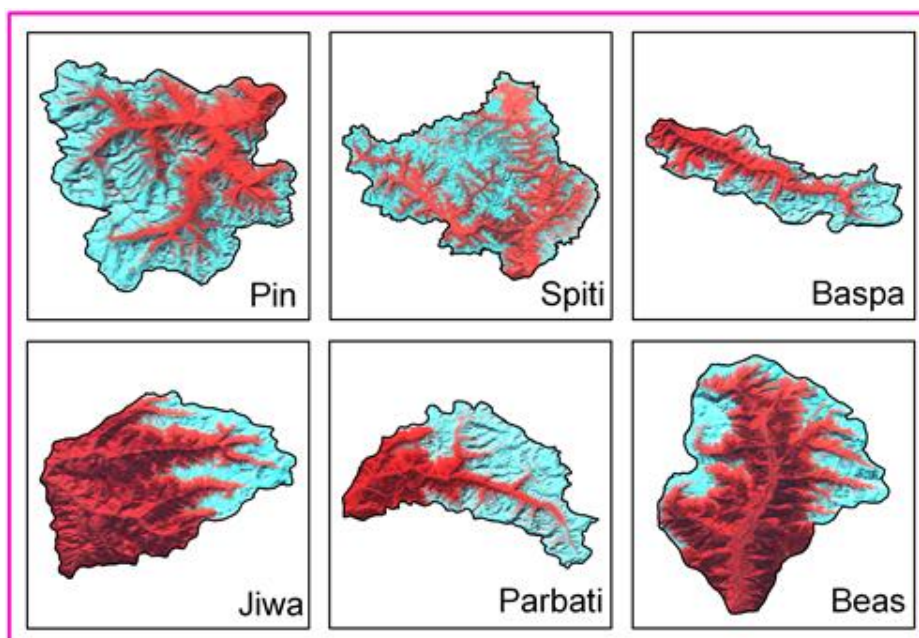


# SNOW COVER ATLAS OF SATLUJ BASIN

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

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

YEAR: 2014-15



State Centre on Climate Change  
(State Council for Science Technology & Environment, Shimla),  
Himachal Pradesh

&

Space Applications Centre (ISRO)  
Ahmedabad-380015

December 2018

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**&**  
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**Ahmedabad-380015**

**December 2018**



**SPACE APPLICATIONS CENTRE (ISRO), AHMEDABAD - 380015****DOCUMENT CONTROL AND DATA SHEET**

Report Number	SAC/EP SA/GHCAG/CSD/ SR/ 135 /2018
Month and year of publication	December 2018
Title	Snow cover Atlas of the Satluj basin
Type of Report	Scientific Report
No. of pages	150
No. of figures, Charts & Tables	110, 18 & 12
Authors	B. P. Rathore, S. K. Singh, I. M. Bahuguna and A. S. Rajawat, Nishtha Gautam and S. S. Randhawa
No. of References	9
Originating Unit	Cryosphere Sciences Division, Geo-Sciences, Hydrology, Cryosphere Sciences and Applications Group, Earth, Ocean, Atmosphere, Planetary Sciences and Applications area, Space Applications Centre (ISRO), Ahmedabad-15
Abstract	This atlas gives sub-basin-wise distribution of snow cover in the Satluj basin from October 2014 to June 2015. The sub-basins 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



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## 1. Introduction

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

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

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

## **2. Study Area:**

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 2014 to June 2015 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:

$$\text{NormalizedDifferenceSnowIndex(NDSI)} = (\text{band2} - \text{band5}) / (\text{band2} + \text{band5}) \quad ..(1)$$

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 2014 to June 2015. Snow ablation pattern varies from basin to basin, depending on area altitude distribution in the basins. For example, in the Jiwa and Beas river basin, which is located in lower altitude zone and contains few glaciers has shown and ablation of snow through out the winter season. Maximum snow cover was observed during first week of March that is 75% and 90 % respectively. However, in case of Pin & Parbati 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 Integrated studies of Himalayan Cryosphere, at Space Applications Centre (ISRO), Ahmedabad. The authors are grateful to Shri D. K. Das, Director, Space Applications Centre, Ahmedabad for continuous guidance and encouragement during the investigation. Authors would like to thank Dr. Rajkumar Deputy Director, EPSA, SAC for their suggestions and comments on the manuscript.

## References

- Agarwal, K. G., Kumar, V. and T. Das, 1983, Melt runoff for a subcatchment of Beas basin. In Proceedings of the First National Symposium on Seasonal Snow Cover, New Delhi, India, April 28-30, 43 p.
- Foster, J. L. and Chang, A. T. C., 1993, Snow cover, in Atlas of satellite observations related to global change. R. J. Gurney, C.L. Parkinson and J. L. Foster (eds.), Cambridge University Press, Cambridge, pp. 361-370.
- Hall, D. K., Riggs, G. A. and Salomonson, V. V., 1995, Development of methods for mapping global snow cover using moderate resolution Image Spectroradiometer data. Remote Sensing of Environment, 54, pp. 127-140.
- Kulkarni, A. V., Mathur, P., Rathore, B. P., Alex, S., Thakur N. and Kumar, M. 2002, Effect of global warming on snow ablation pattern in the Himalayas. Current Science, 83(2), pp 120-123.
- Kulkarni A. V., Singh, S. K., Mathur, P. and Mishra, V. D., 2006, Algorithm to monitor snow cover using AWiFS data of RESOURCESAT for the Himalayan region. International Journal of Remote Sensing, 27(12), pp 2449-2457.
- Kulkarni, A. V., Randhawa, S. S. and Sood, R. K., 1997, A stream flow simulation model in snow covered areas to estimate hydro-power potential: a case study of Malana nala, H.P. Proc. of the First international Conference on Renewable Energy- Small Hydro, Hyderabad, pp 761-770.
- Markham, B. L. and Barker, J. L., 1987, Thematic Mapper bandpass solar exoatmospheric irradiances. International Journal of Remote Sensing, 8(3), pp 517-523.
- Singer, F. S. and Popham, R. W., 1963. Non-meteorological observations from satellite. Astronautics and Aerospace Engineering 1(3), 89-92.

Srinivasulu, J. and Kulkarni, A. V., 2004, A satellite based spectral reflectance model for snow and glacier studies in the Himalayan terrain. Proceedings of the Indian Academy of Science (Earth and Planetary Science), 113 (1), pp. 117-128.

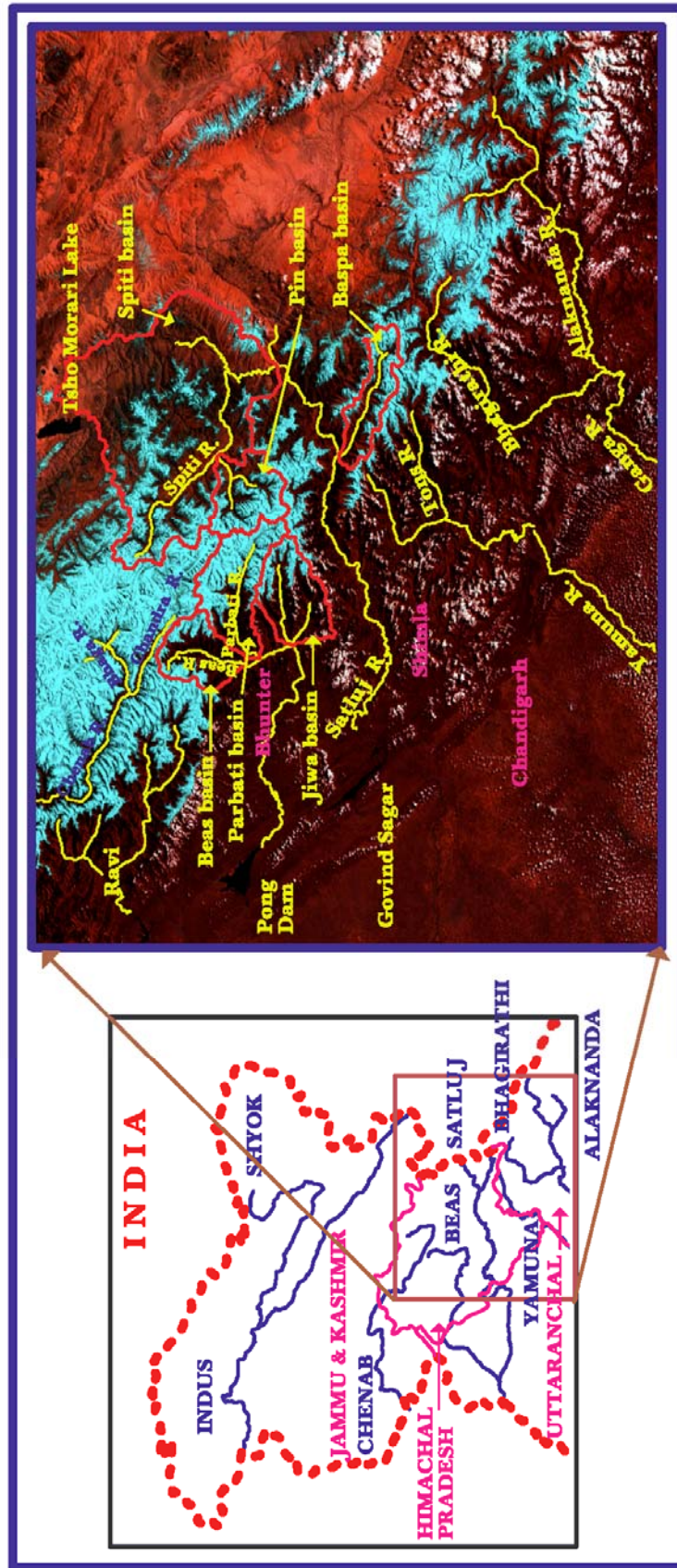
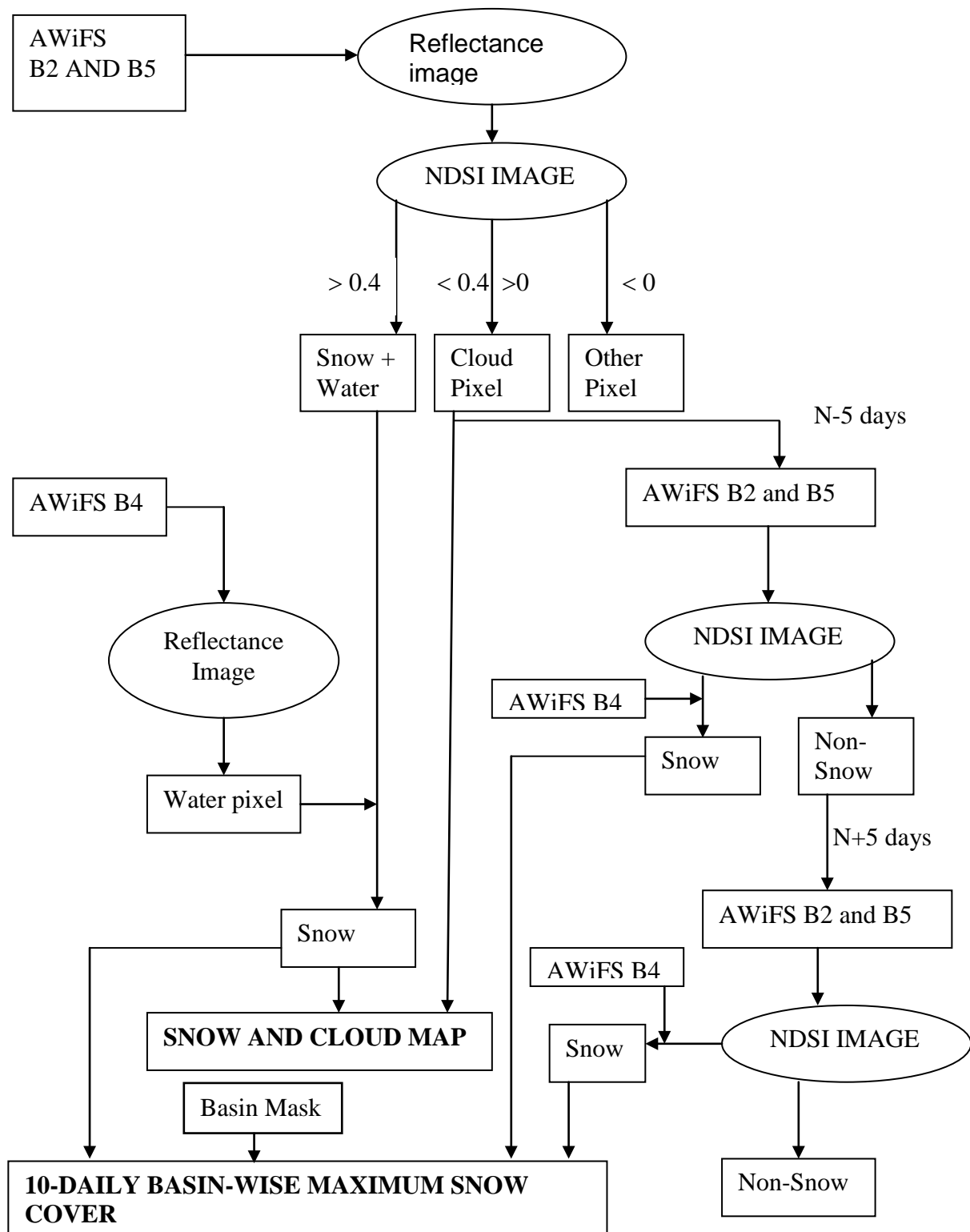


Figure 1: Location map of Pin, Spiti, Baspa, Jiwa, Parbati and Beas sub-basins (Part of Satluj basin)





**Figure 2: Algorithm for snow cover mapping using AWiFS data**

# *PIN SUB-BASIN*

# AREAL EXTENT OF SNOW (5 DAILY)

**BASIN NAME: PIN**

**BASIN AREA: 1266 sq km**

S. No	Date	Snow cover (sq. km)	Snow cover (%)	S. No	Date	Snow cover (sq. km)	Snow cover (%)
<b>October 2014</b>							
1.	01 Oct 2014	71 ©	6	3	04 oct2014	267	21
2.	02Oct 2014	209	17	4	30 Oct 2014	493	39
<b>November 2014</b>							
5.	2 Nov 2014	381.44	30				
<b>December 2014</b>							
6	1 Dec 2014	374	30	7	20 Dec 2014	1266	100
<b>January 2015</b>							
8	01 Jan 2015	1237	98	10	10 Jan 2015	1249	99
9	05 Jan 2015	1258	99	11			
<b>February 2015</b>							
12	04 Feb 2015	1260	100				
<b>March 2015</b>							
13.	04 March 2015	1196.69 ©	95	14.	06 March 2015	1266	100
<b>April 2015</b>							
15.	05 April 2015	1244.10 ©	98	17	12 April 2015	1266	100
16.	11 April 2015	1266.40	100	18	26 April 2015	1202.33	95
<b>May 2015</b>							
19.	03 May 2015	1203.46	95	21.	11 May 2015	930.63	74
20.	06May 2015	1093.01	86	22	23 May 2015	930.63	74
<b>June 2015</b>							
23.	10 June2015	255.45	20 ©	25.	16 June 2015	765.61	61 ©
24.	11 June 2015	679.80	54 ©	26.	20 June 2015	603.00	48 ©

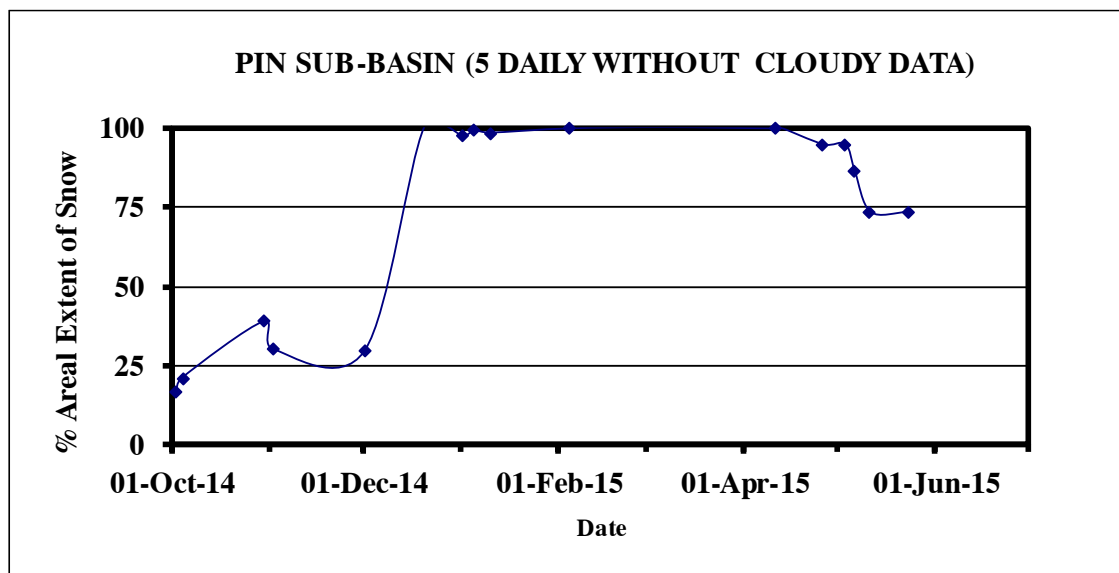
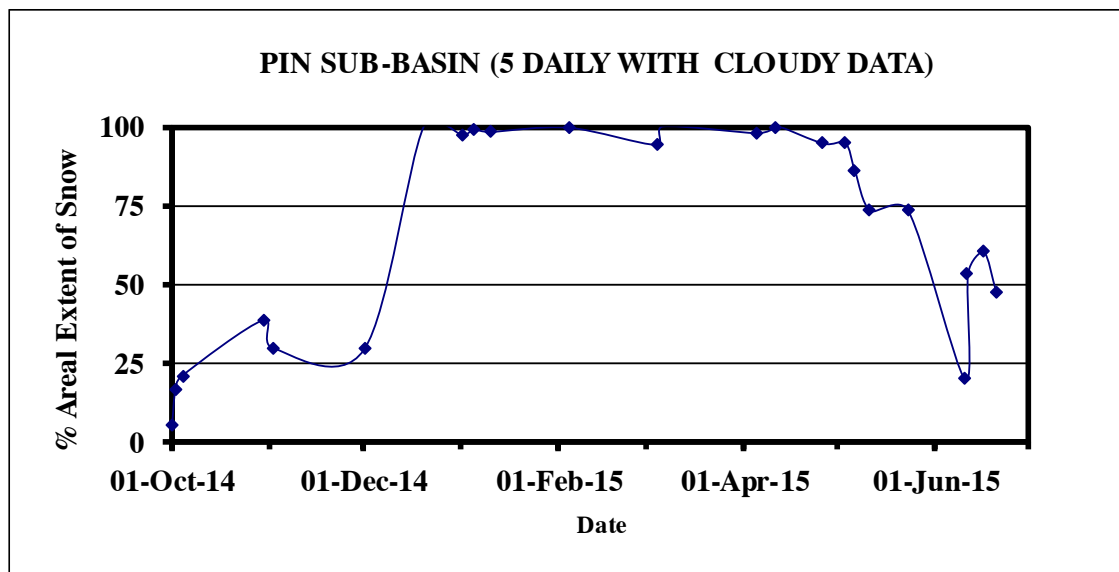
# AREAL EXTENT OF SNOW (10 DAILY)

**BASIN NAME: PIN**

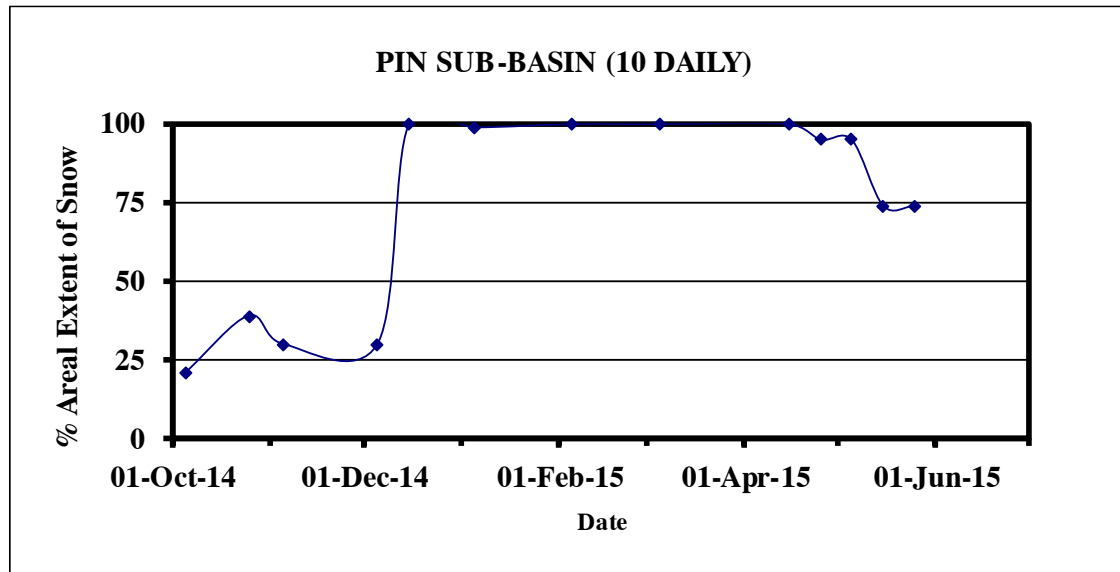
**BASIN AREA: 1266 sq km**

S. No	Date	Snow cover (sq. km)	Snow cover (%)	S. No	Date	Snow cover (sq. km)	Snow cover (%)
<b>October 2014</b>							
1.	05 Oct 2014	266	21	2	25 oct2014	494	39
<b>November 2014</b>							
3.	2 Nov 2014	380	30				
<b>December 2014</b>							
4	5 Dec 2014	380	30	5	15 Dec 2014	1266	100
<b>January 2015</b>							
6	05 Jan 2015	1253	99				
<b>March 2015</b>							
7	04 March 2015	1266	100				
<b>April 2015</b>							
8	05 April 2015	1266	100	10	25 April 2015	1203	95
9	11 April 2015	1266	100				
<b>May 2015</b>							
11.	05 May 2015	1203.46	95	13.	25 May 2015	937	74
12.	15 May 2015	937	74				
<b>June 2015</b>							

## SNOW ACCUMULATION AND ABLATION CURVE

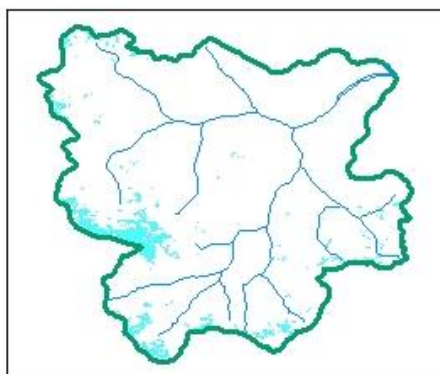


## SNOW ACCUMULATION AND ABLATION CURVE

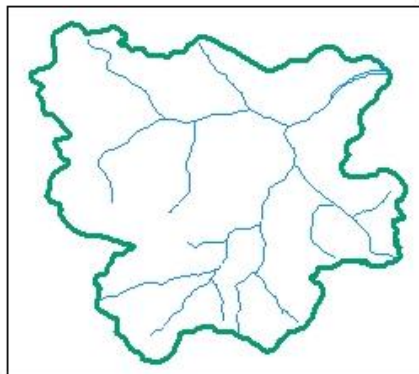


# *SNOW COVER MAP*

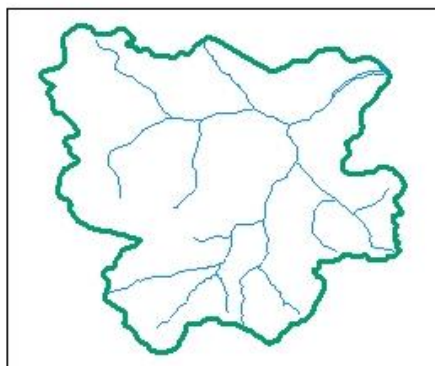
# SNOW COVER MAP : PIN BASIN



**01 Oct 2014**



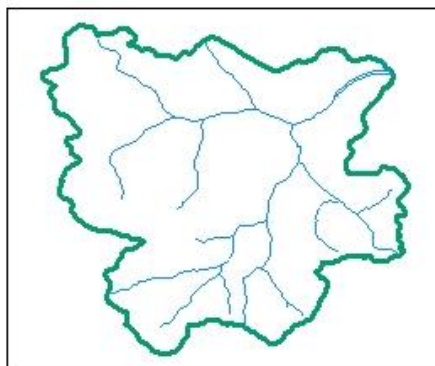
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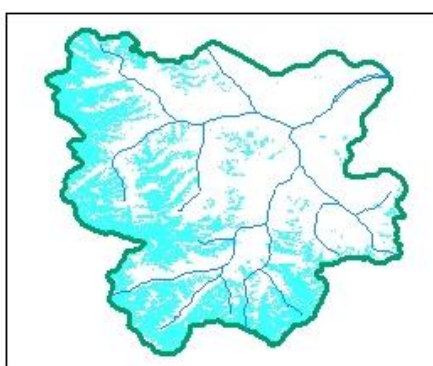
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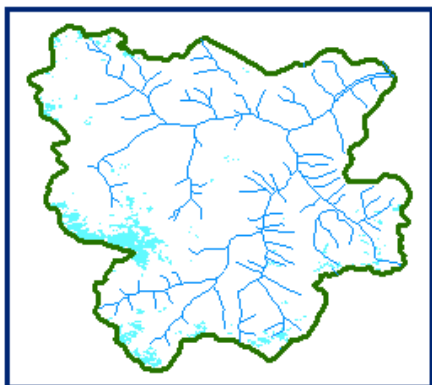
**30 Oct 2014**



