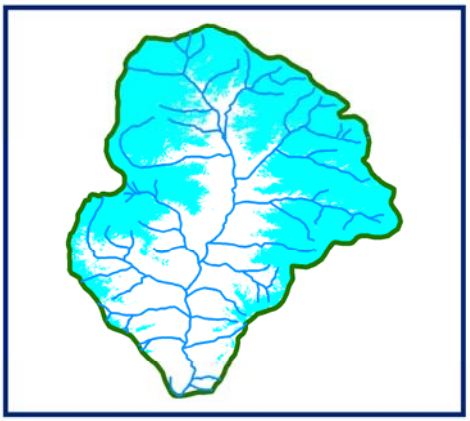
12 MARCH 2013



19 MARCH 2013



21 MARCH 2013



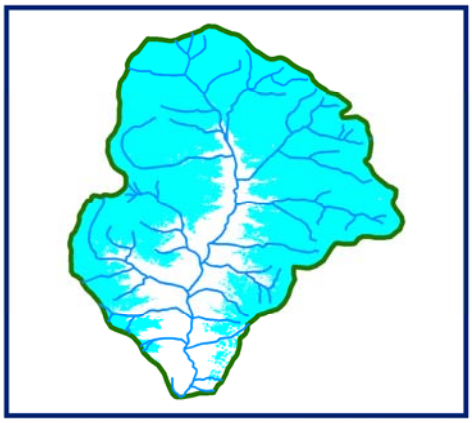
31 MARCH 2013

SNOW

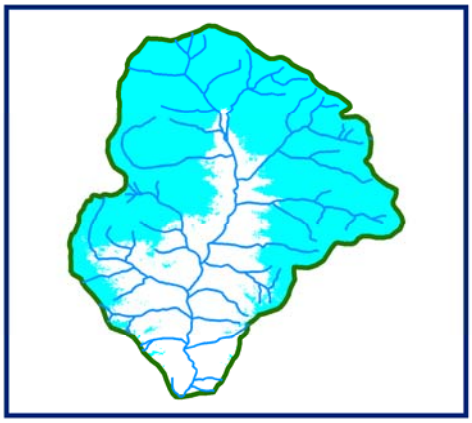
0 3.5 7 14 21 28

Kilometers

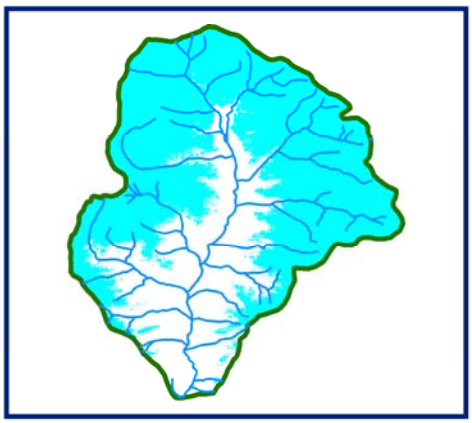
10 DAILY SNOW COVER MAP: BEAS BASIN



DATA USED
02 MARCH 2013
05 MARCH 2013
07 MARCH 2013



DATA USED
12 MARCH 2013
16 MARCH 2013
19 MARCH 2013