0 35 710.84  
Kilometers



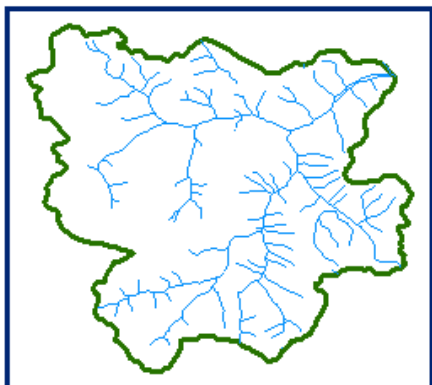
# 10 DAILY SNOW COVER MAP: PIN BASIN



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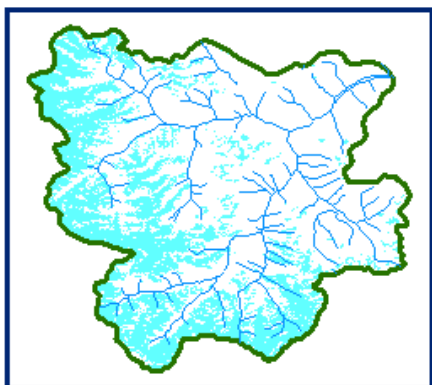
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**02 Oct 2014**



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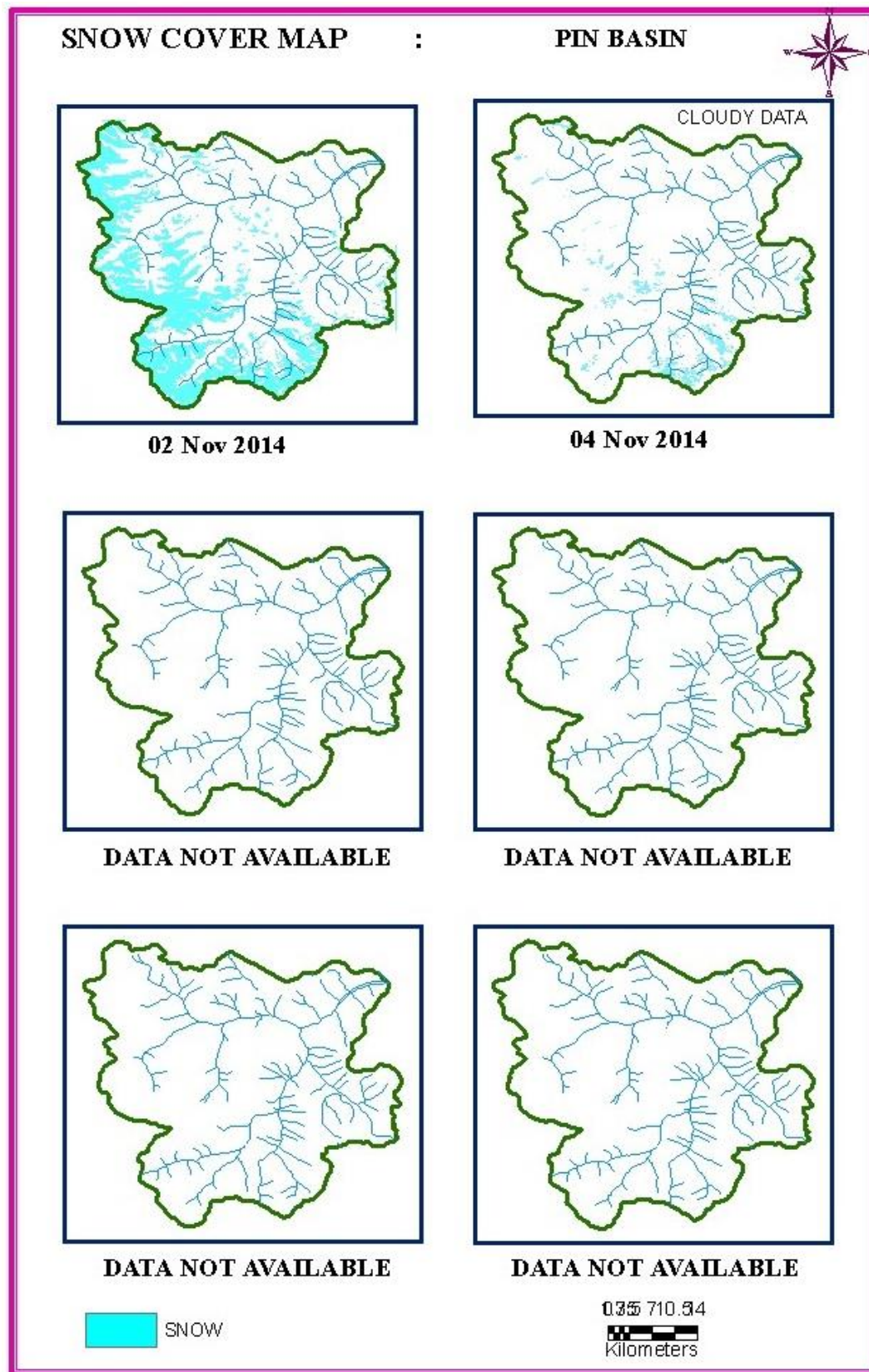


DATA USED

**30 Oct 2014**

 SNOW

0 4.759.5 19 28.5 38  
  
Kilometers



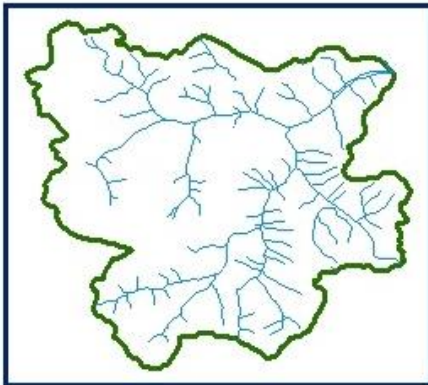
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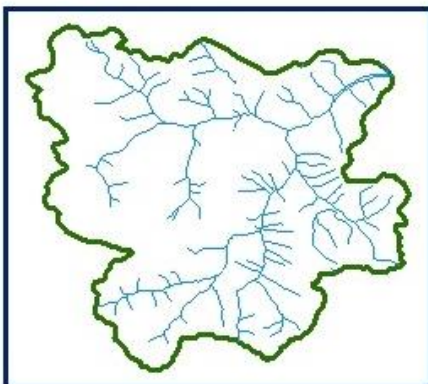
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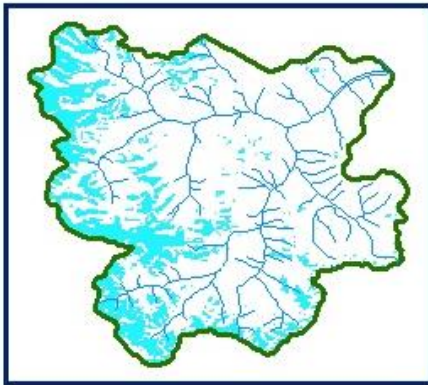
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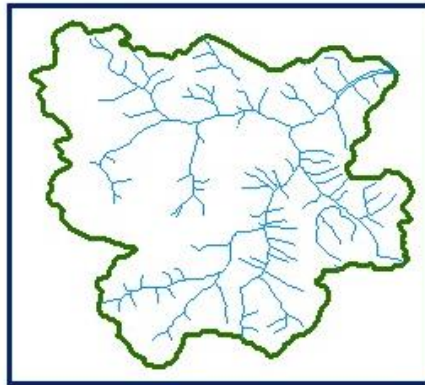
 SNOW



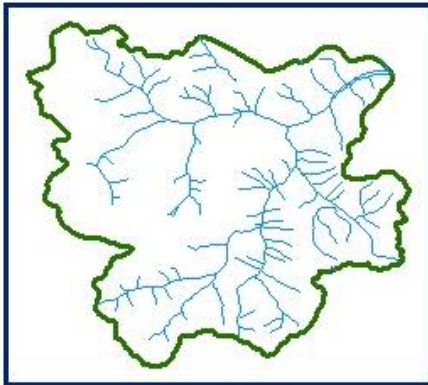
**SNOW COVER MAP : PIN BASIN**



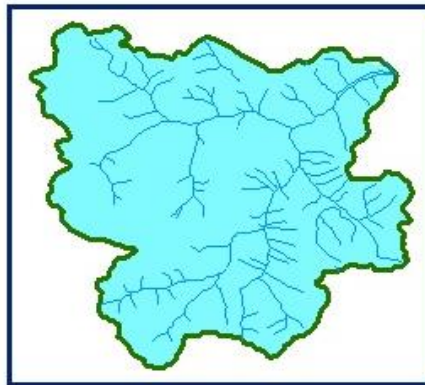
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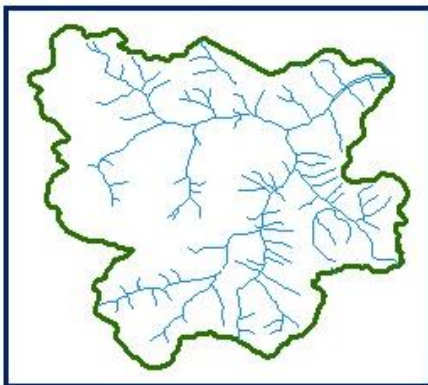
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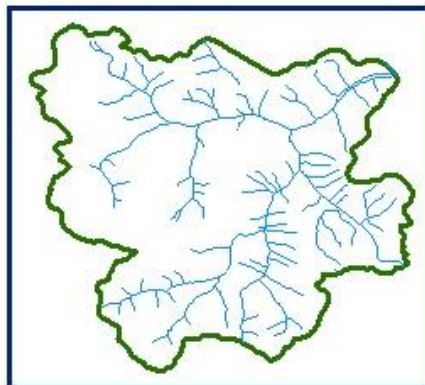
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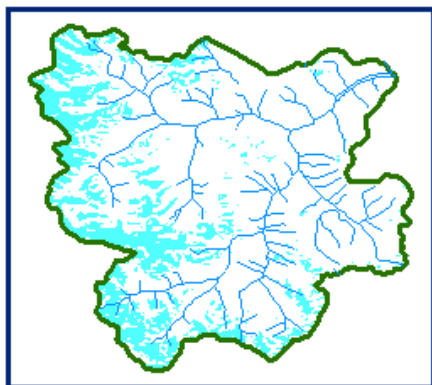


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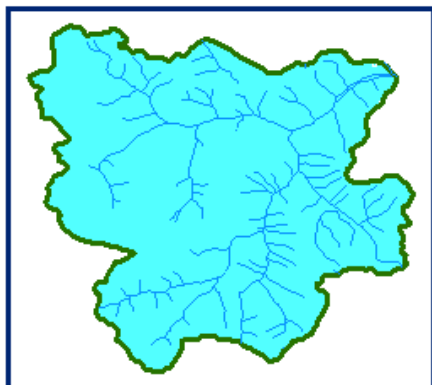
 SNOW

035 710.54  
Kilometers

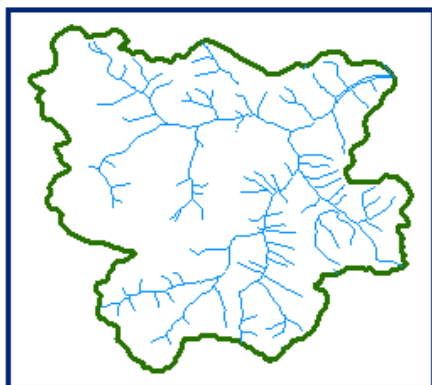
**10 DAILY SNOW COVER MAP: PIN BASIN**



DATA USED  
**01Dec 2014**




DATA USED  
**20 Dec 2014**



DATA USED  
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 SNOW

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Kilometers



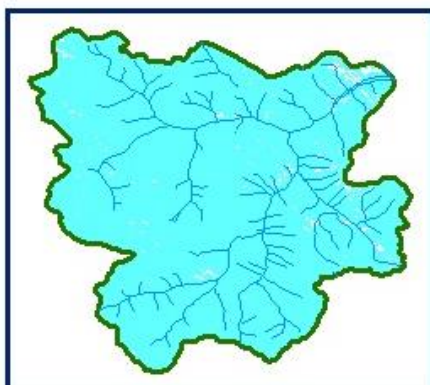
# SNOW COVER MAP : PIN BASIN



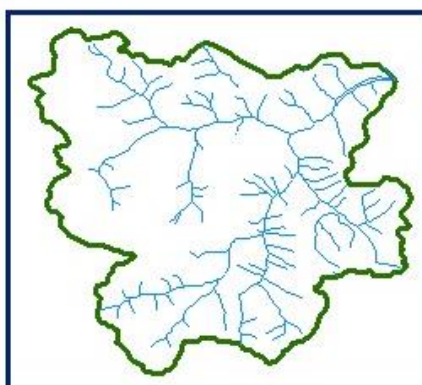
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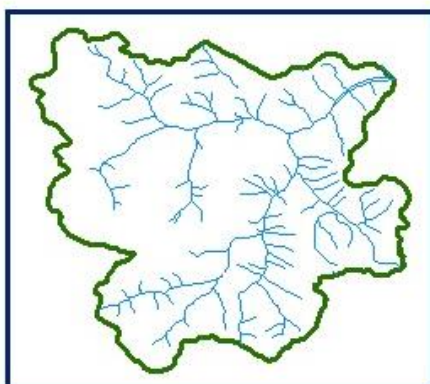
05 Jan 2015



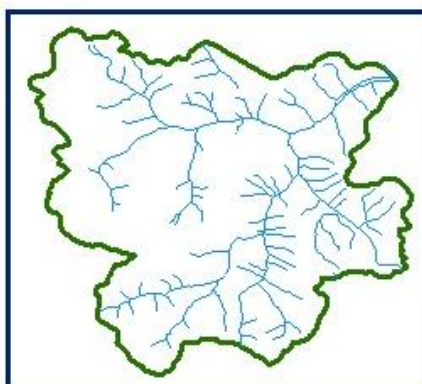
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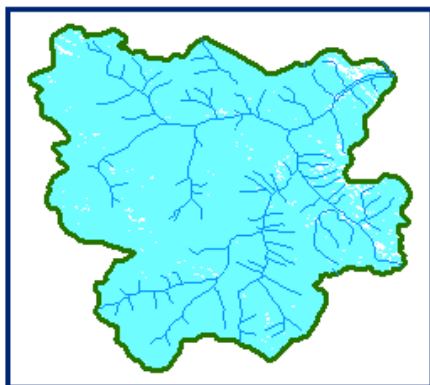


DATA NOT AVAILABLE

 SNOW

035 710.34  
Kilometers

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

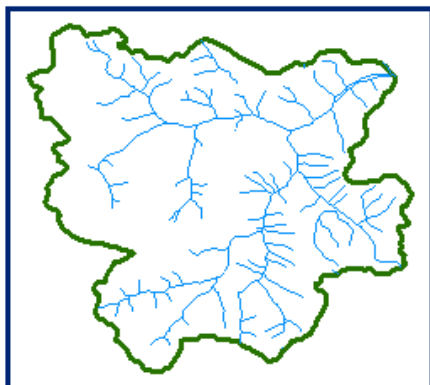


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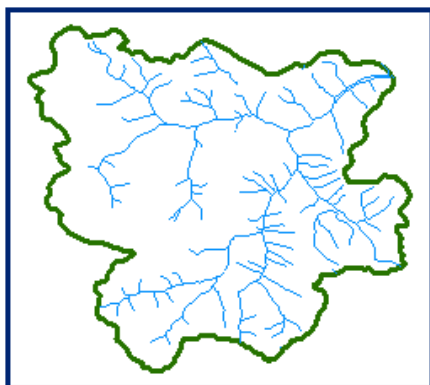
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DATA USED

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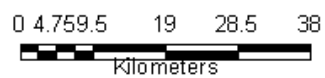


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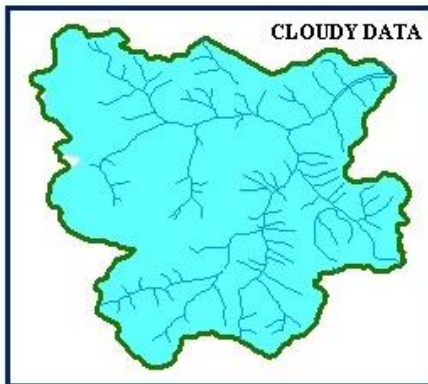
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SNOW



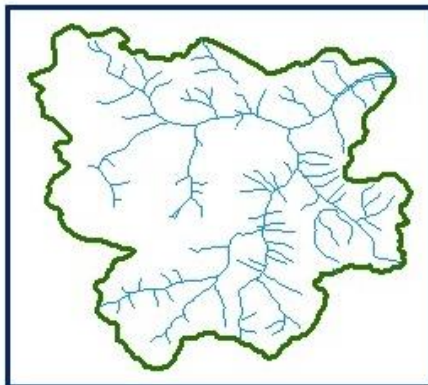
# SNOW COVER MAP : PIN BASIN



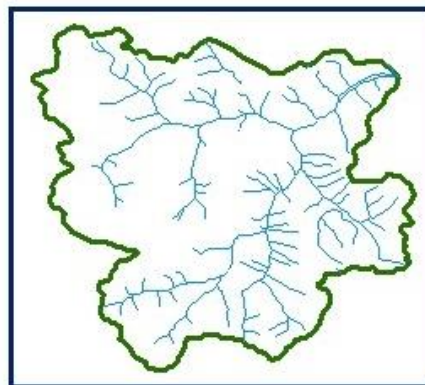
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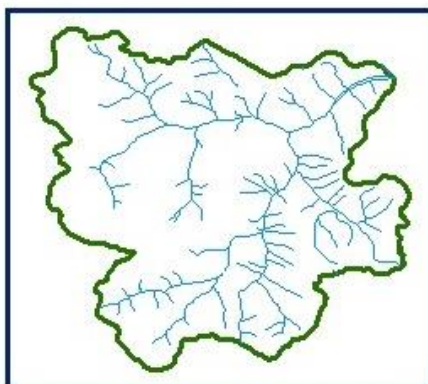
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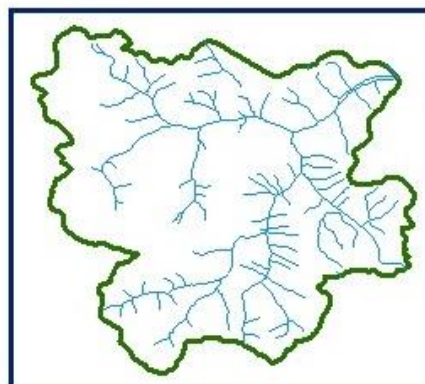
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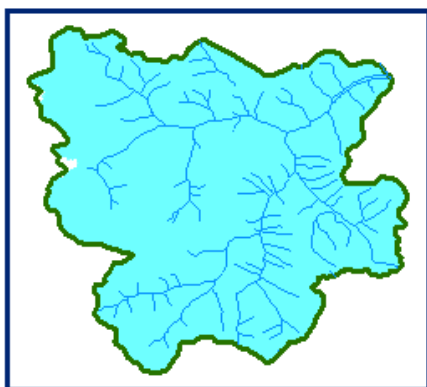
DATA NOT AVAILABLE

 SNOW

0 35 710.34  
  
 Kilometers



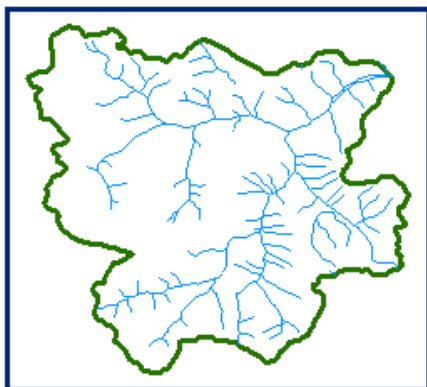
**10 DAILY SNOW COVER MAP: PIN BASIN**



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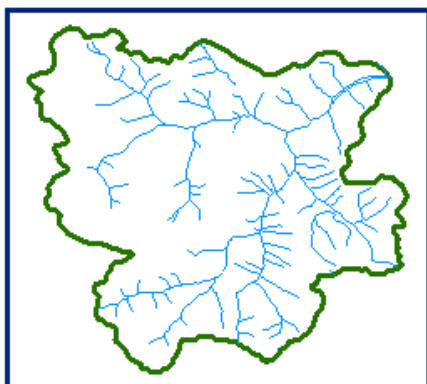
**01 Feb 2015**

**04 Feb 2015**



DATA USED


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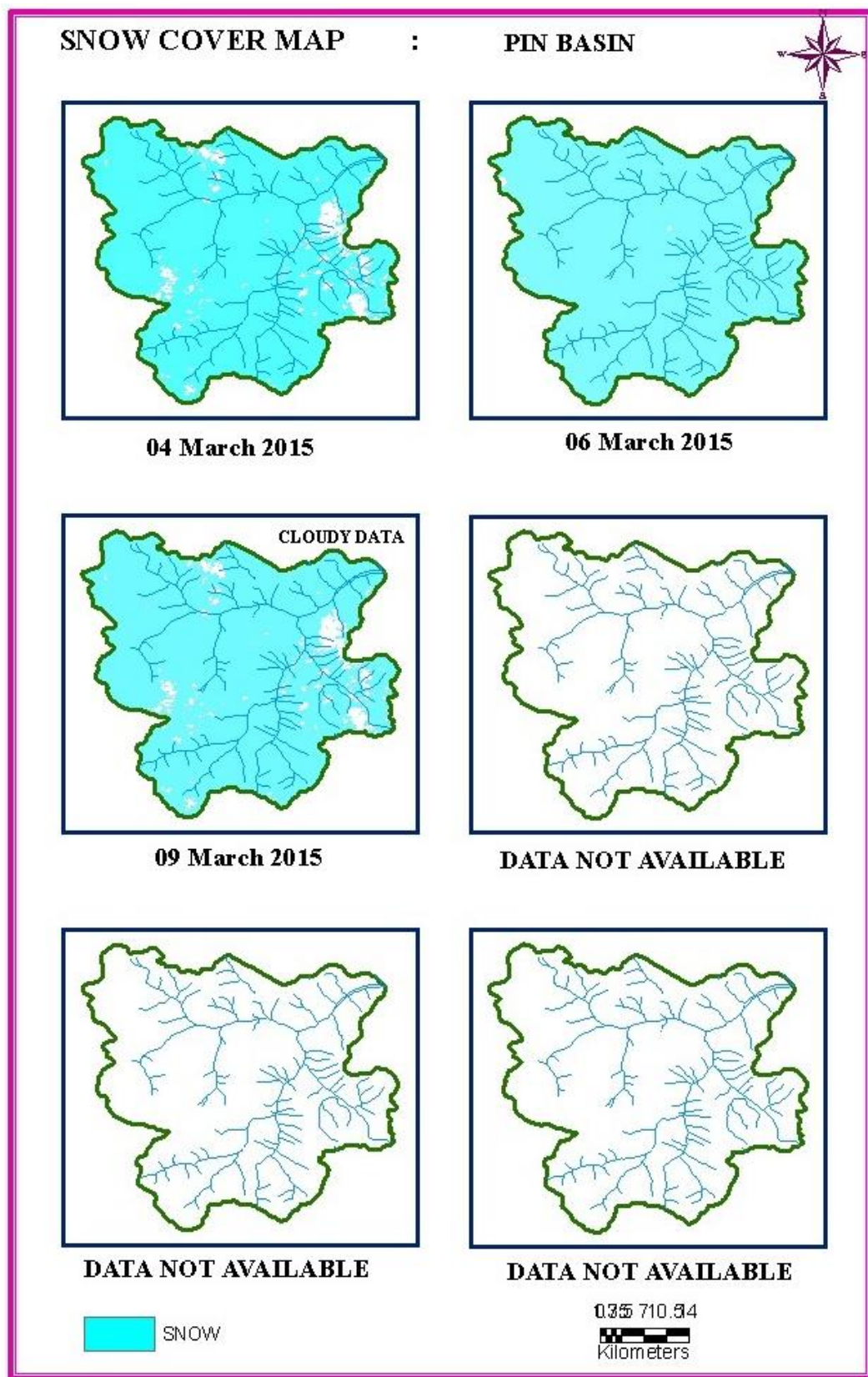


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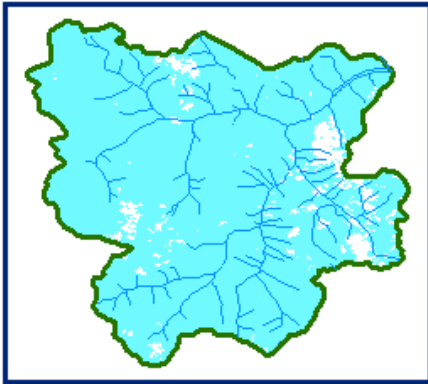
**DATA NOT AVAILABLE**

 SNOW

0 4.759.5 19 28.5 38  
  
Kilometers



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

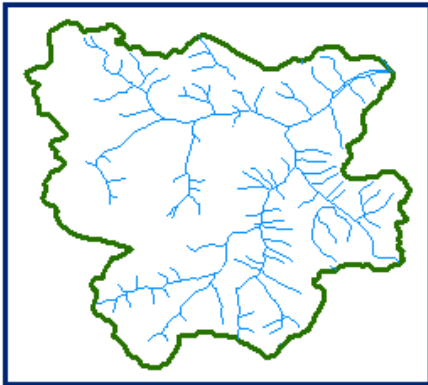


DATA USED

**04 March 2015**

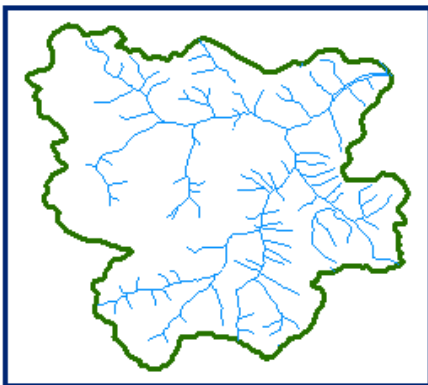
**06 March 2015**

**09 March 2015**



DATA USED


**DATA NOT AVAILABLE**



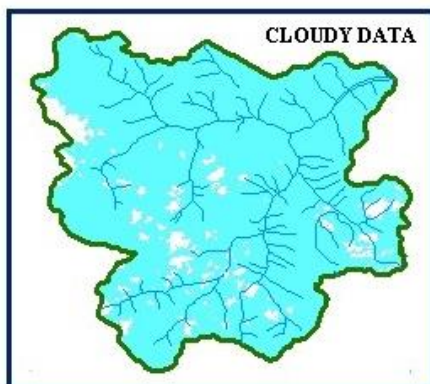
DATA USED

**DATA NOT AVAILABLE**

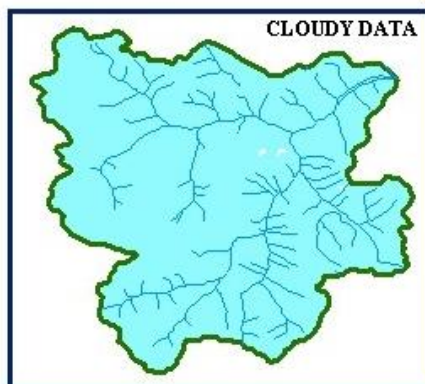
 SNOW

0 4.759.5 19 28.5 38  
  
Kilometers

# SNOW COVER MAP : PIN BASIN



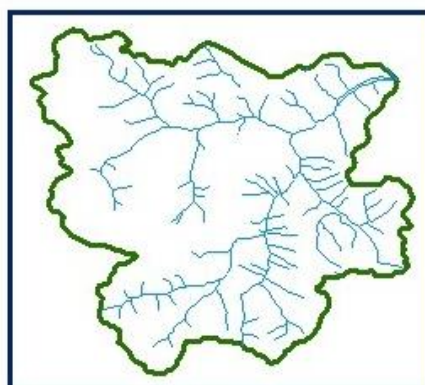
04 April 2015



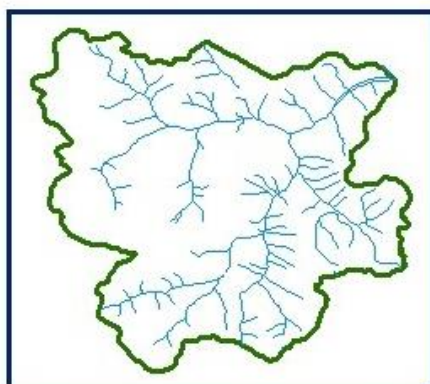
07 April 2015



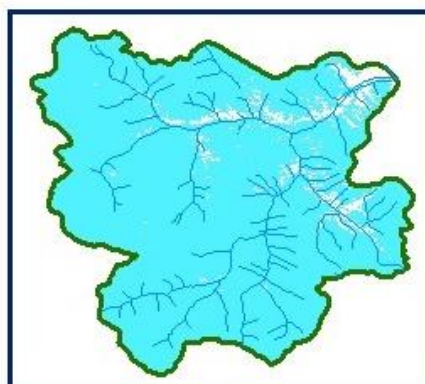
12 April 2015



DATA NOT AVAILABLE



DATA NOT AVAILABLE

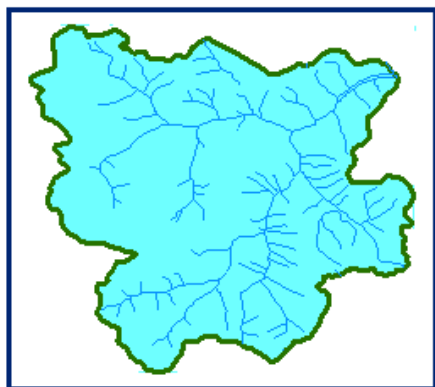


26 April 2015

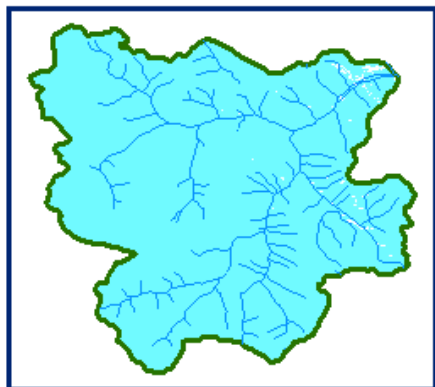
 SNOW

0 35 710.54  
Kilometers

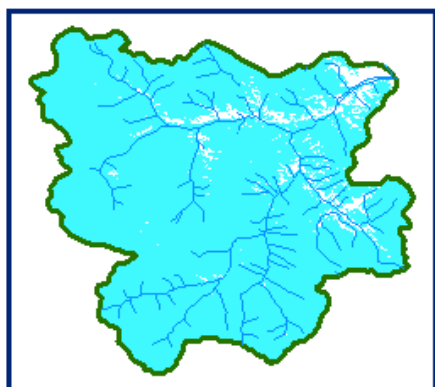
# 10 DAILY SNOW COVER MAP: PIN BASIN



DATA USED  
**04 April 2015**  
**05 April 2015**  
**07 April 2015**




DATA USED  
**11 April 2015**  
**12 April 2015**

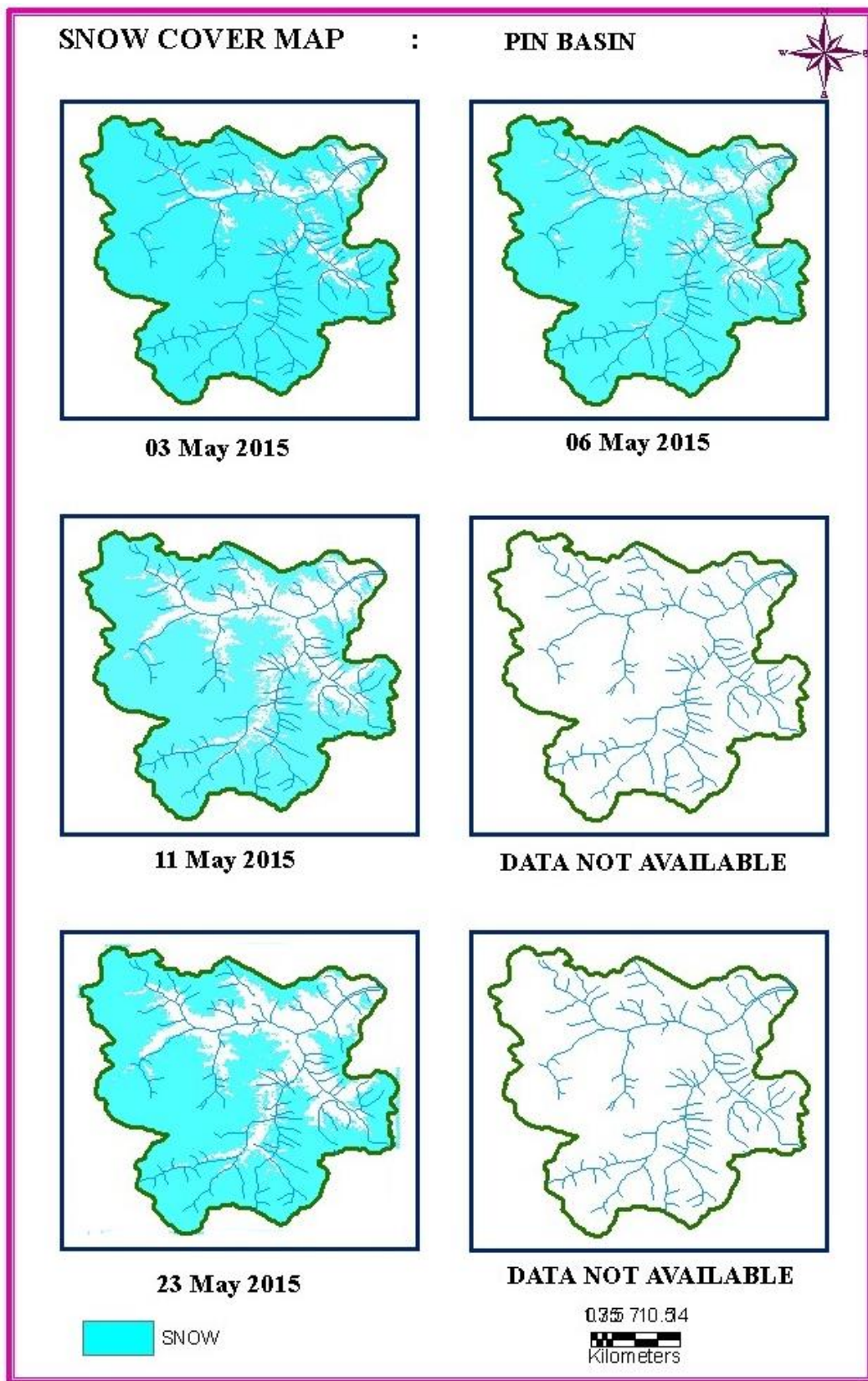


DATA USED  
**26 April 2015**

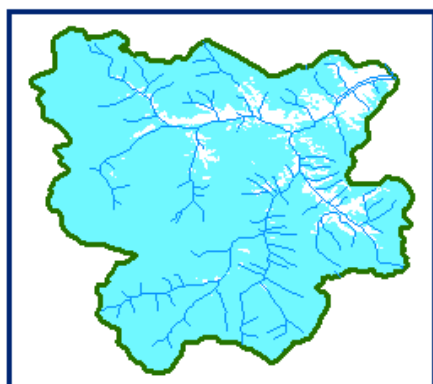
 SNOW

0 4.759.5 19 28.5 38  
  
Kilometers





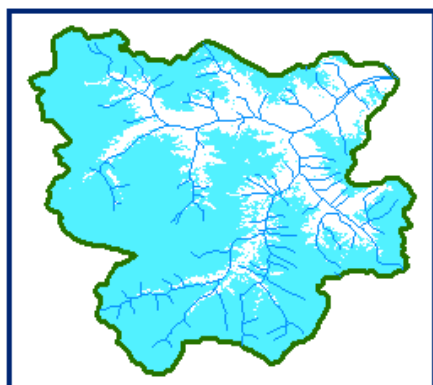
# 10 DAILY SNOW COVER MAP: PIN BASIN



DATA USED

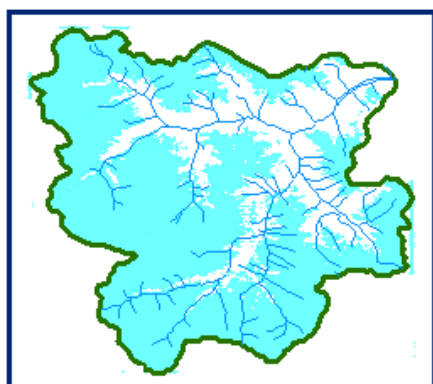
**03 May 2015**

**06 May 2015**



DATA USED


**11 May 2015**



DATA USED

**23 May 2015**

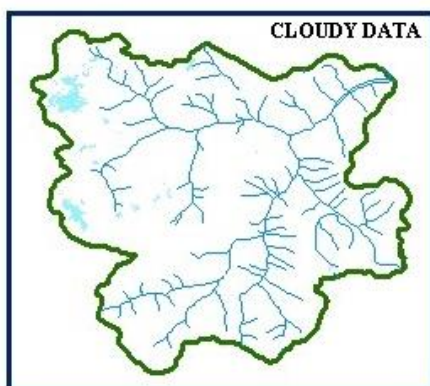
 SNOW

0 4.759.5 19 28.5 38  
  
kilometers

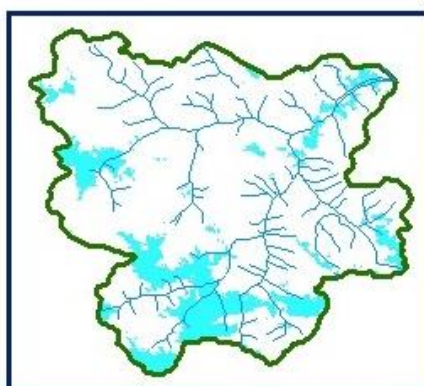
# SNOW COVER MAP

:

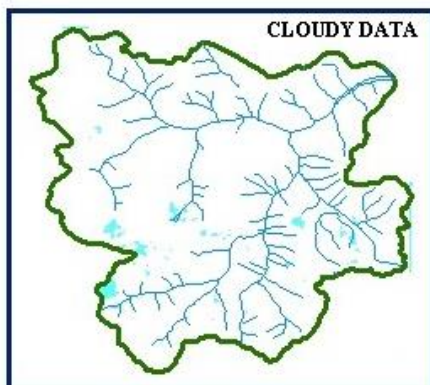
PIN BASIN



04 June 2015



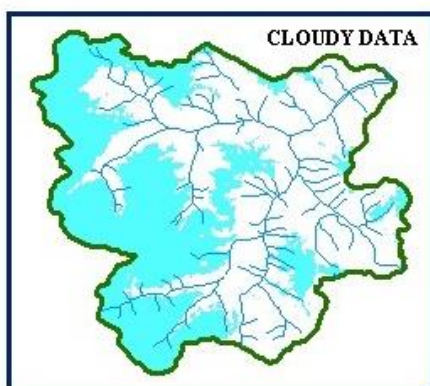
10 June 2015



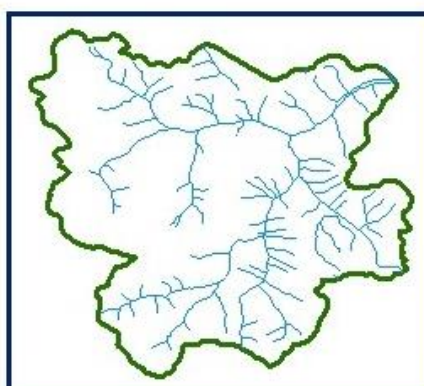
15 June 2015



16 June 2015



20 June 2015



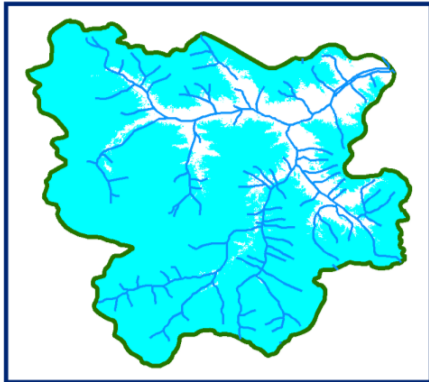
DATA NOT AVAILABLE

 SNOW

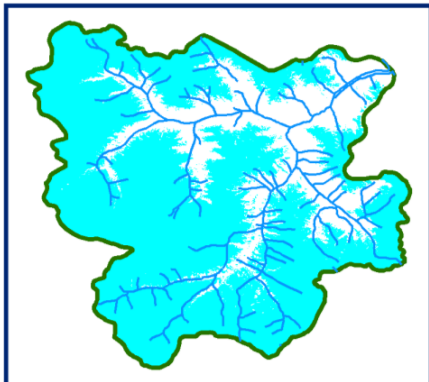
0 35 710.34  
kilometers



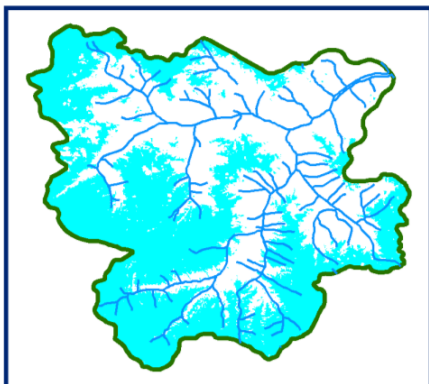
## 10 DAILY SNOW COVER MAP: PIN BASIN



DATA USED  
**03 June 2014**  
**06 June 2014**  
**09 June 2014**




DATA USED  
**13 June 2014**  
**16 June 2014**  
**20 June 2014**



DATA USED  
**28 June 2014**



SNOW

0 2 4 8 12 16  
  
Kilometers

## *SPITI SUB-BASIN*

# AREAL EXTENT OF SNOW (5 DAILY)

**BASIN NAME: SPITI**

**BASIN AREA: 8871 sq km**

S. No	Date	Snow cover (sq. km)	Snow cover (%)	S. No	Date	Snow cover (sq. km)	Snow cover (%)
<b>October 2014</b>							
1.	01 Oct 2014	136.72	1.54 ©	2	30 Oct 2014	505.36	5.69
3.	04 Oct 2014	483.76	5.45				
<b>November 2014</b>							
4.	02 Nov 2014	603.21	6.79				
<b>December 2014</b>							
5.	01 Dec 2014	974	11	6	20 Dec 2014	8326	94
<b>January 2015</b>							
7	01 Jan 2015	4304	49	9	10 Jan 2015	6285	71
8	05 Jan 2015	7066	80				
<b>February 2015</b>							
10.	01 Feb 2015	7839.53	88.37 ©	11.	04 Feb 2015	7839.43	88.37
<b>March 2015</b>							
12.	04 Mar 2015	8486.83	95.66	13	06 Mar 2015	8710.412	98.18
<b>April 2015</b>							
14.	04 April 2015	8565.54	96.55 ©	16	11 April 2015	6700.69	75.53
15.	07 April 2015	6054.40	68.24 ©	17	12 April 2015	6599.31	74.39
<b>May 2015</b>							
18.	03 May 2015	5526.97	62.30	20	11 May 2015	3000	34
19.	06 May 2015	4557.53	51.37	21	23 may 2015	4156	46
<b>June 2015</b>							
22.	10 June 2015	2448.09	27.59 ©	24.	20 June 2015	2206.45	24.87 ©
23	16 June2015	2351	27				

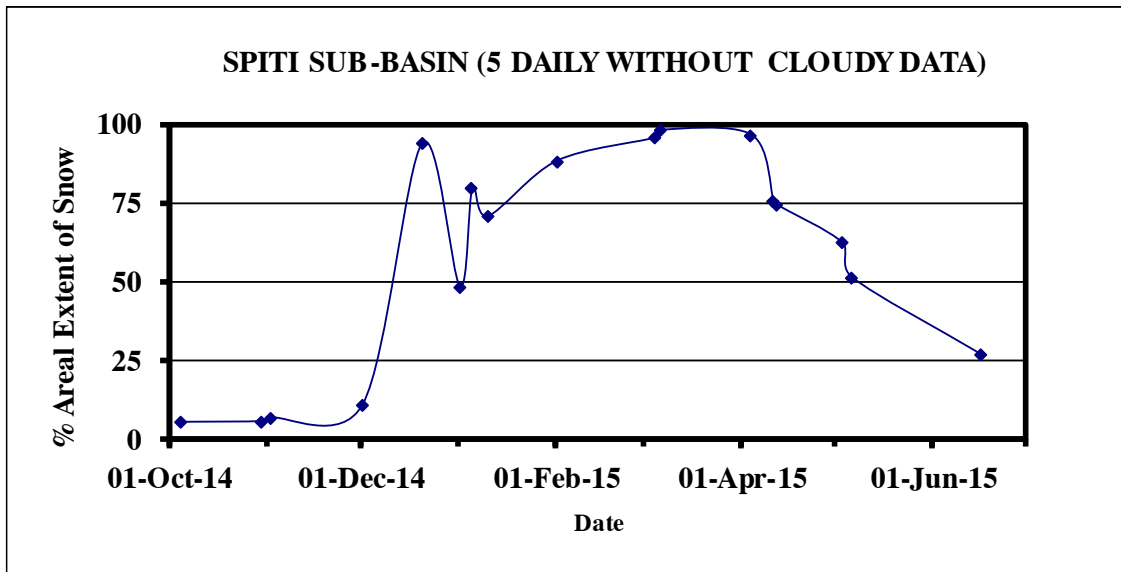
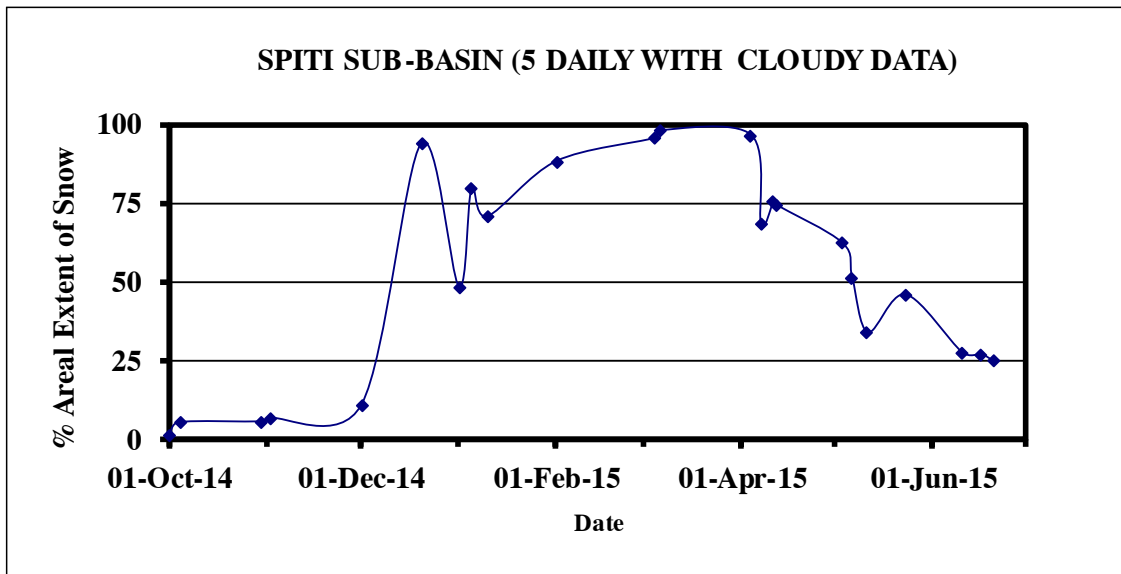
# AREAL EXTENT OF SNOW (10 DAILY)