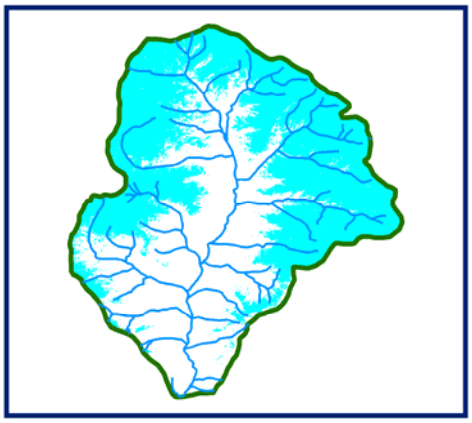


DATA USED
26 MARCH 2013
31 MARCH 2013

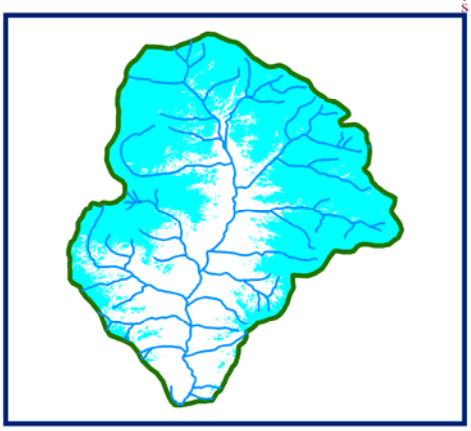
SNOW

03.57 14 21 28
Kilometers

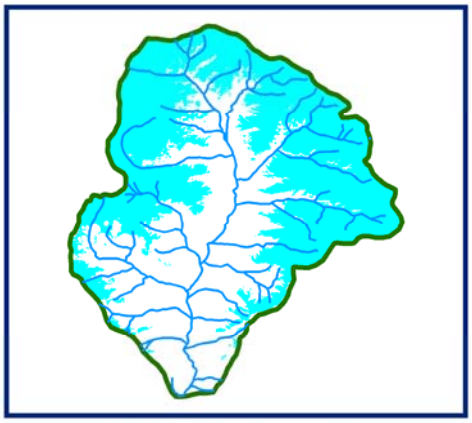
SNOW COVER MAP : BEAS BASIN



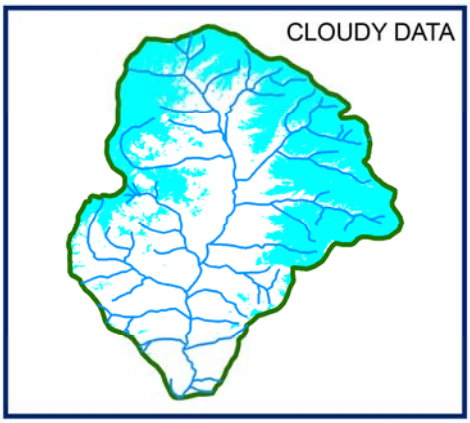
05 APRIL 2013



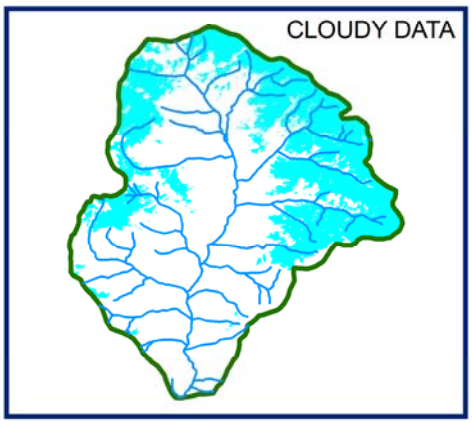
07 APRIL 2013



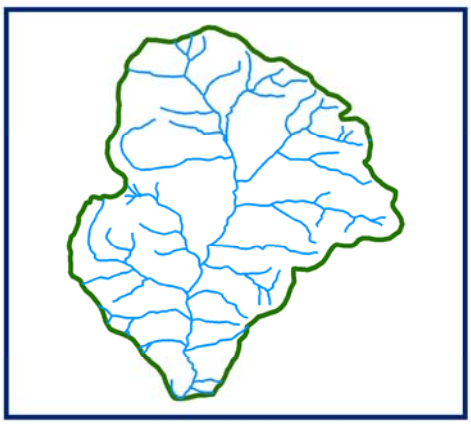
12 APRIL 2013