**BASIN NAME: SPITI**

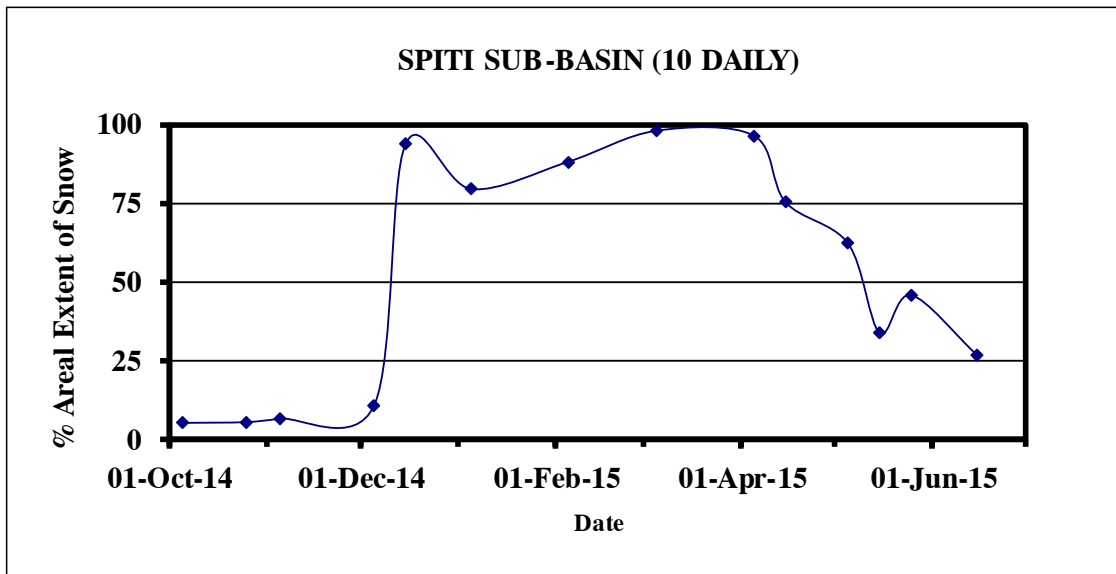
**BASIN AREA: 8871 sq km**

S. No	Date	Snow cover (sq. km)	Snow cover (%)	S. No	Date	Snow cover (sq. km)	Snow cover (%)
<b>October 2014</b>							
1.	01 Oct 2014	483	5	2	30 Oct 2014	505	6
<b>November 2014</b>							
3.	02 Nov 2014	603	7				
<b>December 2014</b>							
4.	01 Dec 2014	974	11	5.	20 Dec 2014	8327	94
<b>January 2015</b>							
6.	01 Jan 2015	7066	80				
<b>February 2015</b>							
7.	01 Feb 2015	7839	88				
<b>March 2015</b>							
8.	04 Mar 2015	8710	98				
<b>April 2015</b>							
9	04 April 2015	8566	97	10	11 April 2015	6700	76
<b>May 2015</b>							
11	03 May 2015	5527	62	12.	11 May 2015	3016	34
				13	23 May 2015	4081	46
<b>June 2015</b>							
14	15 June 2015	2395	27				

## SNOW ACCUMULATION AND ABLATION CURVE

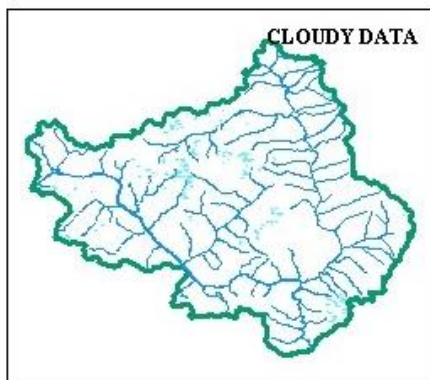


## SNOW ACCUMULATION AND ABLATION CURVE

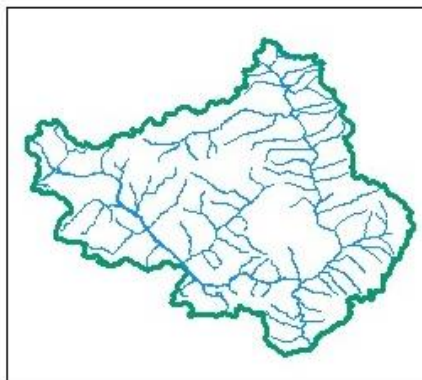


# *SNOW COVER MAP*

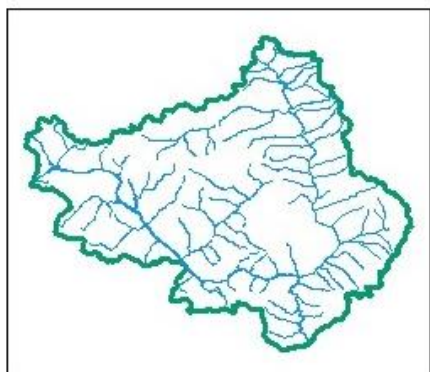
# SNOW COVER MAP : SPITI BASIN



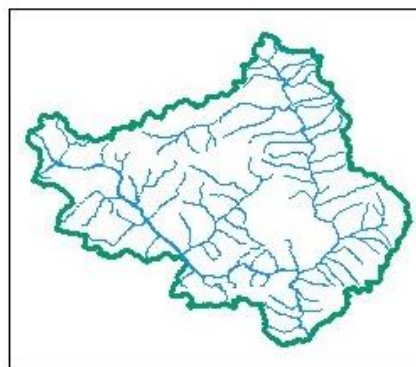
**01 Oct 2014**



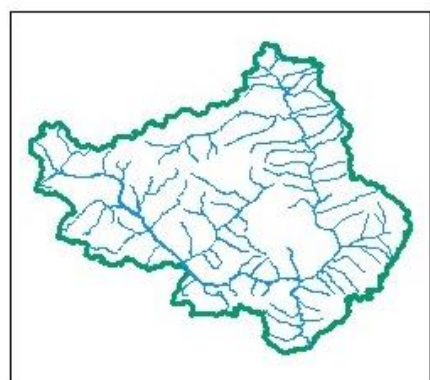
**DATA NOT AVAILABLE**



**DATA NOT AVAILABLE**



**DATA NOT AVAILABLE**



**DATA NOT AVAILABLE**



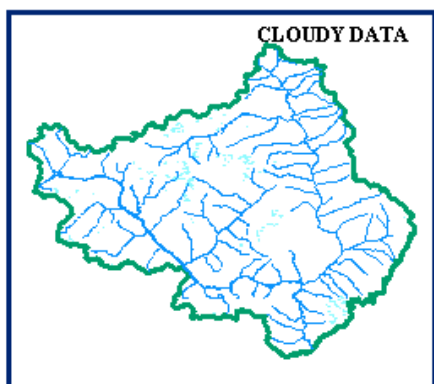
**30 Oct 2014**

 SNOW

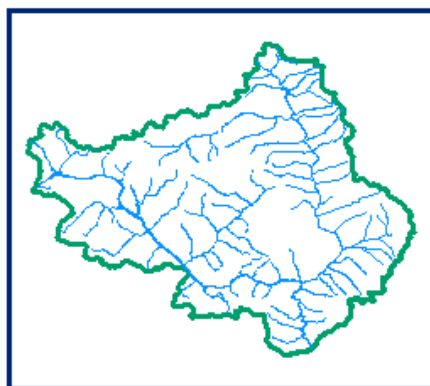
0 20 40 80 120 160  
Kilometers



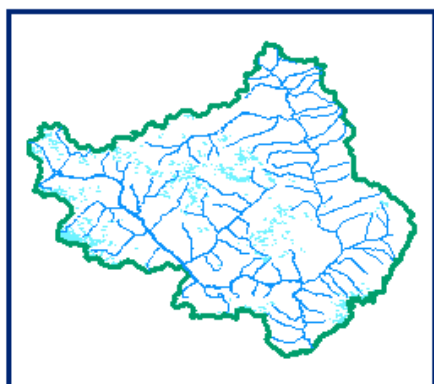
## 10 DAILY SNOW COVER MAP: SPITI BASIN



DATA USED  
**01 Oct 2014**



DATA USED  
**DATA NOT AVAILABLE**



DATA USED  
**30 Oct 2014**

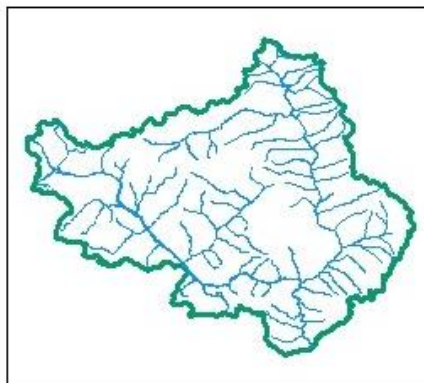
 SNOW

0 20 40 80 120 160  
  
Kilometers

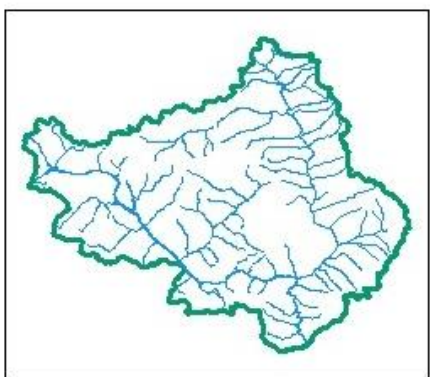
# SNOW COVER MAP : SPITI BASIN



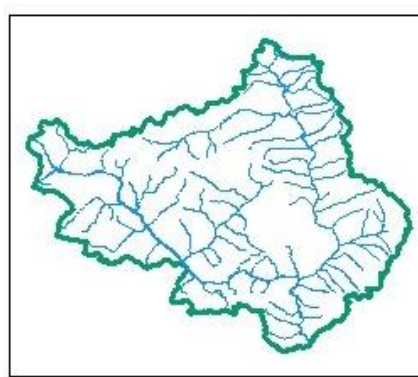
**02 Nov 2014**



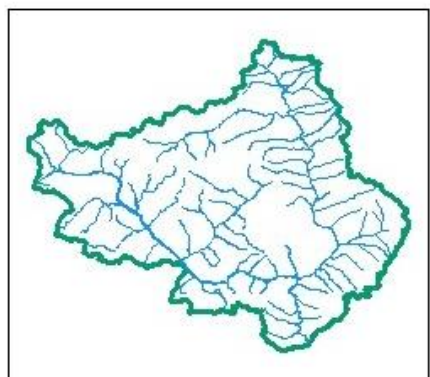
**DATA NOT AVAILABLE**



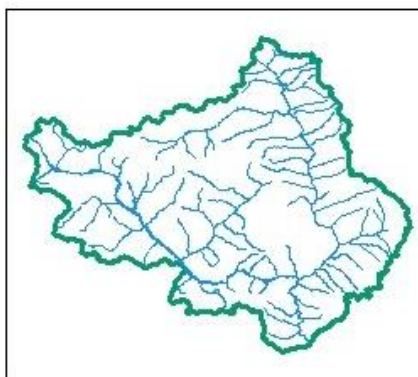
**DATA NOT AVAILABLE**



**DATA NOT AVAILABLE**



**DATA NOT AVAILABLE**



**DATA NOT AVAILABLE**

 SNOW

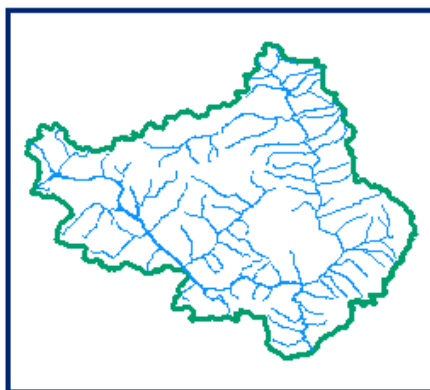
0 20 40 80 120 160  
Kilometers

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



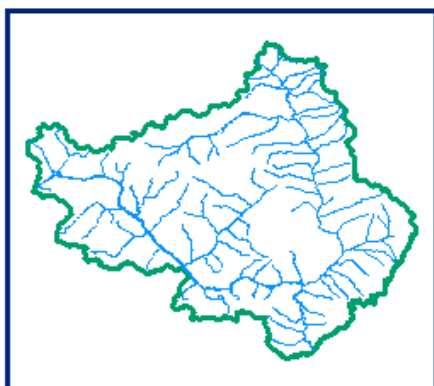
DATA USED

**02 Nov 2014**



DATA USED


**DATA NOT AVAILABLE**



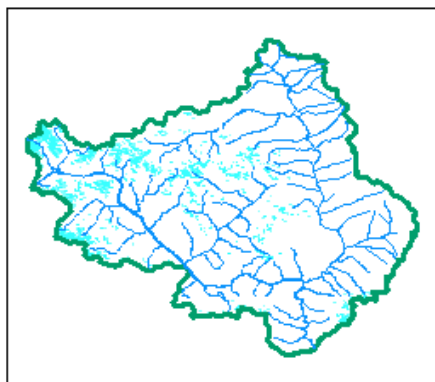
DATA USED

**DATA NOT AVAILABLE**

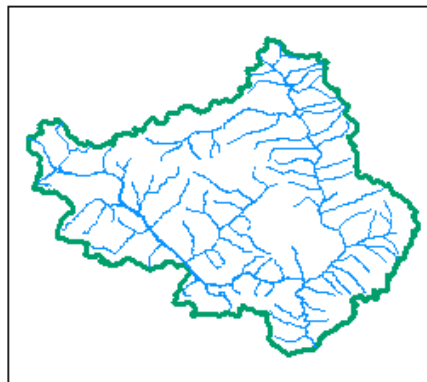
 SNOW

0 20 40 80 120 160  
  
Kilometers

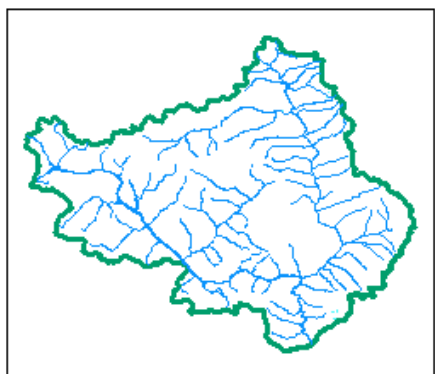
**SNOW COVER MAP : SPITI BASIN**



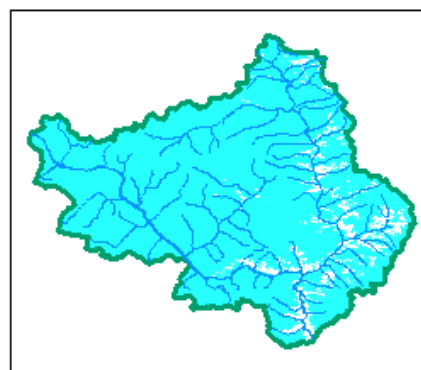
**01 Dec 2014**



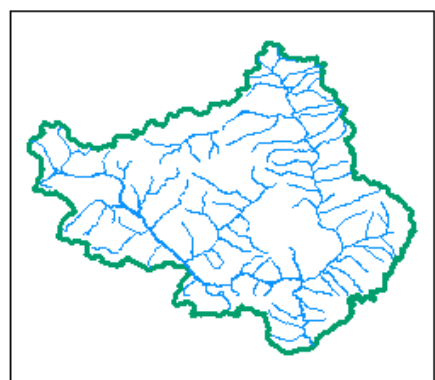
**DATA NOT AVAILABLE**



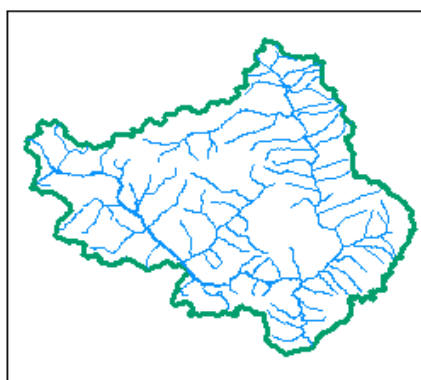
**DATA NOT AVAILABLE**




**20 Dec 2014**



**DATA NOT AVAILABLE**

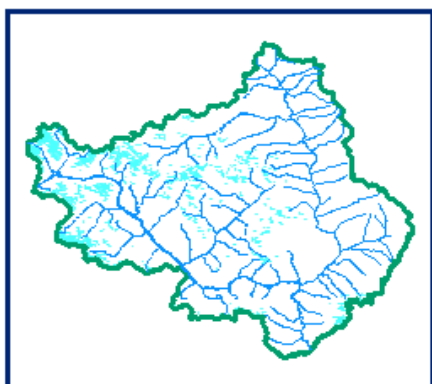


**DATA NOT AVAILABLE**

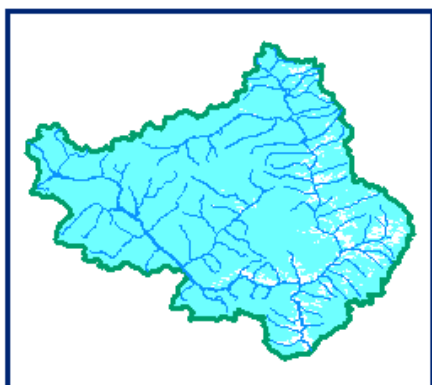
 SNOW

0 20 40 80 120 160  
  
Kilometers

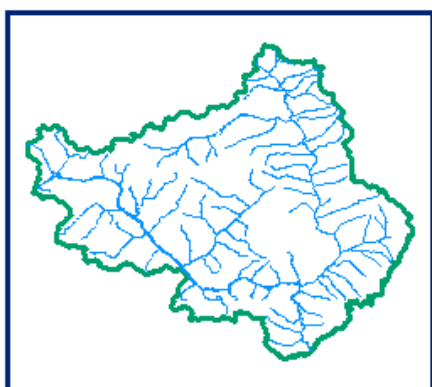
# 10 DAILY SNOW COVER MAP: SPITI BASIN



DATA USED  
**01 Dec 2014**



DATA USED  
**20 Dec 2014**



DATA USED  
**DATA NOT AVAILABLE**

 SNOW

0 15 30 60 90 120  
  
Kilometers

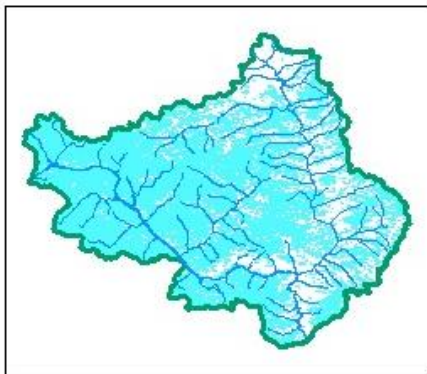
# SNOW COVER MAP : SPITI BASIN



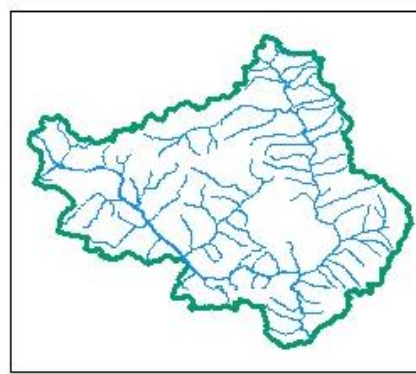
**01 Jan 2015**



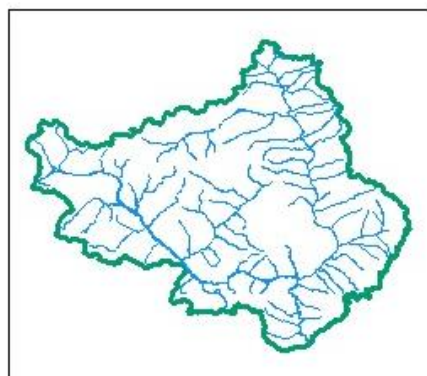
**05 Jan 2015**



**10 Jan 2015**



**DATA NOT AVAILABLE**



**DATA NOT AVAILABLE**

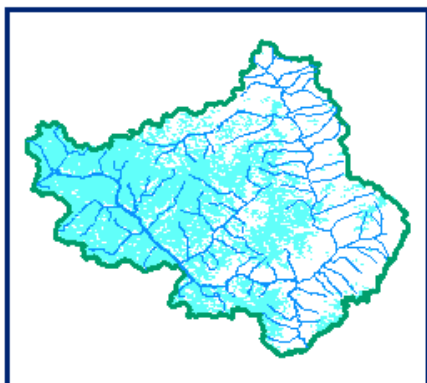


**DATA NOT AVAILABLE**

 SNOW

0 20 40 80 120 160  
Kilometers

## 10 DAILY SNOW COVER MAP: SPITI BASIN

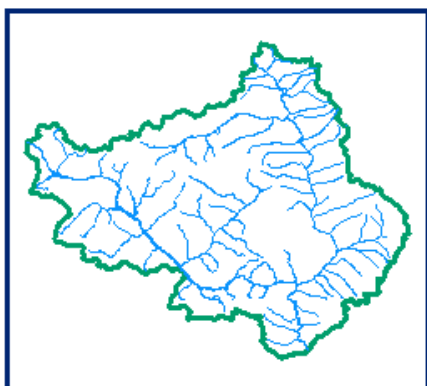


DATA USED

**01 Jan 2015**

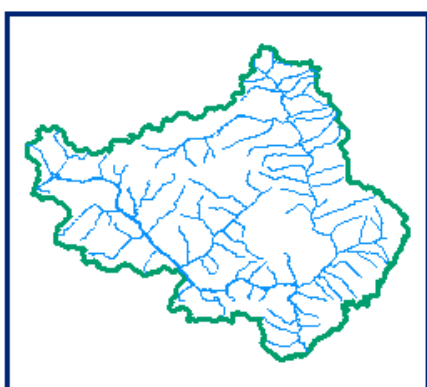
**05 Jan 2015**

**10 Jan 2015**



DATA USED

**DATA NOT AVAILABLE**



DATA USED

**DATA NOT AVAILABLE**

 SNOW

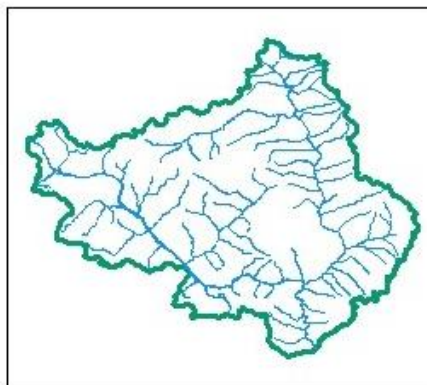
0 20 40 80 120 160  
  
Kilometers



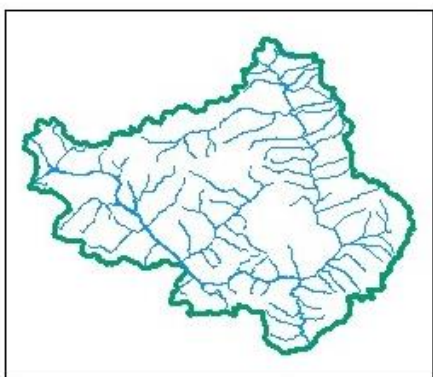
# SNOW COVER MAP : SPITI BASIN



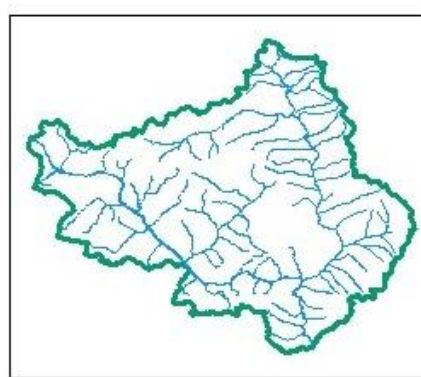
**01 Feb 2015**



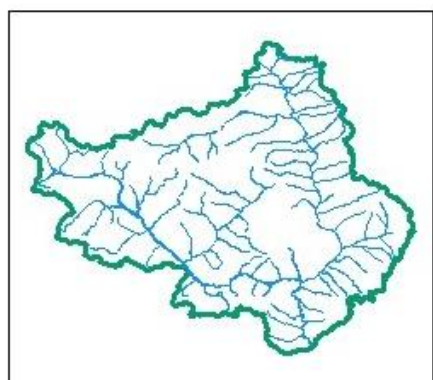
**DATA NOT AVAILABLE**



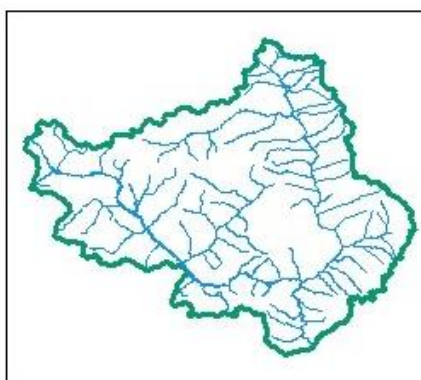
**DATA NOT AVAILABLE**



**DATA NOT AVAILABLE**



**DATA NOT AVAILABLE**



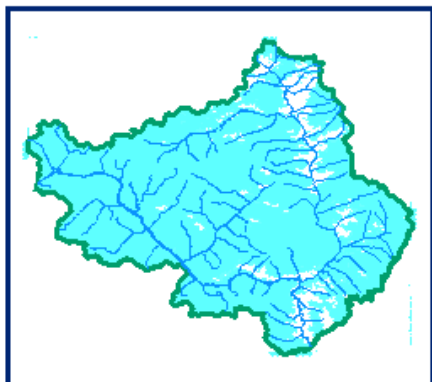
**DATA NOT AVAILABLE**

 SNOW

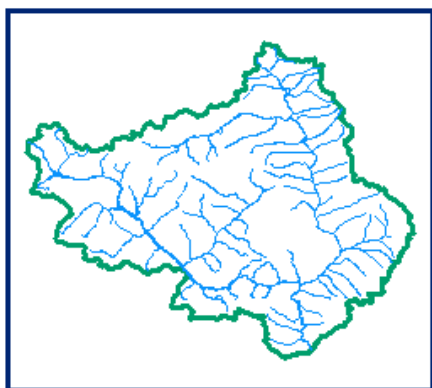




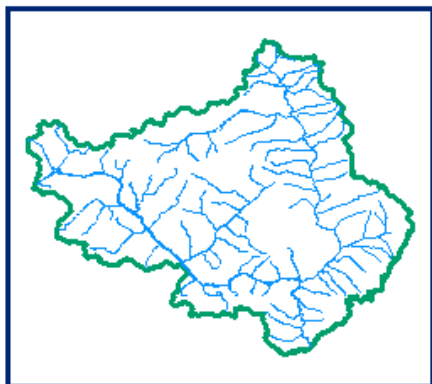
**10 DAILY SNOW COVER MAP: SPITI BASIN**



DATA USED  
**01 Feb 2015**



DATA USED  
**DATA NOT AVAILABLE**



DATA USED  
**DATA NOT AVAILABLE**

 SNOW

0 20 40 80 120 160  
  
Kilometers

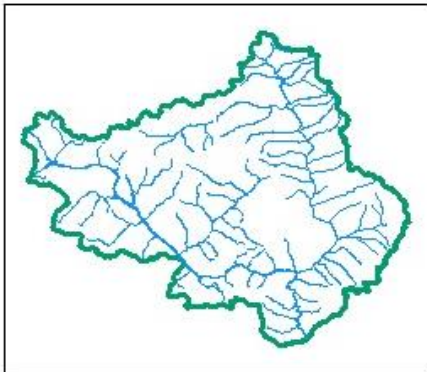
**SNOW COVER MAP : SPITI BASIN**



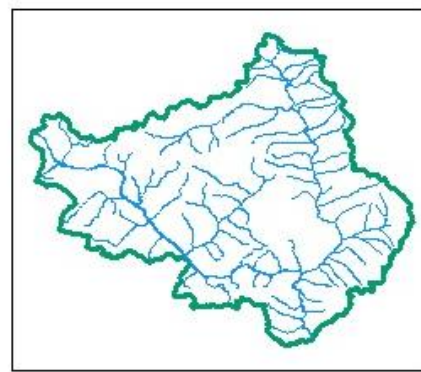
**04 March 2015**



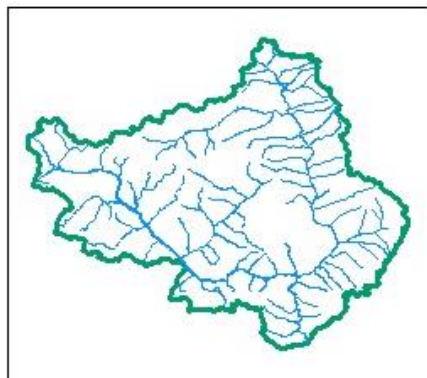
**06 March 2015**



**DATA NOT AVAILABLE**



**DATA NOT AVAILABLE**



**DATA NOT AVAILABLE**

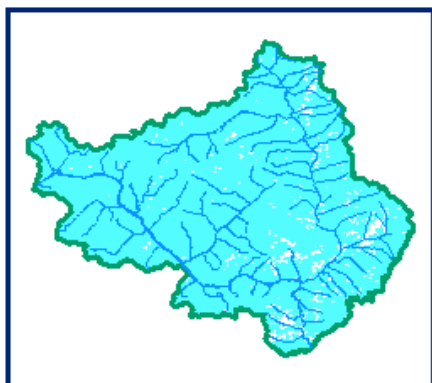


**DATA NOT AVAILABLE**

 SNOW

0 20 40 80 120 160  
  
Kilometers

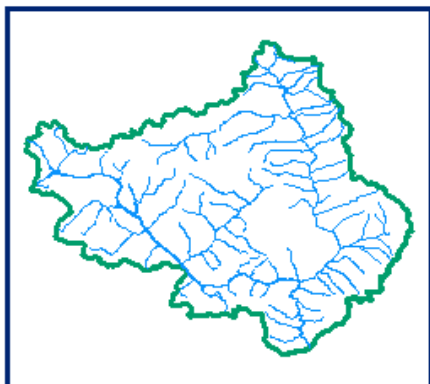
# 10 DAILY SNOW COVER MAP: SPITI BASIN



DATA USED

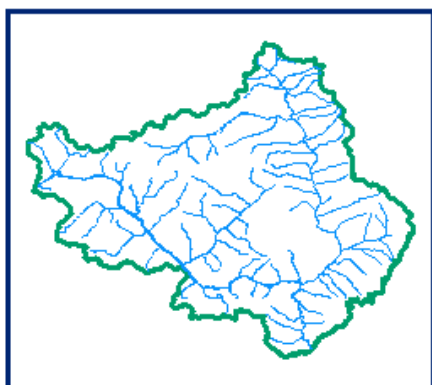
**04 March 2015**

**06 March 2015**



DATA USED

**DATA NOT AVAILABLE**



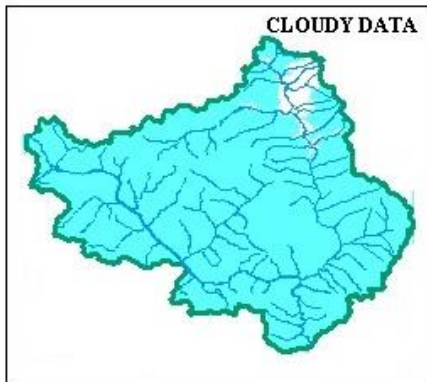
DATA USED

**DATA NOT AVAILABLE**

 SNOW

0 20 40 80 120 160  
  
Kilometers

# SNOW COVER MAP : SPITI BASIN



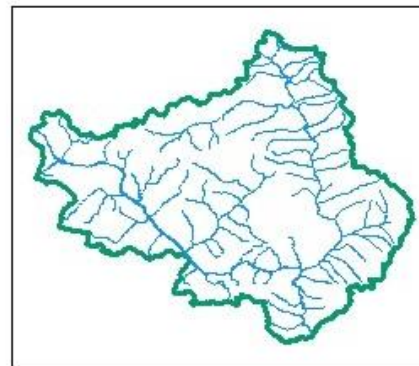
**04 April 2015**



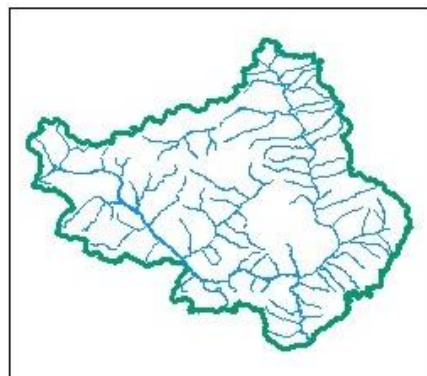
**07 April 2015**



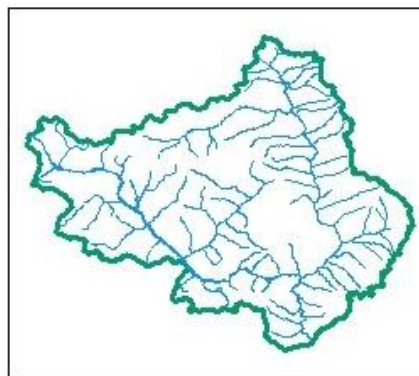
**11 April 2015**



**DATA NOT AVAILABLE**



**DATA NOT AVAILABLE**



**DATA NOT AVAILABLE**

 SNOW

0 20 40 80 120 160  
Kilometers

## 10 DAILY SNOW COVER MAP: SPITI BASIN



DATA USED

**04 April 2015**

**06 April 2015**

**07 April 2015**




DATA USED

**11 April 2015**

**12 April 2015**



**DATA NOT AVAILABLE**

 SNOW

0 5 10 20 30 40  
Kilometers



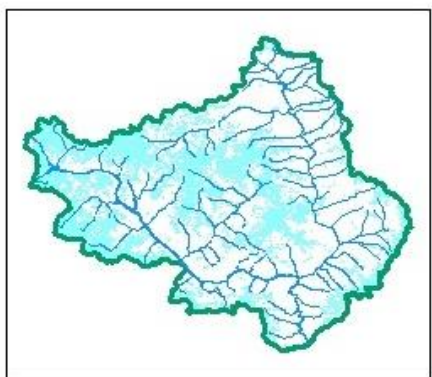
# SNOW COVER MAP : SPITI BASIN



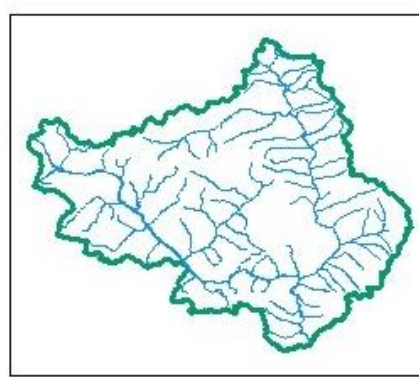
**03 May 2015**



**06 May 2015**



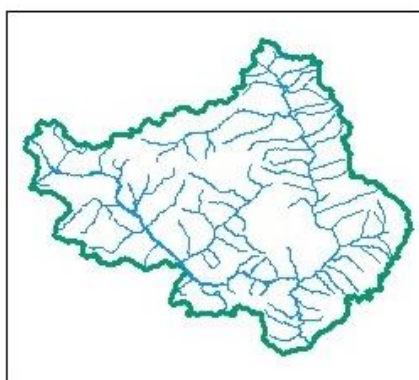
**11 May 2015**



**DATA NOT AVAILABLE**



**23 May 2015**

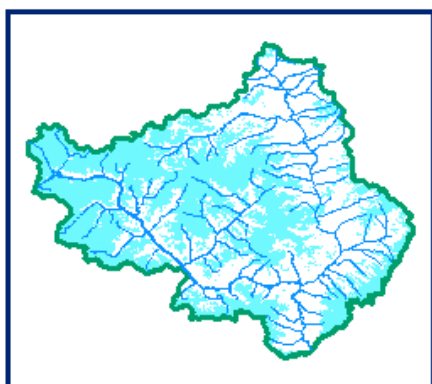


**DATA NOT AVAILABLE**

 SNOW

0 20 40 80 120 160  
Kilometers

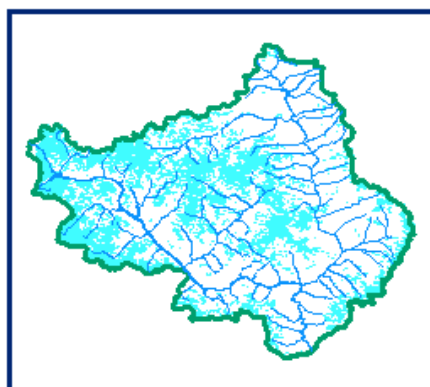
# 10 DAILY SNOW COVER MAP: SPITI BASIN



DATA USED

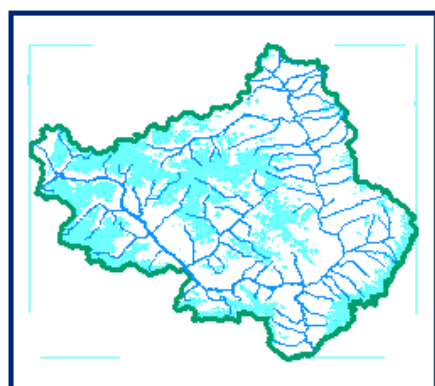
**03 May 2015**

**06 May 2015**



DATA USED


**11 May 2015**



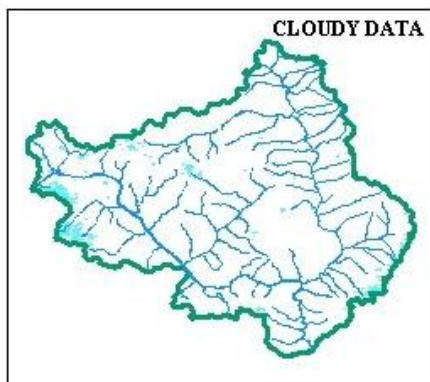
DATA USED

**23 May 2015**

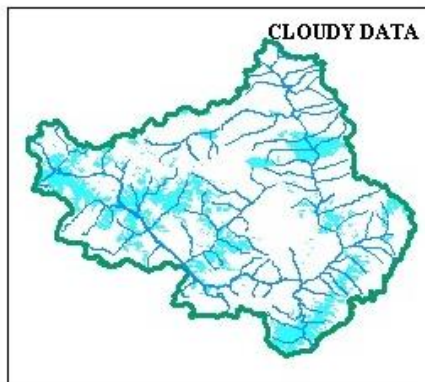
 SNOW

0 20 40 80 120 160  
  
Kilometers

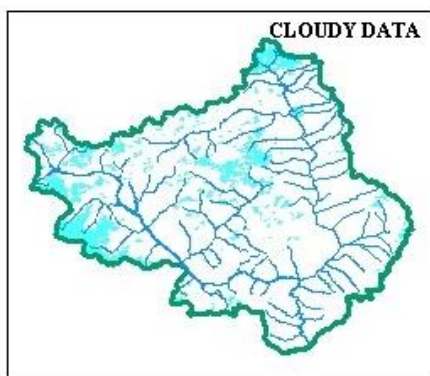
# SNOW COVER MAP : SPITI BASIN



**04 June 2015**



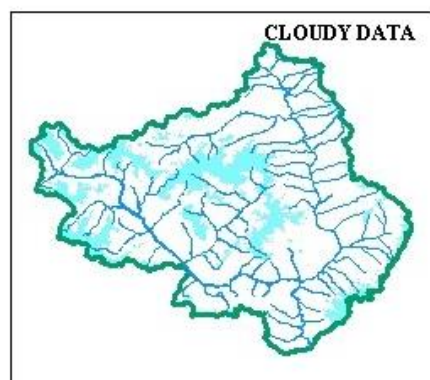
**10 June 2015**



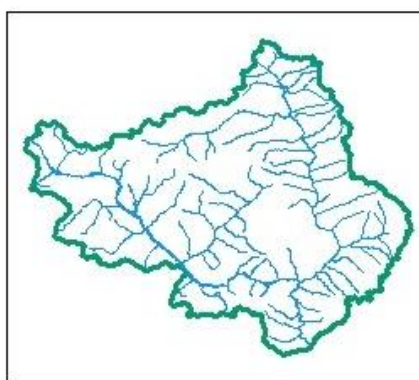
**11 June 2015**



**16 June 2015**



**20 June 2015**



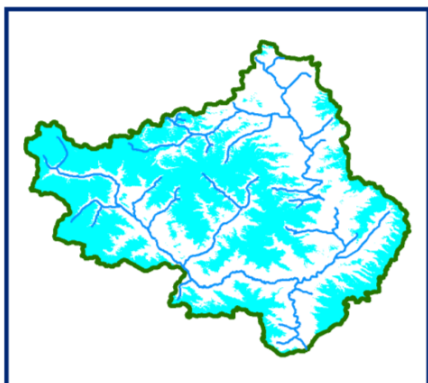
**DATA NOT AVAILABLE**

 SNOW

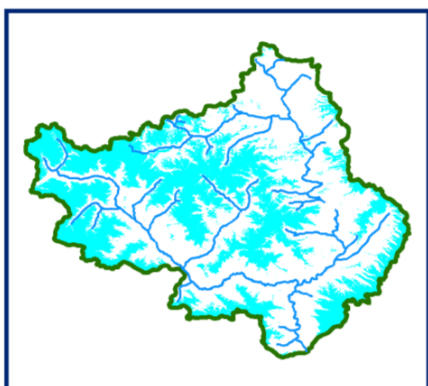
0 20 40 80 120 160  
Kilometers



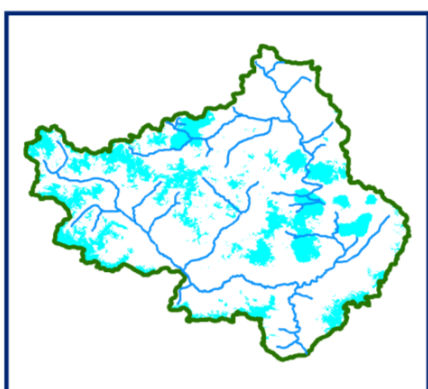
## 10 DAILY SNOW COVER MAP: SPITI BASIN



DATA USED  
**03 June 2014**  
**04 June 2014**  
**06 June 2014**

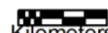


DATA USED  
**11 June 2014**  
**16 June 2014**  
**20 June 2014**



DATA USED  
**28 June 2014**

 SNOW

0.9 182736  
  
Kilometers

## *BASPA SUB-BASIN*

# AREAL EXTENT OF SNOW (5 DAILY)

**BASIN NAME: BASPA**

**BASIN AREA: 1096 sq km**

S No	Date	Snow cover (sq km)	Snow cover (%)	S No	Date	Snow cover (sq km)	Snow cover (%)
<b>October 2014</b>							
1.	01 Oct 2014	180	16	3.	04 Oct 2014	190	17
2.	02 Oct 2014	342	31	4.	30 Oct 2014	639	58
<b>November 2014</b>							
5.	02 Nov 2014	379	35	6	04 Nov 2014	339	31
<b>December 2014</b>							
7	18 Dec 2014		93	8	20 Dec 2014		95
<b>January 2015</b>							
9	01 Jan 2015		68	10	05 Jan 2015	90	
11	10 Jan 2015		85				
<b>February 2015</b>							
12.	01 Feb 2015	1060	97	13	4 Feb 2015	1065	97
<b>March 2015</b>							
14.	04 Mar 2015	1032	94	15	6 Mar 2015	1083	99
<b>April 2015</b>							
16.	05 Apr 2015	958	87	17.	11 Apr 2015	979	89
18	26 Apr 2015	875	80				
<b>May 2015</b>							
19.	03 May 2015	892	81	21.	11 May 2015	673	61
20.	06 May 2015	811	74	22.	23 May 2015	709	65
<b>June 2015</b>							
23.	04 June 2015	434	40	25.	16 June 2015	442	40
24.	11 June 2015	372	34				

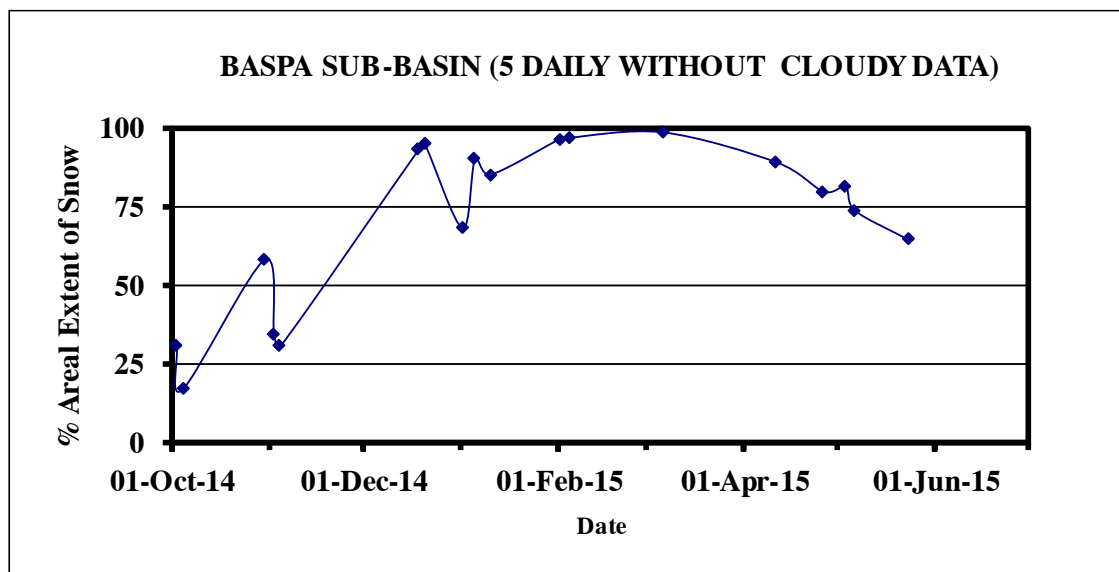
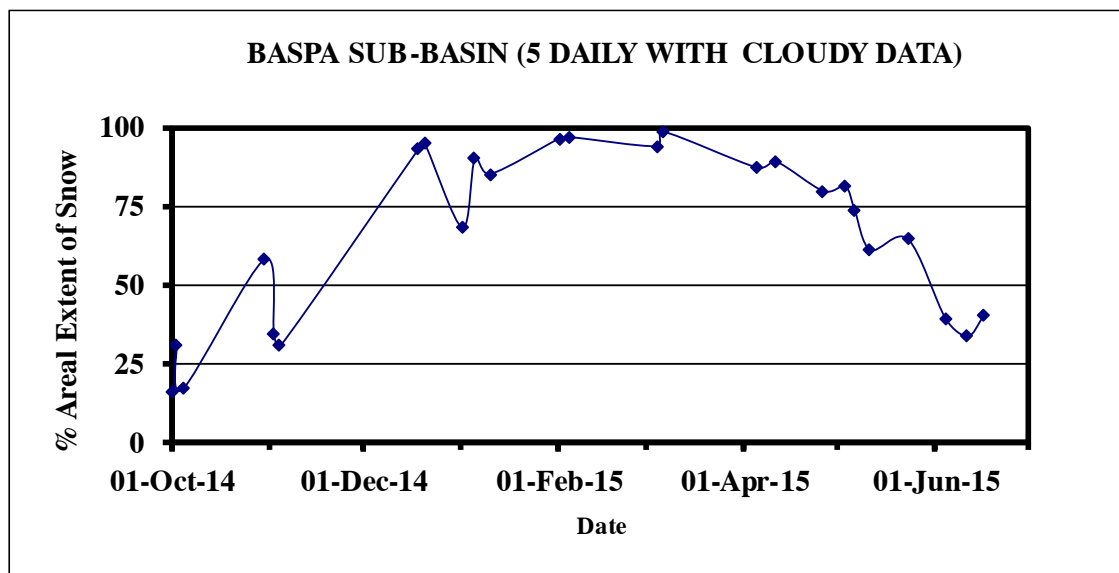
# AREAL EXTENT OF SNOW (10 DAILY)

**BASIN NAME: BASPA**

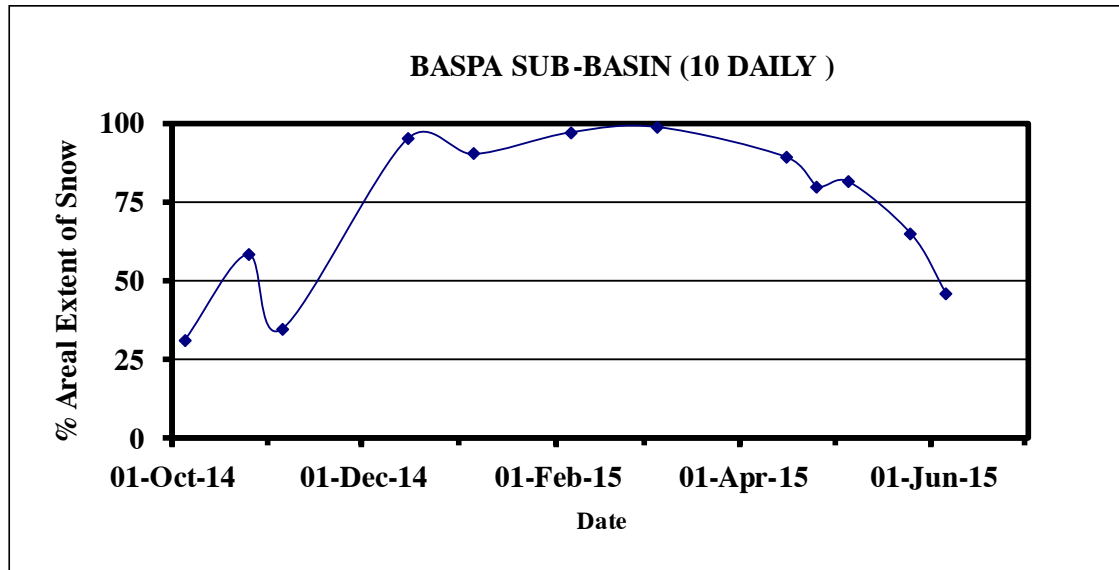
**BASIN AREA: 1096 sq km**

S No	Date	Snow cover (sq km)	Snow cover (%)	S No	Date	Snow cover (sq km)	Snow cover (%)
<b>October 2014</b>							
1.	05 Oct 2014	342	32	2.	25 Oct2014	639	58
<b>November 2014</b>							
3.	05 Nov 2014	379	35				
<b>December 2014</b>							
4	15 Dec 2014	1042	95				
<b>January 2015</b>							
5	05 Jan 2015	989	90				
<b>February 2015</b>							
6.	05 Feb 2015	1064	99				
<b>March 2015</b>							
7.	05 Mar 2015	1083	85				
<b>April 2015</b>							
8.	15 Apr 2015	979	89	9.	25 Apr 2015	877	80
<b>May 2015</b>							
10.	05 May 2015	892	81	11.	25 May 2015	709	65
<b>June 2015</b>							
12.	05 June 2015	504	46				