19 APRIL 2013



24 APRIL 2013



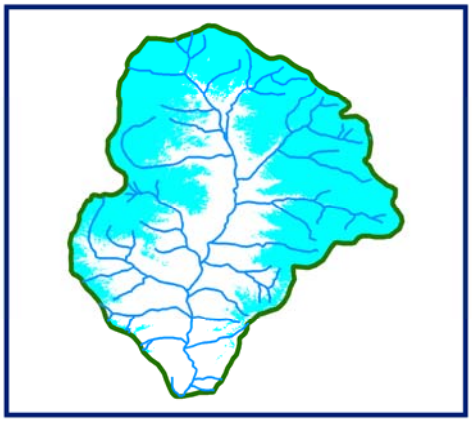
DATA NOT AVAILABLE

SNOW

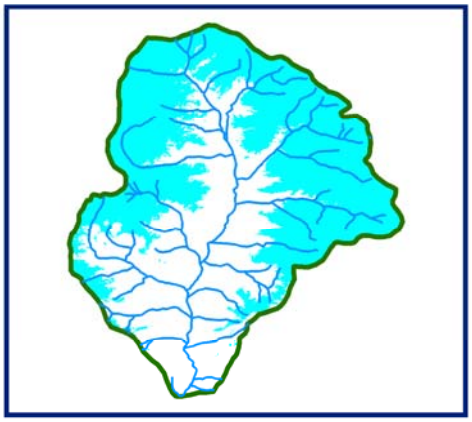
0 3.5 7 14 21 28

Kilometers

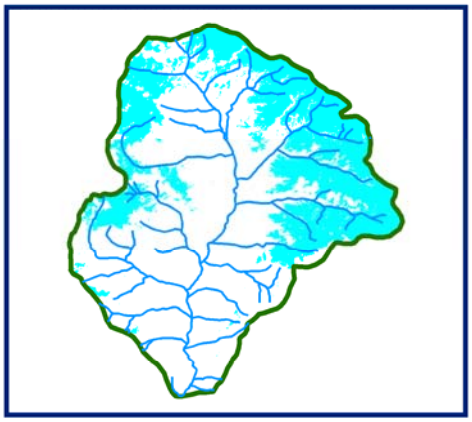
10 DAILY SNOW COVER MAP: BEAS BASIN



DATA USED
04 APRIL 2013
05 APRIL 2013
07 APRIL 2013



DATA USED
12 APRIL 2013
17 APRIL 2013
19 APRIL 2013

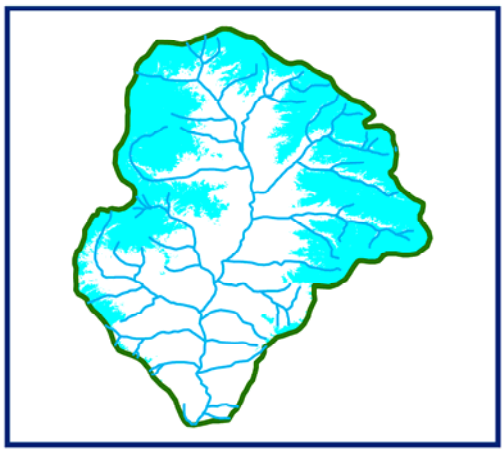