## SNOW ACCUMULATION AND ABLATION CURVE

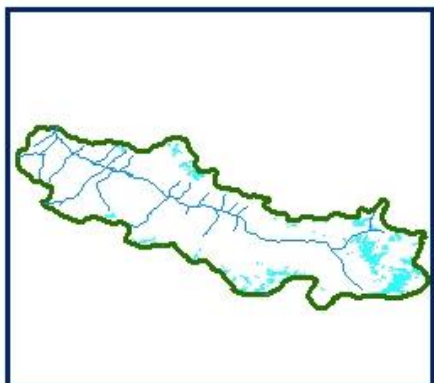


## SNOW ACCUMULATION AND ABLATION CURVE

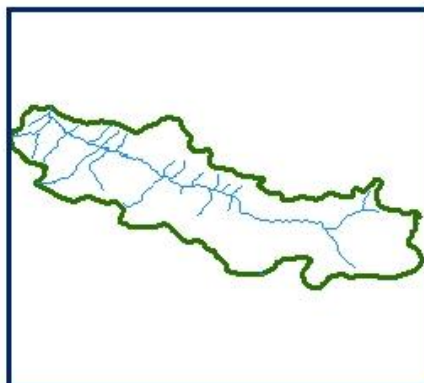


# *SNOW COVER MAP*

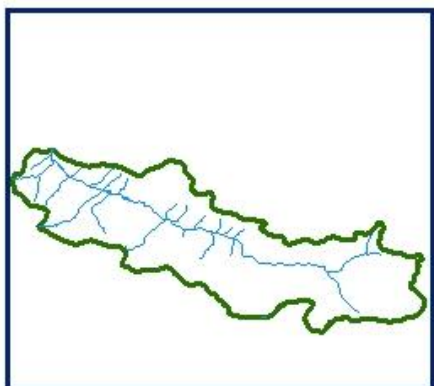
# SNOW COVER MAP : BASPA BASIN



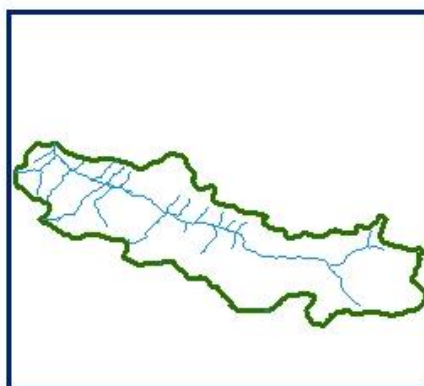
01 Oct 2014



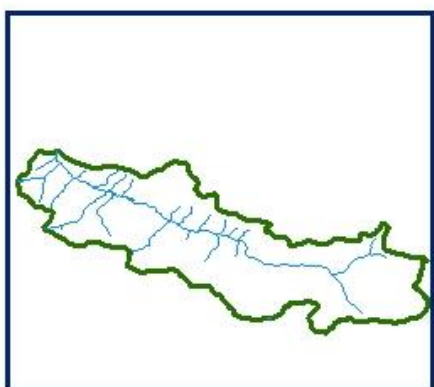
DATA NOT AVAILABLE



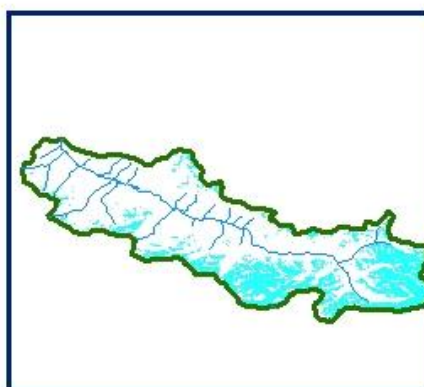
DATA NOT AVAILABLE



DATA NOT AVAILABLE



DATA NOT AVAILABLE



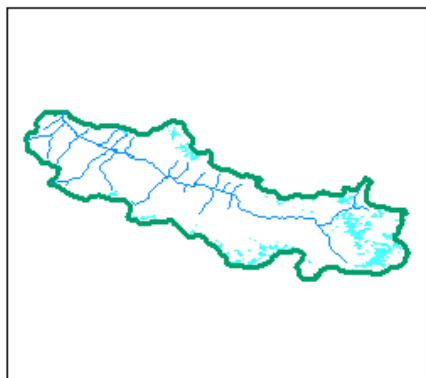
30 Oct 2014

 SNOW

0 4.75 9.5 19 28.5 38  
Kilometers



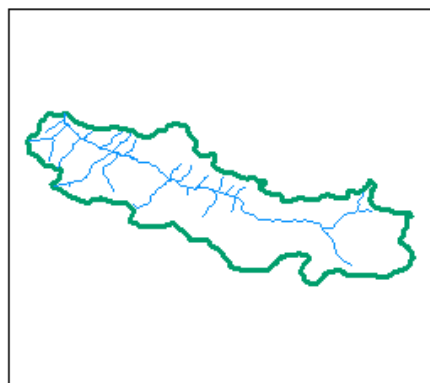
# 10 DAILY SNOW COVER MAP: BASPA BASIN



DATA USED

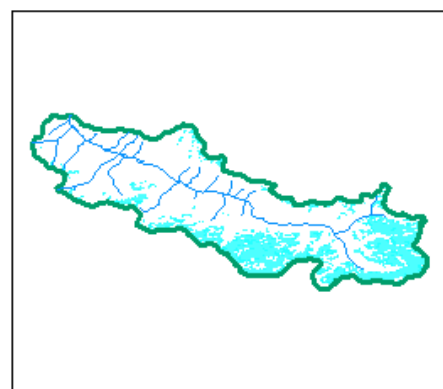
**01 Oct 2014**

**02 Oct 2014**



DATA USED


**DATA NOT AVAILABLE**



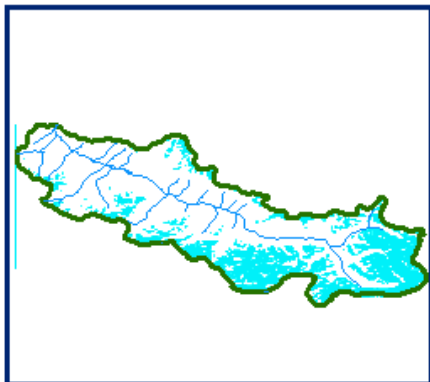
DATA USED

**30 Oct 2014**

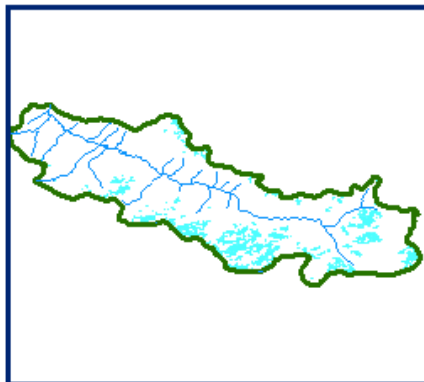
 SNOW

0 10 20 40 60 80  
  
Kilometers

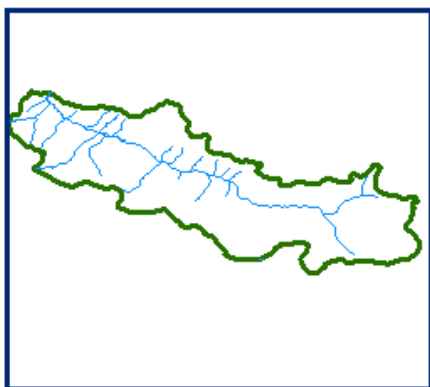
# SNOW COVER MAP : BASPA BASIN



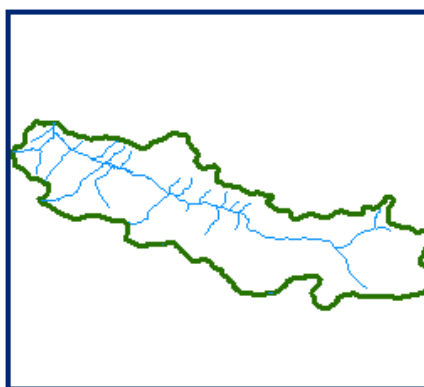
02 Nov 2014



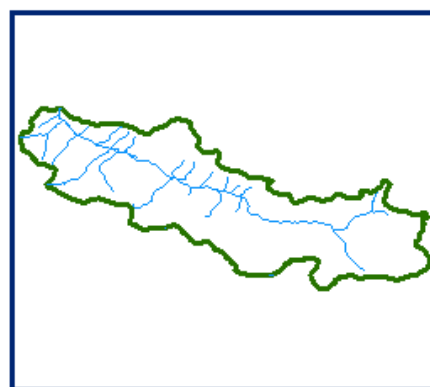
04 Nov 2014



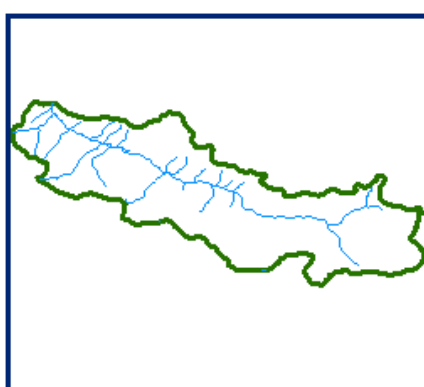
DATA NOT AVAILABLE




DATA NOT AVAILABLE



DATA NOT AVAILABLE

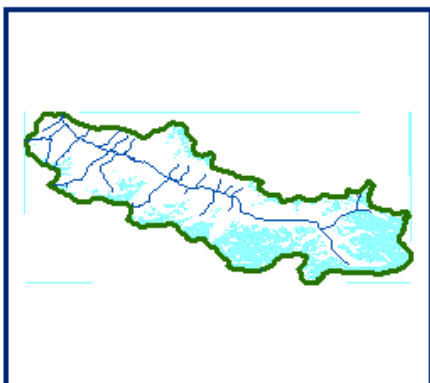


DATA NOT AVAILABLE

 SNOW

0 7.5 15 22.5 30  
Kilometers

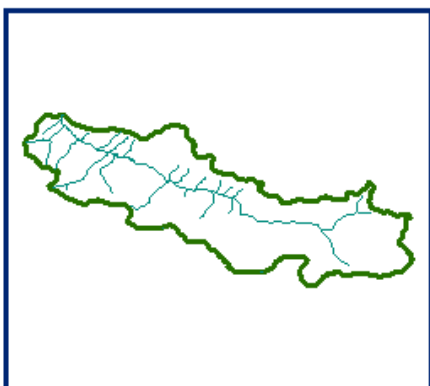
**10 DAILY SNOW COVER MAP: BASPA BASIN**



DATA USED

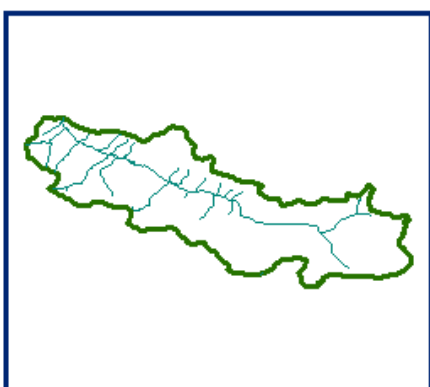
**02 Nov 2014**

**04 nov 2014**



DATA USED

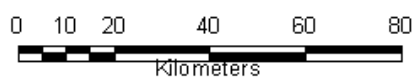
**DATA NOT AVAILABLE**



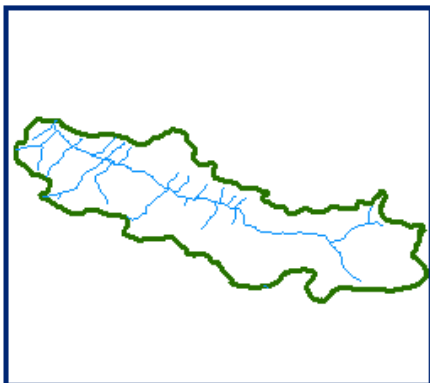
DATA USED

**DATA NOT AVAILABLE**

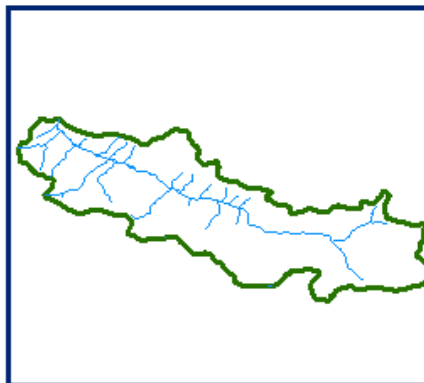
 SNOW



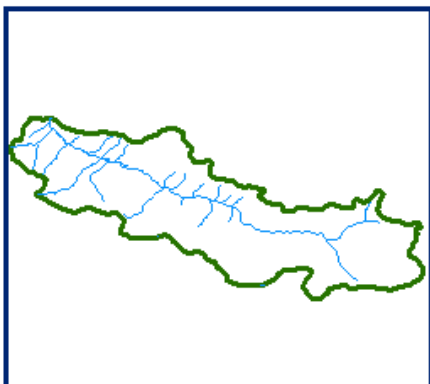
# SNOW COVER MAP : BASPA BASIN



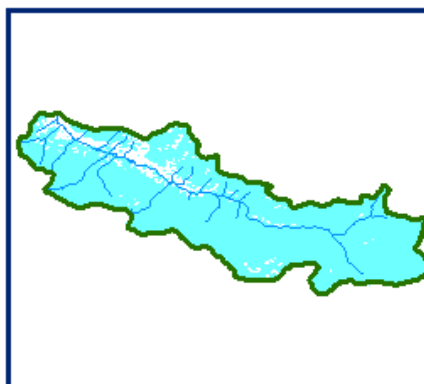
DATA NOT AVAILABLE



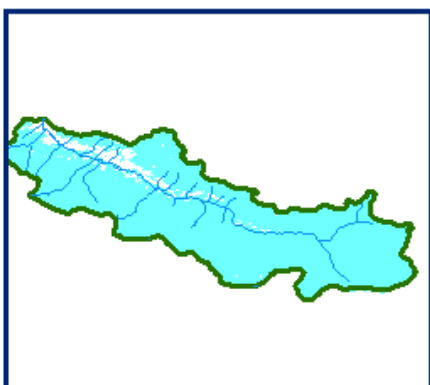
DATA NOT AVAILABLE



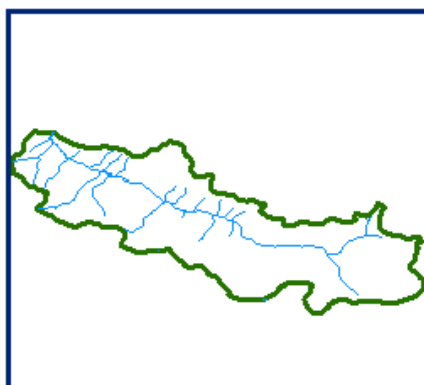
DATA NOT AVAILABLE



18 Dec 2014



20 Dec 2014

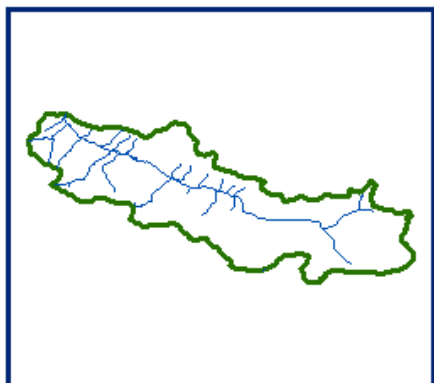


DATA NOT AVAILABLE

SNOW

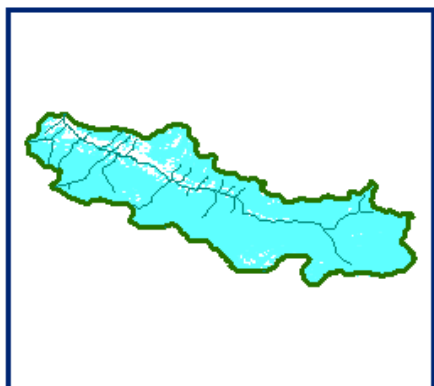
0 4.75 9.5 19 28.5 38  
Kilometers

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



DATA USED

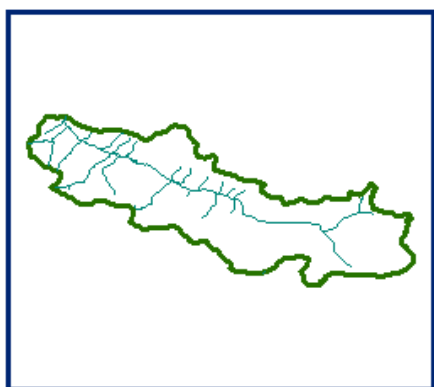
**DATA NOT AVAILABLE**



DATA USED

**18 Dec 2014**


**20 Dec 2014**



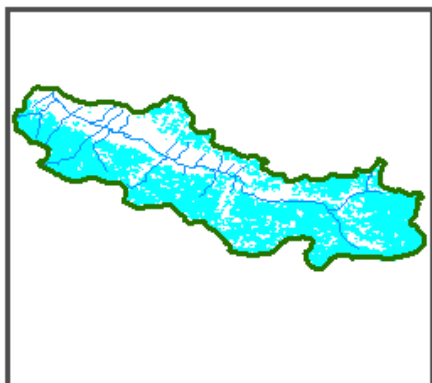
DATA USED

**DATA NOT AVAILABLE**

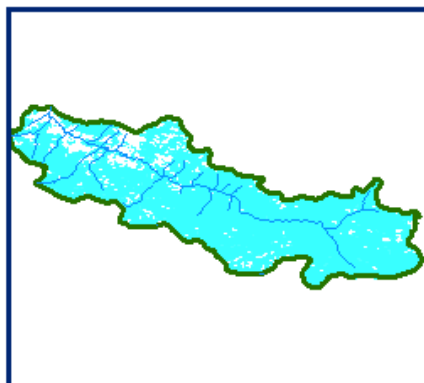
 SNOW

0 7.5 15 22.5 30  
  
Kilometers

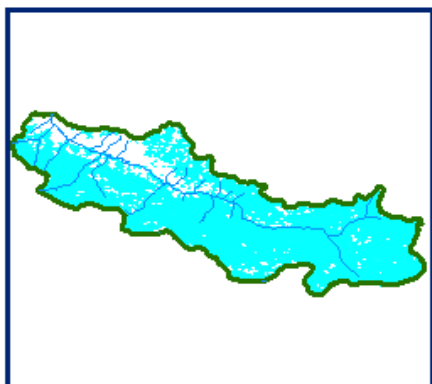
# SNOW COVER MAP : BASPA BASIN



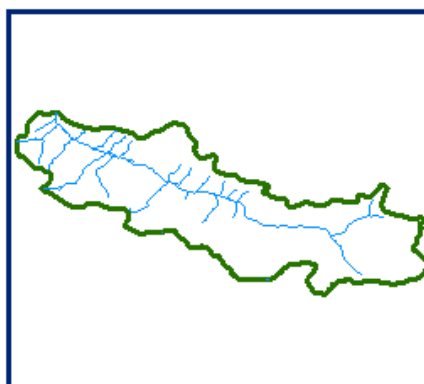
01Jan2015



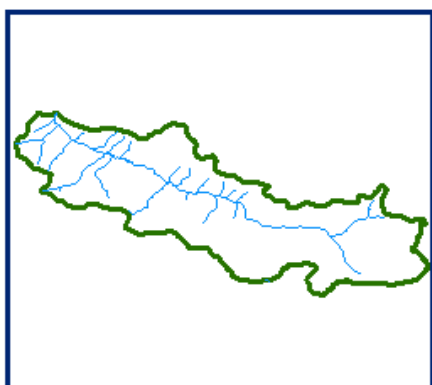
05 Jan 2015



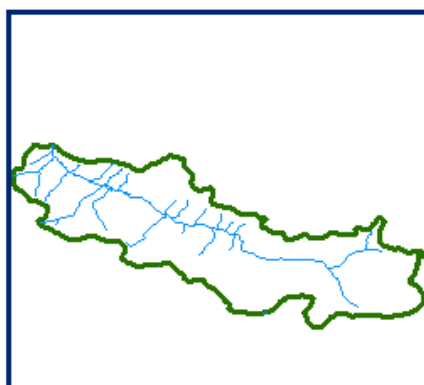
10 Jan 2015




DATA NOT AVAILABLE



DATA NOT AVAILABLE

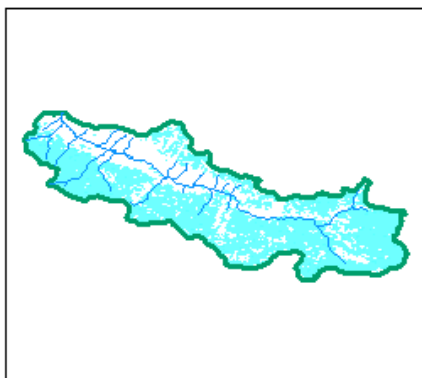


DATA NOT AVAILABLE

 SNOW

0 4.75 9.5 19 28.5 38  
Kilometers

## 10 DAILY SNOW COVER MAP: BASPA BASIN

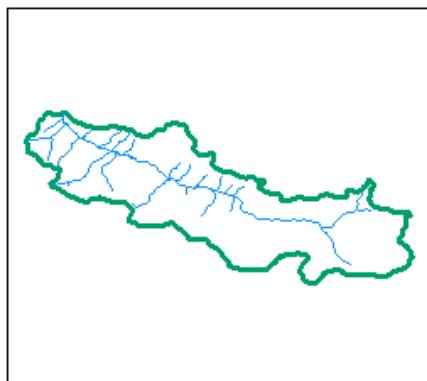


DATA USED

**01 Jan 2015**

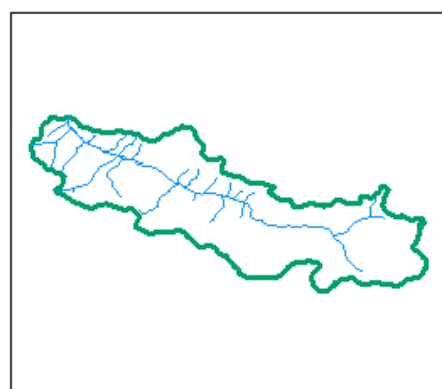
**05 Jan 2015**

**10 Jan 2015**



DATA USED


**DATA NOT AVAILABLE**



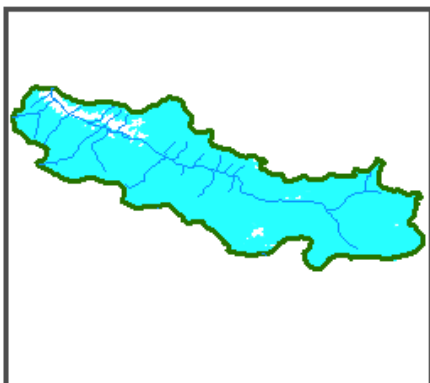
DATA USED

**DATA NOT AVAILABLE**

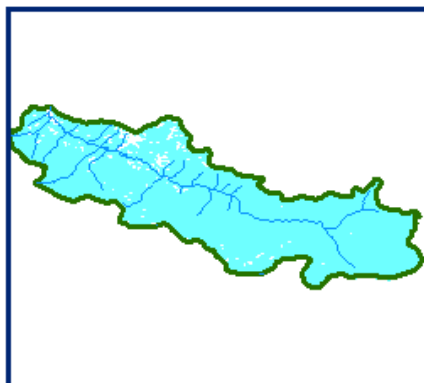
 SNOW

0 10 20 40 60 80  
  
Kilometers

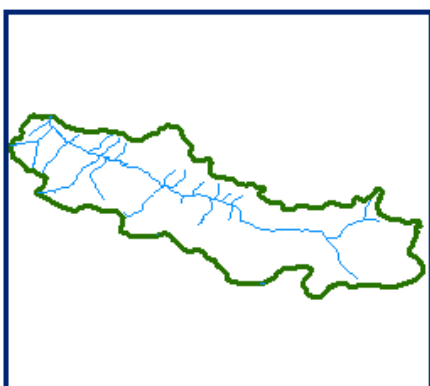
# SNOW COVER MAP : BASPA BASIN



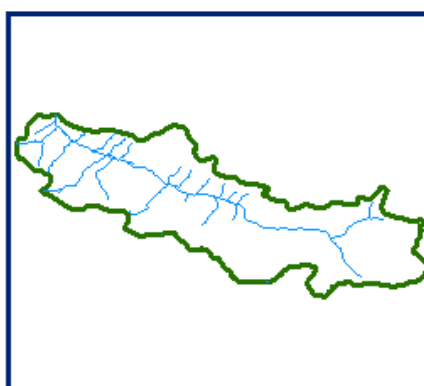
01 Feb 2015



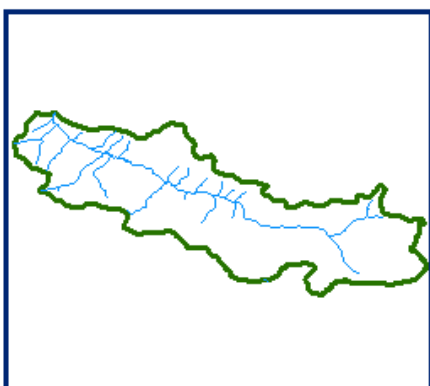
04 Feb 2015



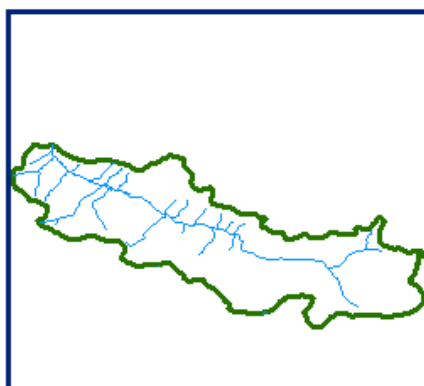
DATA NOT AVAILABLE




DATA NOT AVAILABLE



DATA NOT AVAILABLE



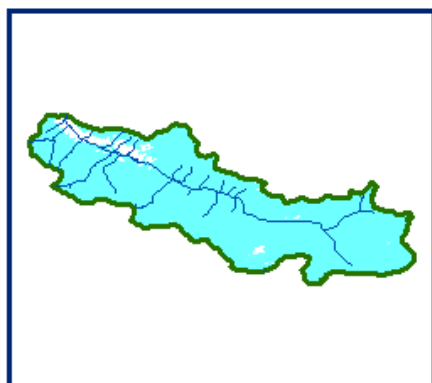
DATA NOT AVAILABLE

 SNOW

0 4.75 9.5 19 28.5 38  
Kilometers



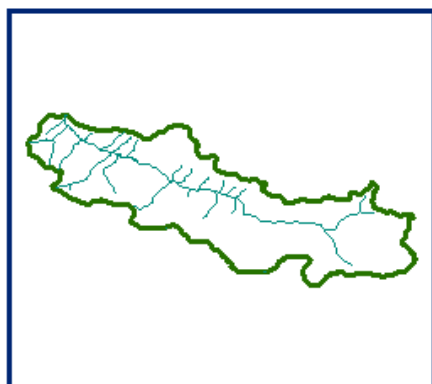
# 10 DAILY SNOW COVER MAP: BASPA BASIN



DATA USED

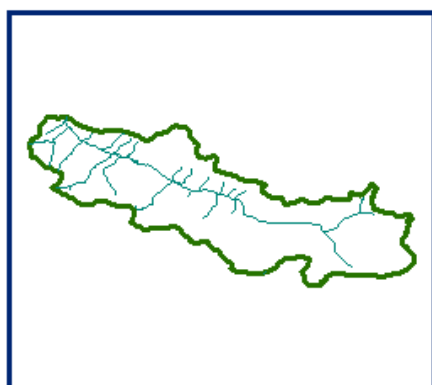
**01 Feb 2015**

**04 Feb 2015**



DATA USED


**DATA NOT AVAILABLE**

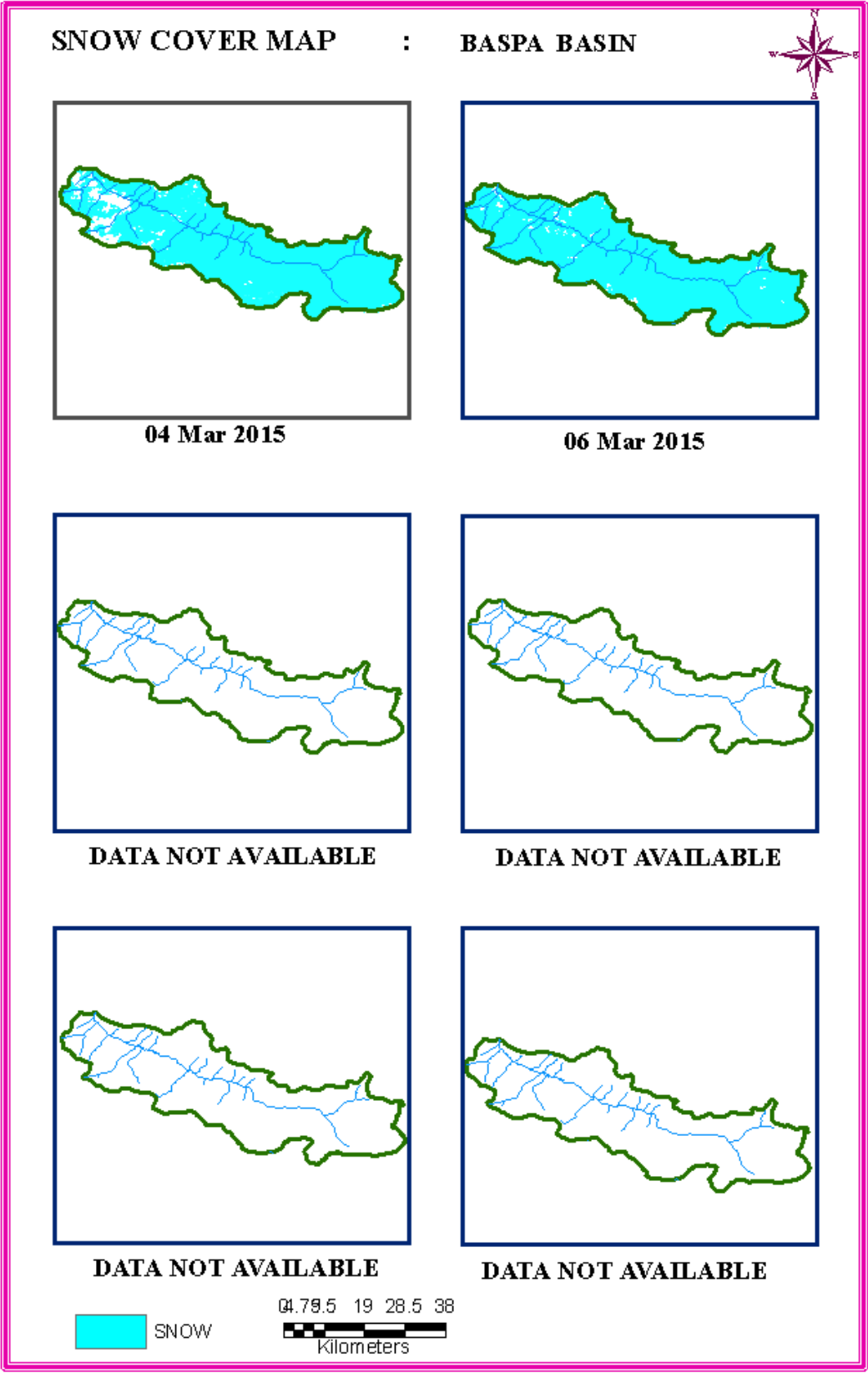


DATA USED

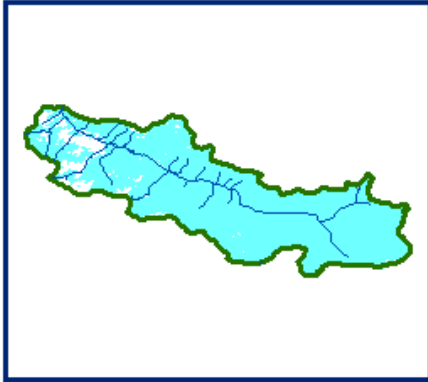
**DATA NOT AVAILABLE**

 SNOW

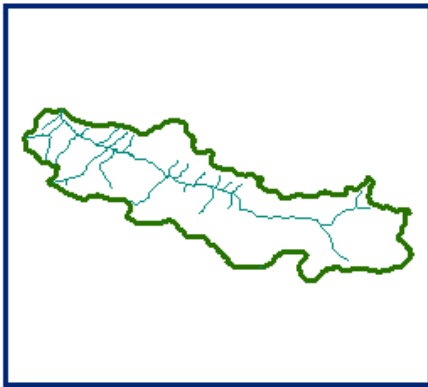
0 5 10 20 30 40  
  
Kilometers



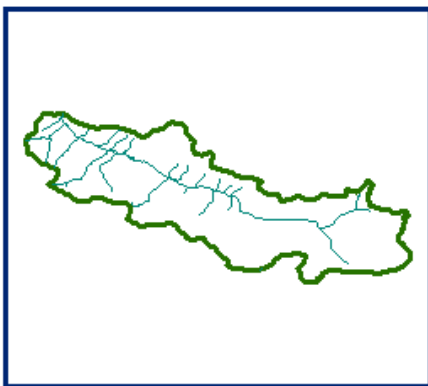
**10 DAILY SNOW COVER MAP: BASPA BASIN**



DATA USED  
**04 March 2015**  
**06 March 2015**




DATA USED  
**DATA NOT AVAILABLE**

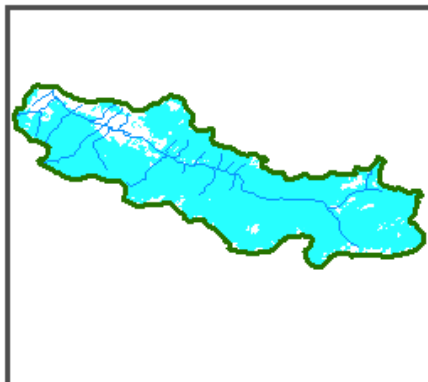


DATA USED  
**DATA NOT AVAILABLE**

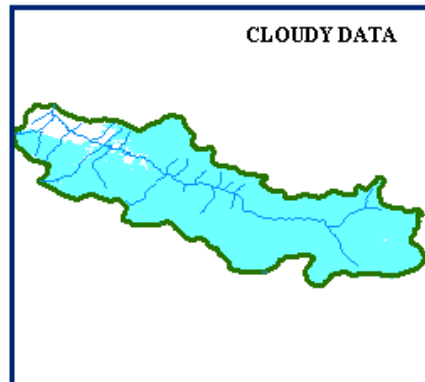
 SNOW

0 10 20 40 60 80  
  
Kilometers

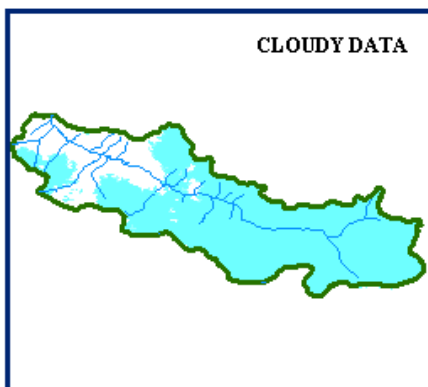
# SNOW COVER MAP : BASPA BASIN



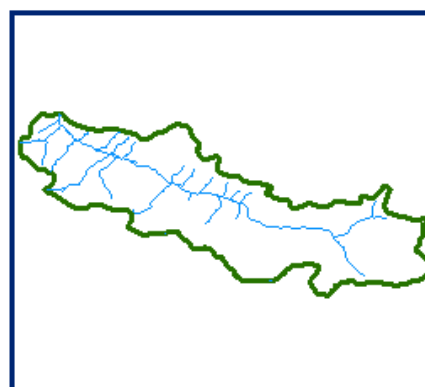
05 April 2015



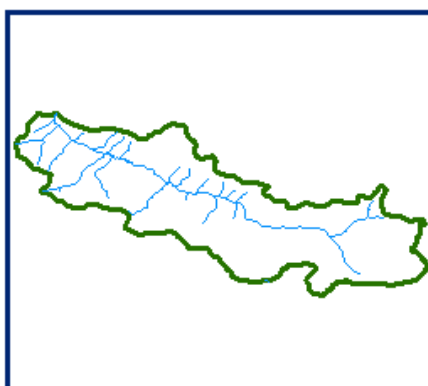
07 April 2015



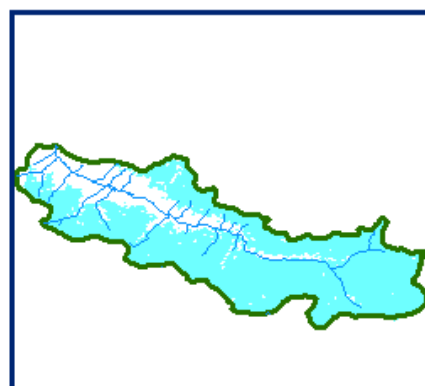
12 April 2015




DATA NOT AVAILABLE



DATA NOT AVAILABLE

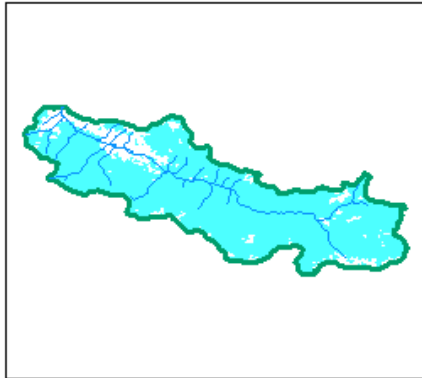


26 April 2015

 SNOW

0 7.5 15 22.5 30  
Kilometers

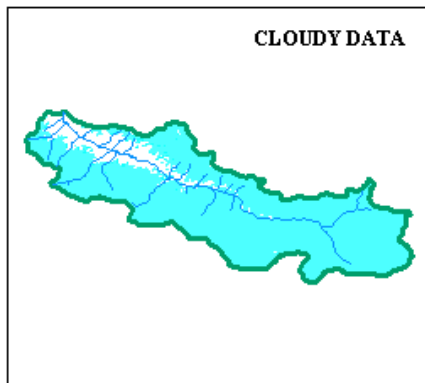
## 10 DAILY SNOW COVER MAP: BASPA BASIN



DATA USED

**05 April 2015**

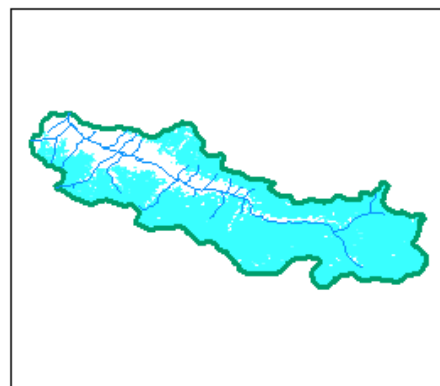
**07 April 2015**



DATA USED

**11 April 2015**


**12 April 2015**



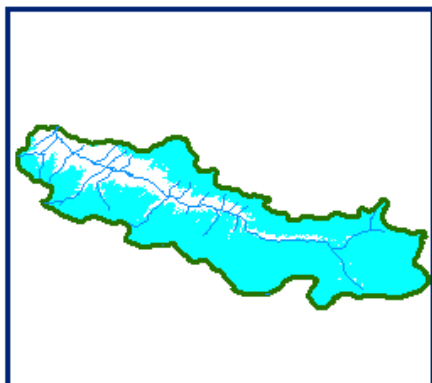
DATA USED

**26 April 2015**

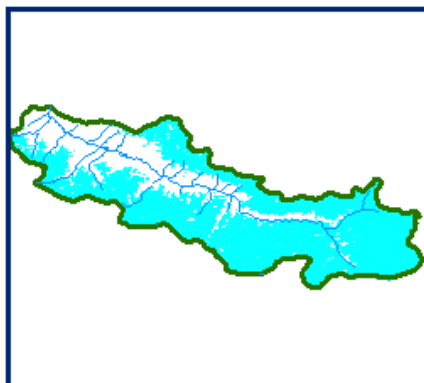
 SNOW

0 10 20 40 60 80  
  
Kilometers

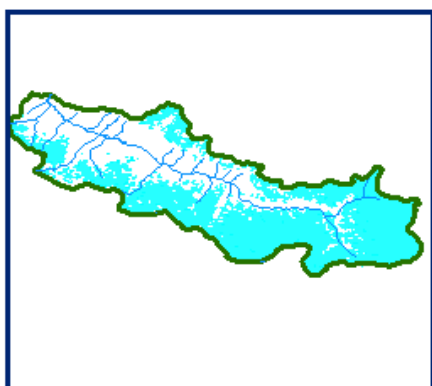
# SNOW COVER MAP : BASPA BASIN



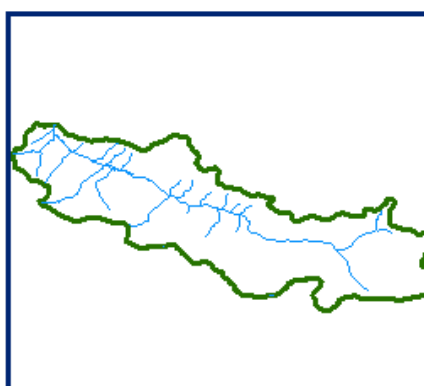
**03 May 2015**



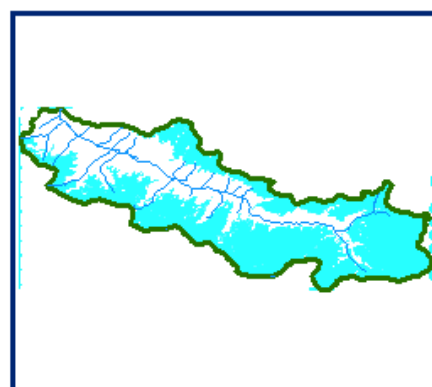
**06 May 2015**



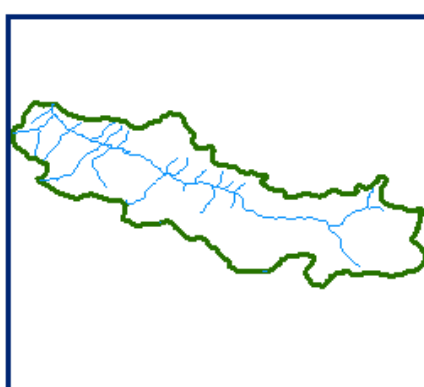
**11 May 2015**




**DATA NOT AVAILABLE**



**23 May 2015**

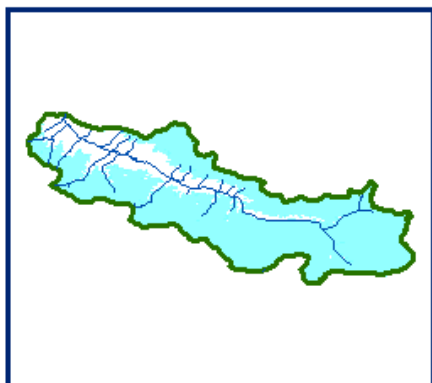


**DATA NOT AVAILABLE**

 SNOW

0 4.75 9.5 19 28.5 38  
Kilometers

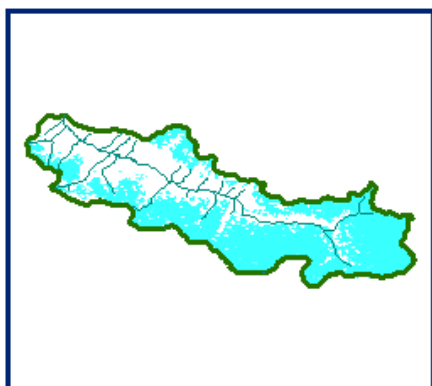
## 10 DAILY SNOW COVER MAP: BASPA BASIN



DATA USED

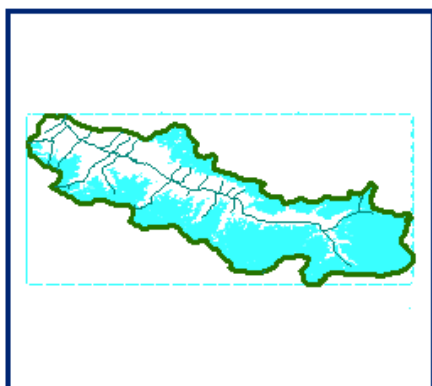
**03 May 2015**

**06 May 2015**



DATA USED


**11 May 2015**



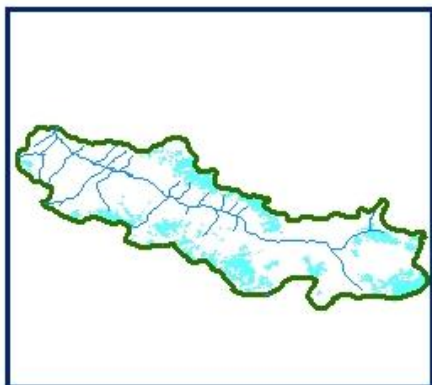
DATA USED

**23 May 2015**

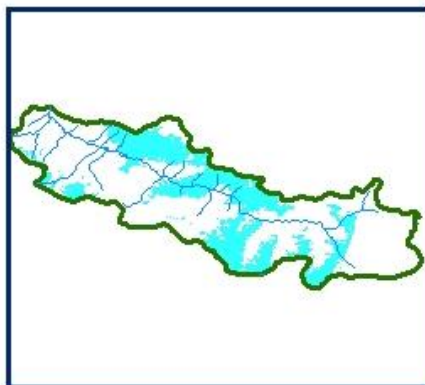
 SNOW

0 10 20 40 60 80  
  
Kilometers

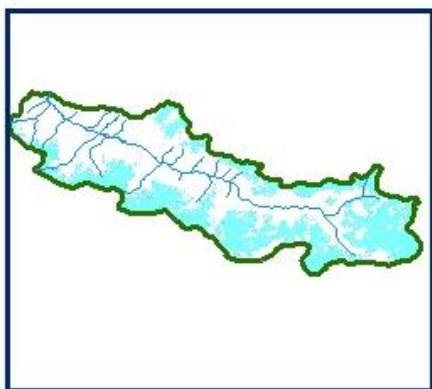
# SNOW COVER MAP : BASPA BASIN



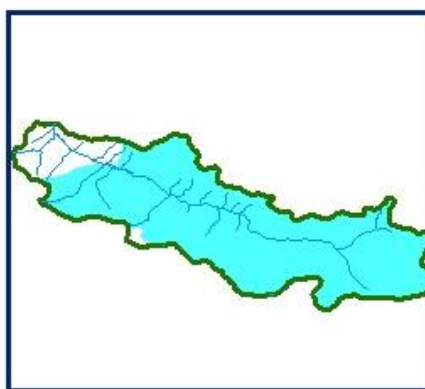
04 June 2015



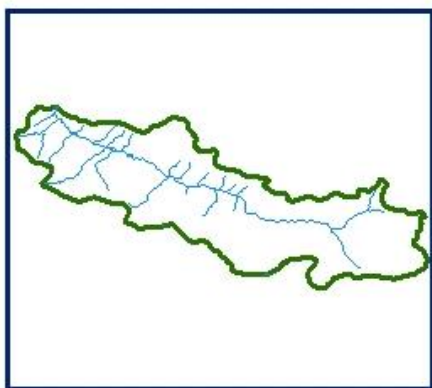
10 June 2015



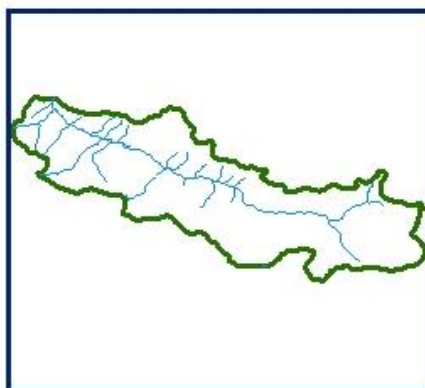
16 June 2015



20 June 2015



DATA NOT AVAILABLE



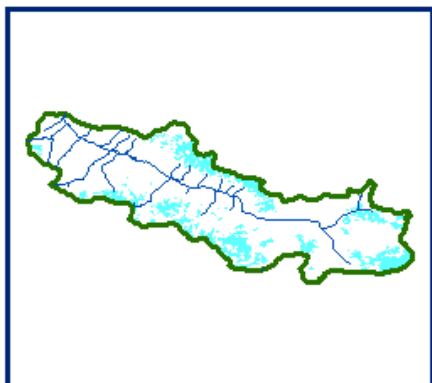
DATA NOT AVAILABLE

 SNOW

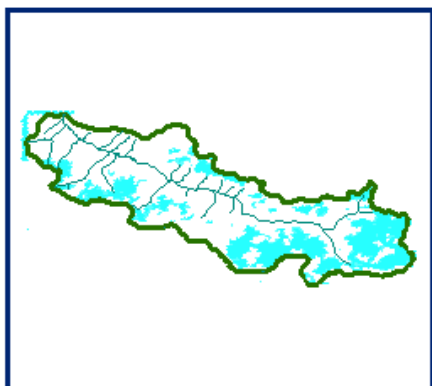
0 7.5 15 22.5 30  
Kilometers



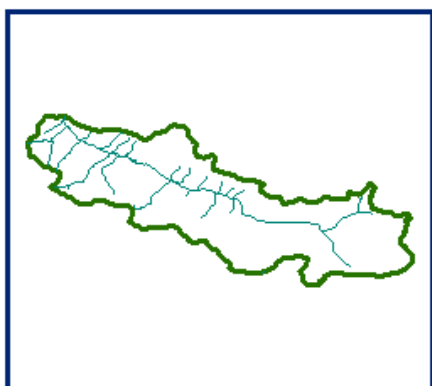
# 10 DAILY SNOW COVER MAP: BASPA BASIN



DATA USED  
**04 June 2015**  
**10 June 2015**



DATA USED  
**11 June 2015**  
**15 June 2015**  
**16 June 2015**  
**20 June 2015**