DATA USED
24 APRIL 2013

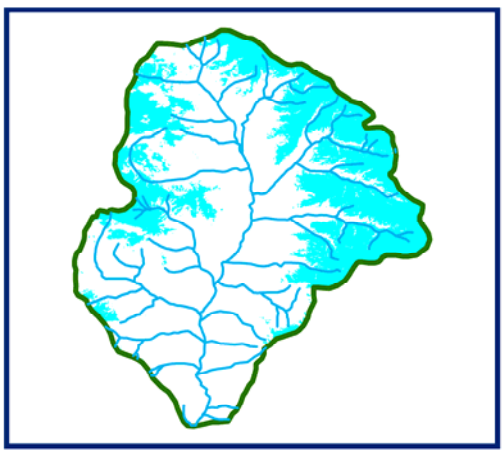
SNOW

03.57 14 21 28
Kilometers

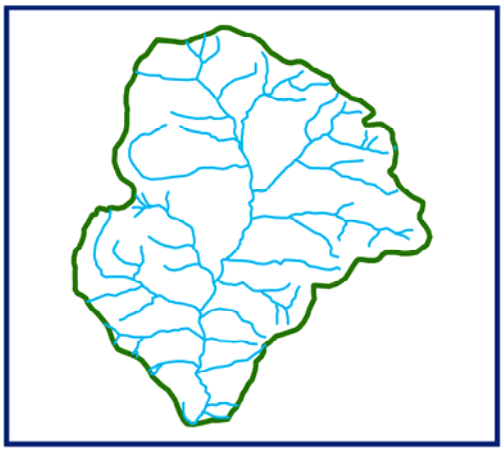
SNOW COVER MAP : BEAS BASIN



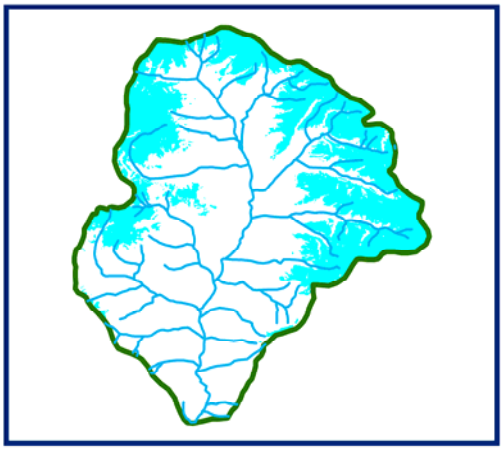
3 MAY 2013



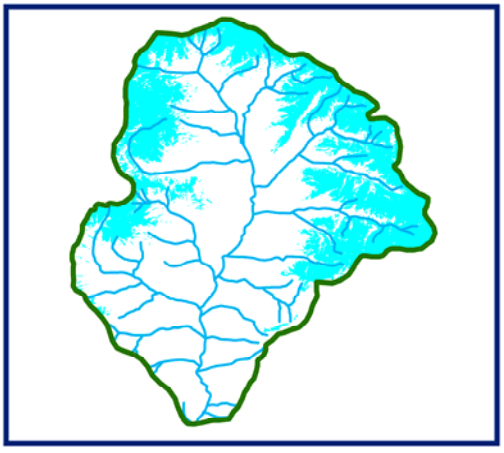
08 MAY 2013



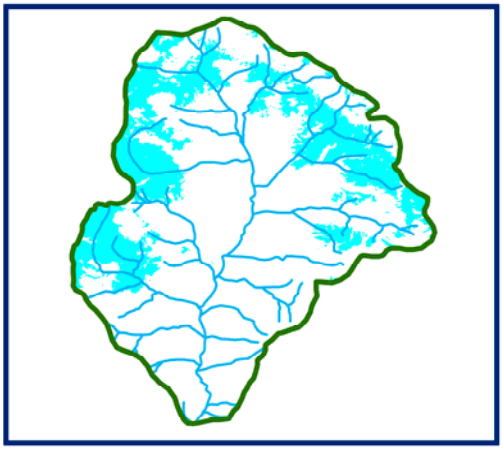
DATA NOT AVAILABLE



20 MAY 2013



20 MAY 2013



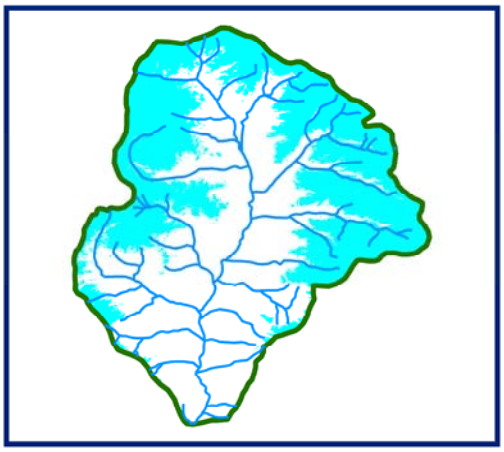
25 MAY 2013

SNOW

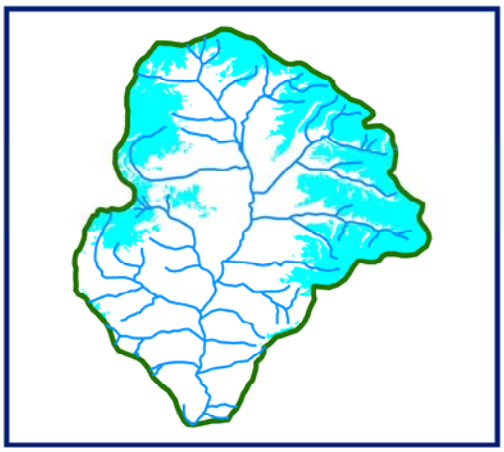
10 5 0 10 20 30 40

Kilometers

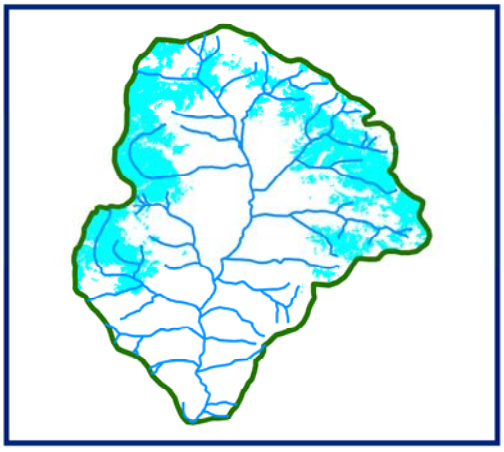
10 DAILY SNOW COVER MAP : BEAS BASIN



DATA USED
03 MAY 2013
08 MAY 2013



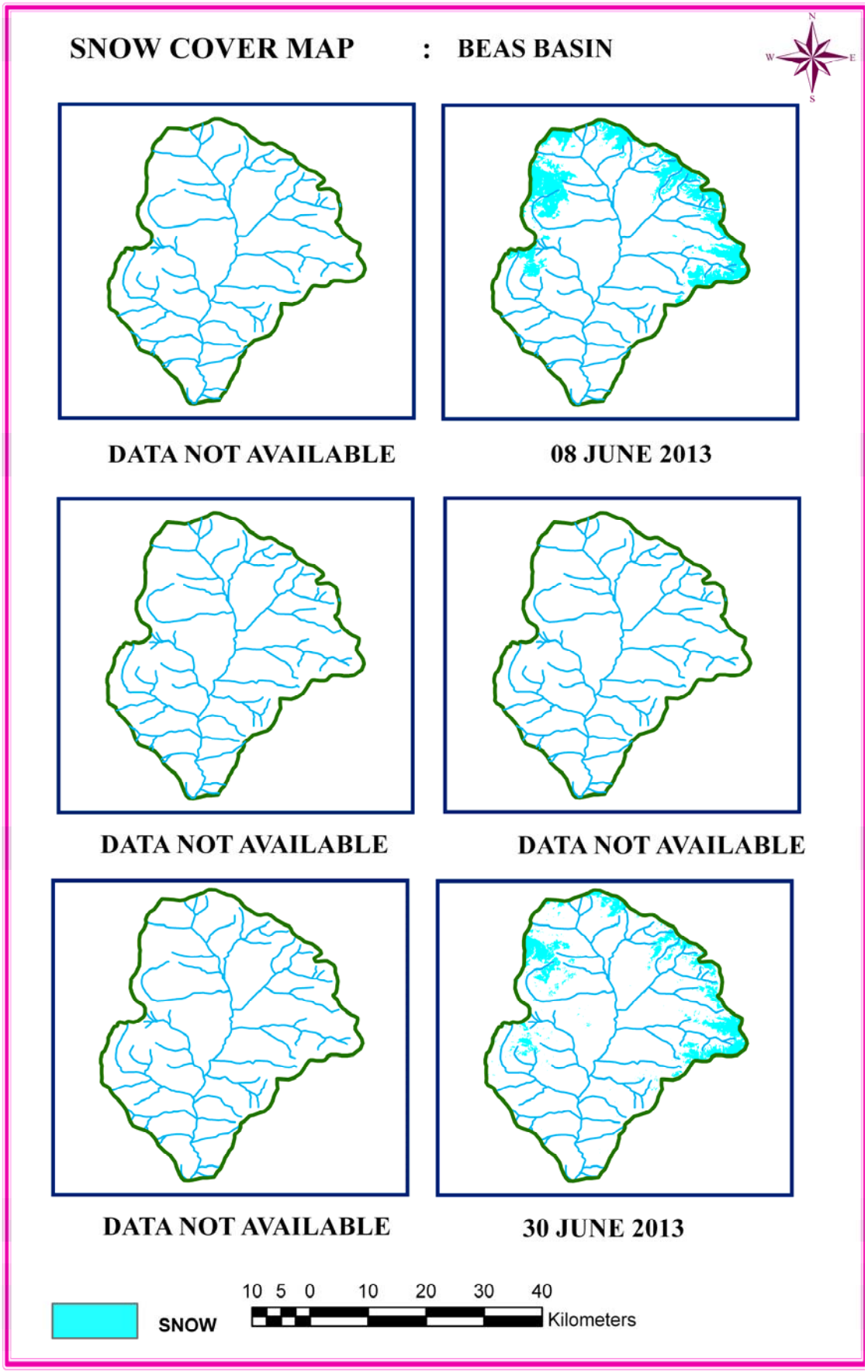
DATA USED
20 MAY 2013



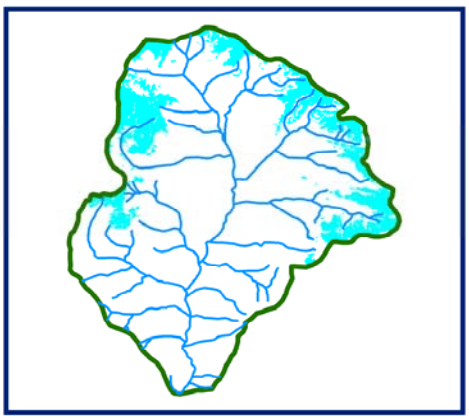
DATA USED
23 MAY 2013
25 MAY 2013

SNOW

10 5 0 10 20 30 40 Kilometers

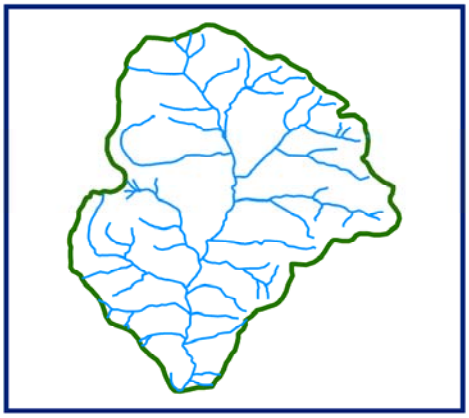

SNOW COVER MAP : BEAS BASIN
N
W
E
S
DATA NOT AVAILABLE
08 JUNE 2013
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
30 JUNE 2013
SNOW
10 5 0 10 20 30 40
Kilometers

10 DAILY SNOW COVER MAP : BEAS BASIN



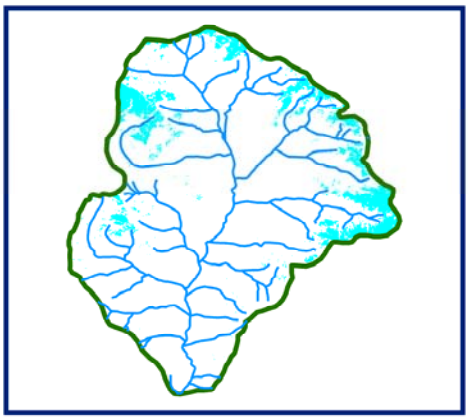
DATA USED

08 JUNE 2013



DATA USED

DATA NOT AVAILABLE



DATA USED

30 JUNE 2013

SNOW

10 5 0 10 20 30 40

Kilometers