DATA USED  
**DATA NOT AVAILABLE**

 SNOW

0 10 20 40 60 80  
Kilometers

## *JIWA SUB-BASIN*

# AREAL EXTENT OF SNOW (5 DAILY)

BASIN NAME: JIWA

BASIN AREA: 1445 sq. km

S. No	Date	Snow cover (sq. km)	Snow cover (%)	S. No	Date	Snow cover (sq. km)	Snow cover (%)
<b>October 2014</b>							
1.	01 Oct 2014	73 ☉	5	3	30 Oct 2014	152	10
2	04 Oct 2014	82 ☉	6				
<b>November 2014</b>							
4.	02 Nov 2014	170	12				
<b>December 2014</b>							
5	07 Dec 2014	44 ☉	3				
6	05 Jan 2015	603	42	8	24 Jan 2015	649	45
7	10 Jan 2015	514	36				
<b>March 2015</b>							
9.	04Mar 2015	948	66	11.	09 Mar 2015	1082	75
10.	06 Mar 2015	812	56				
<b>April 2015</b>							
12.	04 Apr 2015	621	43	15.	12 Apr 2015	466 ☉	32
13.	06 Apr 2015	568	39	16.	26 Apr 2015	476	33
14.	11 Apr 2015	564	39				
<b>May 2015</b>							
17.	03 May2015	481	33	19.	24 May 2015	295	20
18.	06 May 2015	385	27				
<b>June 2015</b>							
20.	10 June 2015	1039 ☉	72	22.	29 June 2015	208	14
21.	11 June 2015	369	26				

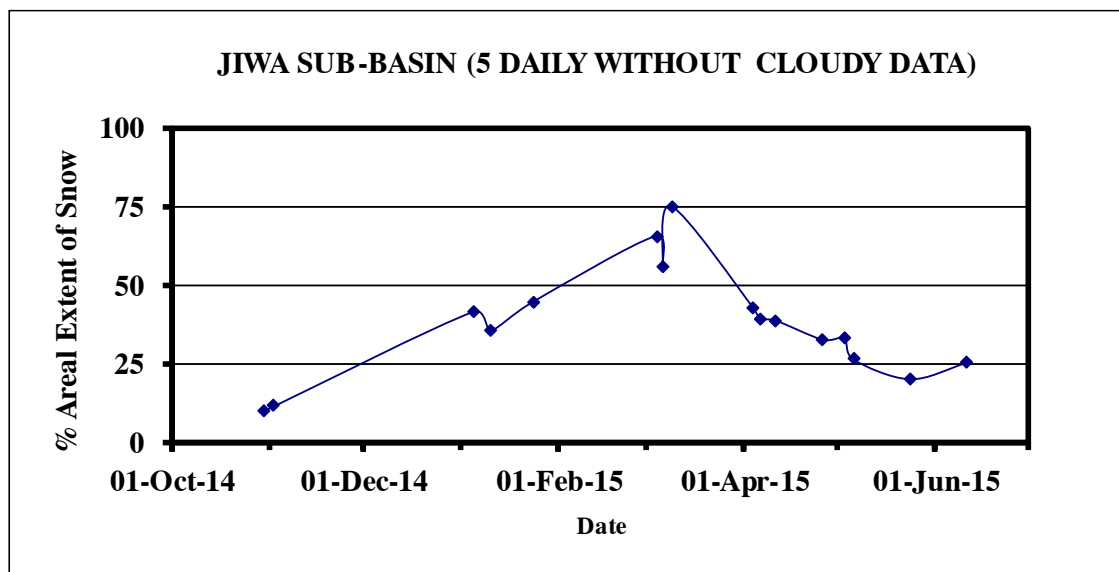
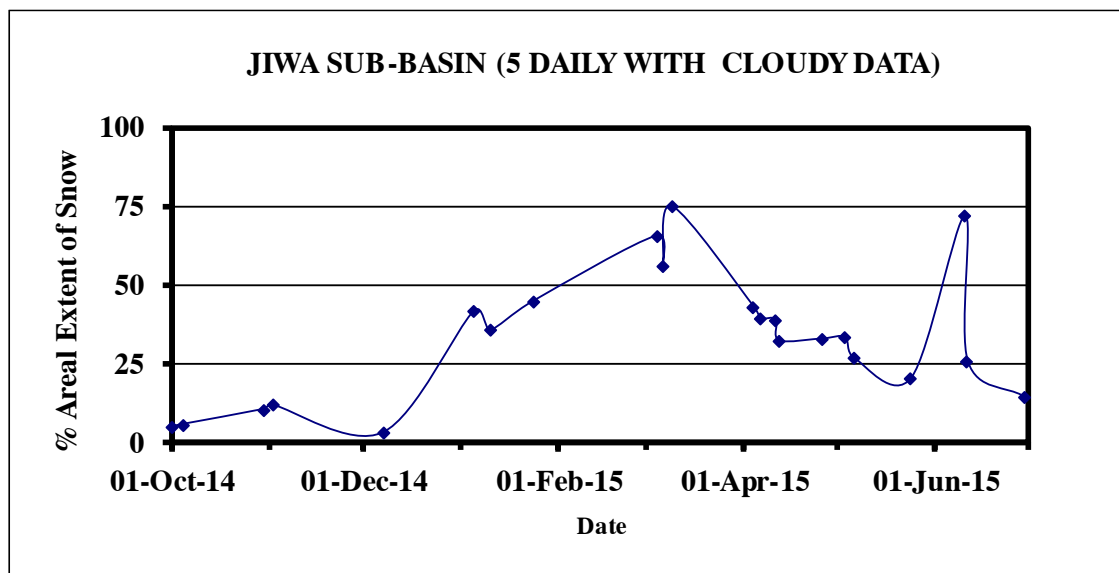
# AREAL EXTENT OF SNOW (10 DAILY)

**BASIN NAME: JIWA**

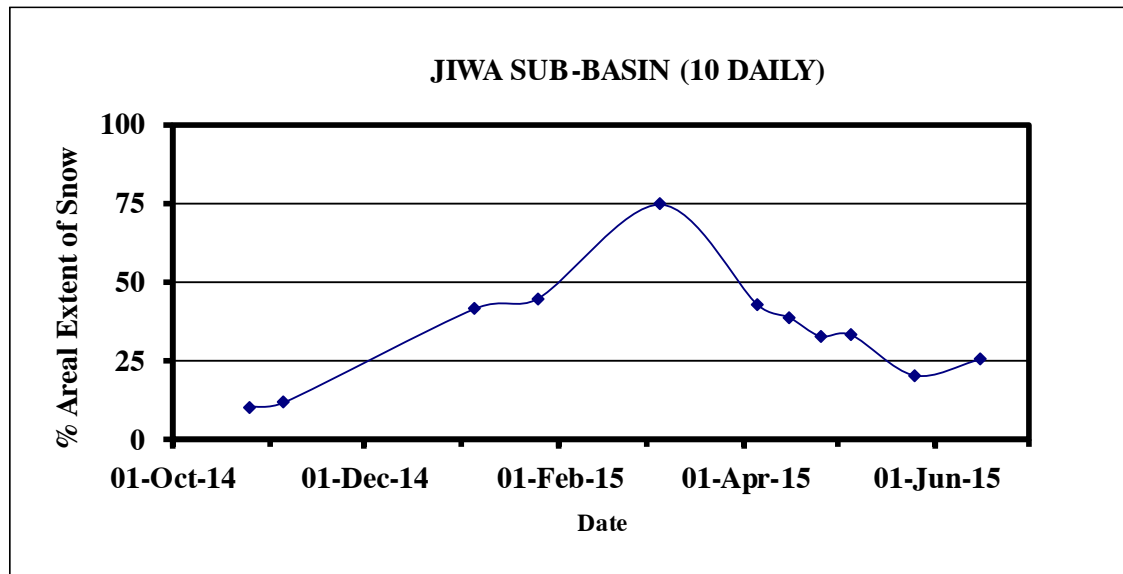
**BASIN AREA: 1445 sq. km**

S. No	Date	Snow cover (sq. km)	Snow cover (%)	S. No	Date	Snow cover (sq. km)	Snow cover (%)
<b>October 2014</b>							
1.	25 Oct 2014	152	10				
<b>November 2014</b>							
2.	02 Nov 2014	170	12				
<b>January 2015</b>							
3.	05 Jan 2015	603	42	4.	25 Jan 2015	649	45
<b>March 2015</b>							
5.	05 Mar 2015	1082	75				
<b>April 2015</b>							
6	05 Apr 2015	624	43	6	15 Apr 2015	563	39
7	25 Apr 2015	476	33				
<b>May 2015</b>							
8	05 May 2015	481	33	9	25 May 2015	295	20
<b>June 2015</b>							
10	15 June 2015	369	26				

## SNOW ACCUMULATION AND ABLATION CURVE

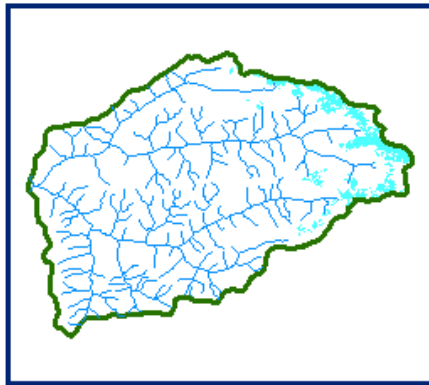


## SNOW ACCUMULATION AND ABLATION CURVE

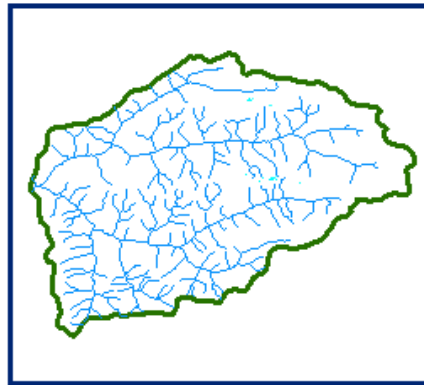


# *SNOW COVER MAP*

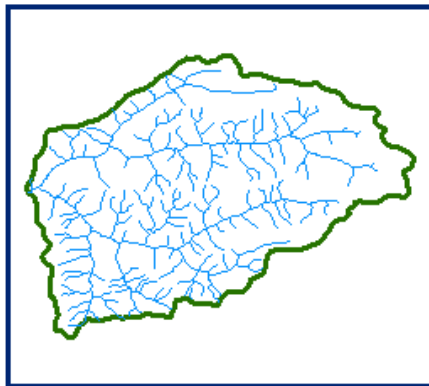
# SNOW COVER MAP : JIWA BASIN



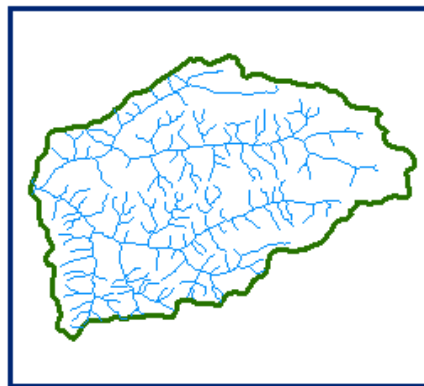
01 Oct 2014



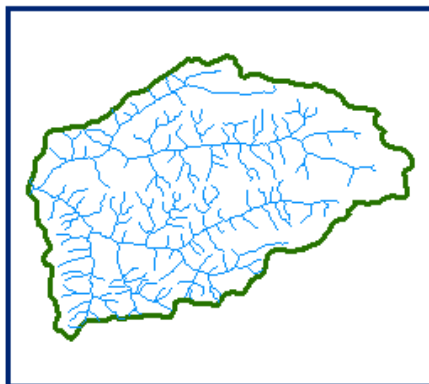
04 Oct 2014



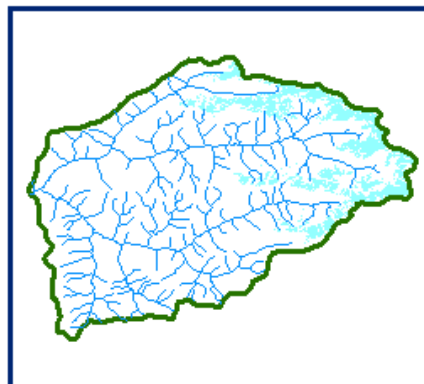
DATA NOT AVAILABLE




DATA NOT AVAILABLE



DATA NOT AVAILABLE



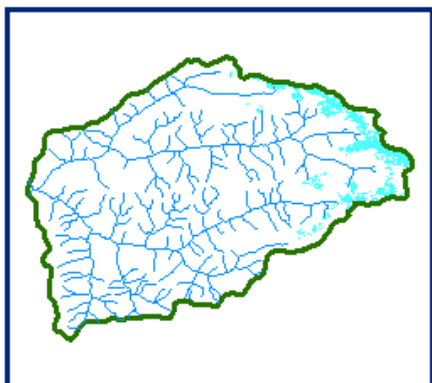
30 Oct 2014

 SNOW

0 2.5 5 10 15 20 25  
Kilometers

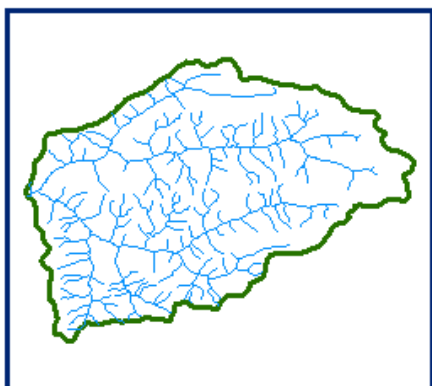


# 10 DAILY SNOW COVER MAP: JIWA BASIN



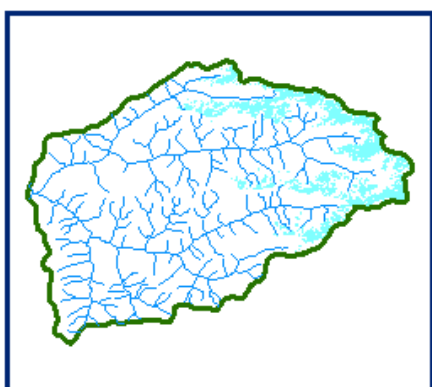
DATA USED

**01 Oct 2014**



DATA USED


**DATA NOT AVAILABLE**



DATA USED

**30 Oct 2014**

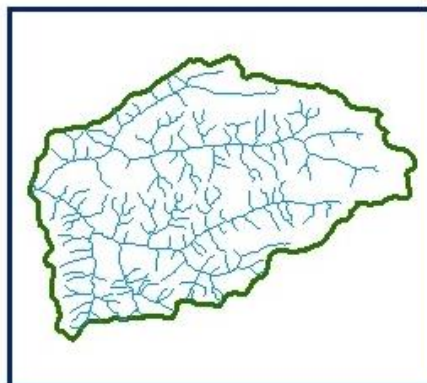
 SNOW

0 5 10 20 30 40  
  
Kilometers

# SNOW COVER MAP : JIWA BASIN



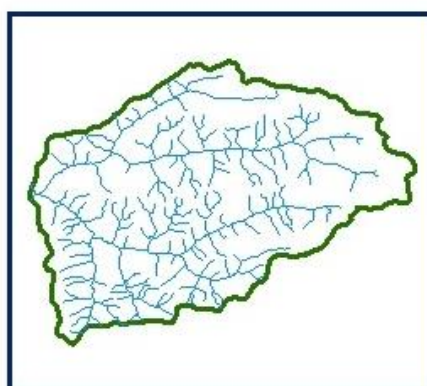
**02 Nov 2014**



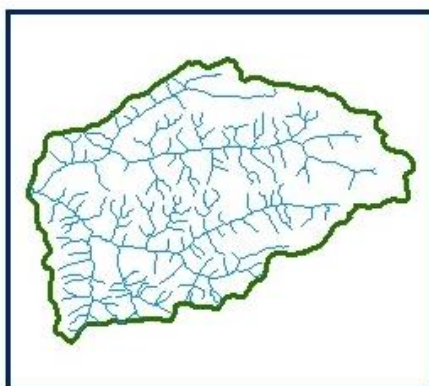
**DATA NOT AVAILABLE**



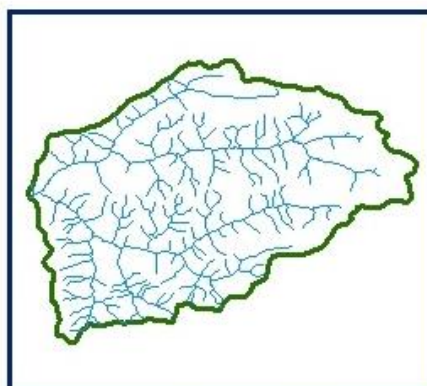
**DATA NOT AVAILABLE**



**DATA NOT AVAILABLE**



**DATA NOT AVAILABLE**



**DATA NOT AVAILABLE**

 SNOW

03.57 14 21 28  
  
 Kilometers

# SNOW COVER MAP : JIWA BASIN



**DATA NOT AVAILABLE**



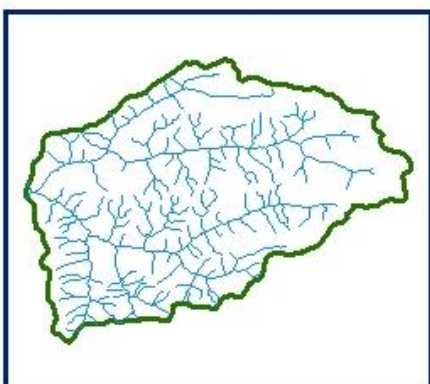
**07 Dec 2014**



**DATA NOT AVAILABLE**



**DATA NOT AVAILABLE**



**DATA NOT AVAILABLE**

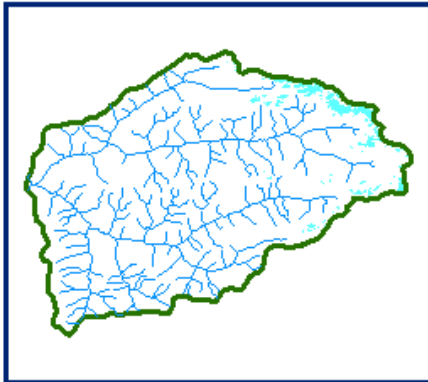


**DATA NOT AVAILABLE**

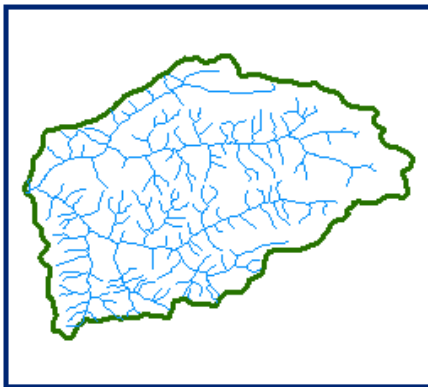
 SNOW

0 2.5 5 10 15 20 25  
Kilometers

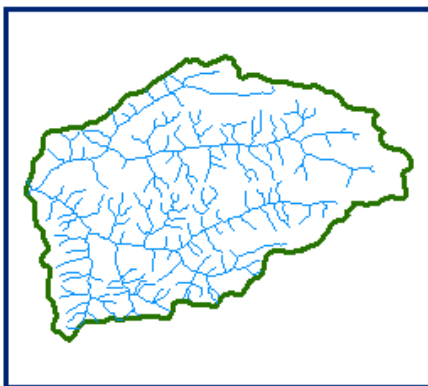
**10 DAILY SNOW COVER MAP: JIWA BASIN**



DATA USED  
**07 Dec 2014**




DATA USED  
**DATA NOT AVAILABLE**



DATA USED  
**DATA NOT AVAILABLE**

 SNOW

0 5 10 20 30 40  
  
Kilometers

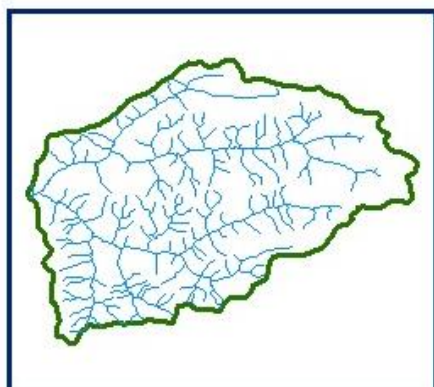
# SNOW COVER MAP : JIWA BASIN



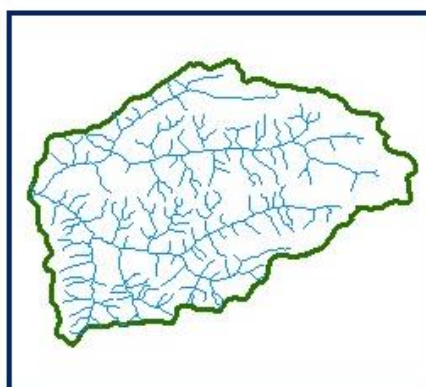
05 Jan 2015



10 Jan 2015



DATA NOT AVAILABLE



DATA NOT AVAILABLE



24 Jan 2015

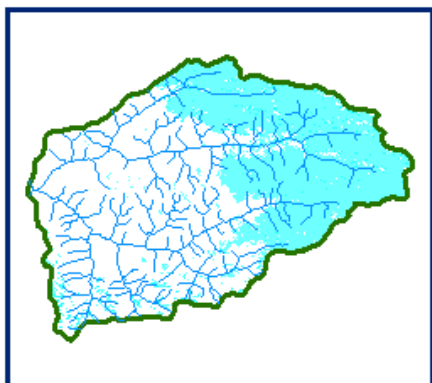


DATA NOT AVAILABLE

 SNOW

0 2.5 5 10 15 20 25  
kilometers

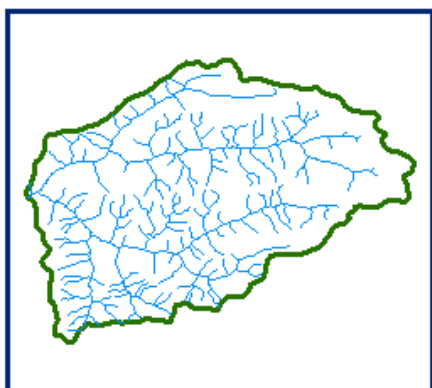
**10 DAILY SNOW COVER MAP: JIWA BASIN**



DATA USED

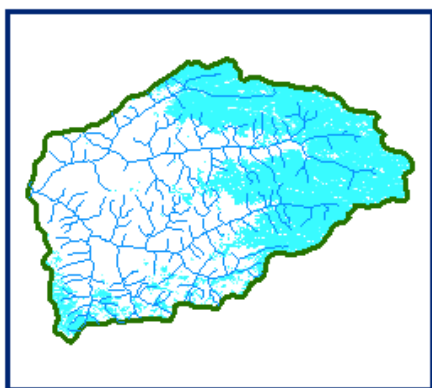
**05 Jan 2015**

**10 Jan 2015**



DATA USED


**DATA NOT AVAILABLE**



DATA USED

**24 Jan 2015**

 SNOW

0 5 10 20 30 40  
  
Kilometers



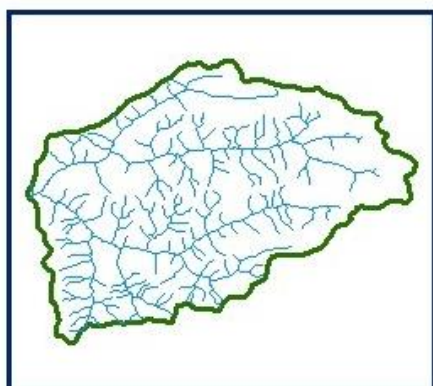
# SNOW COVER MAP : JIWA BASIN



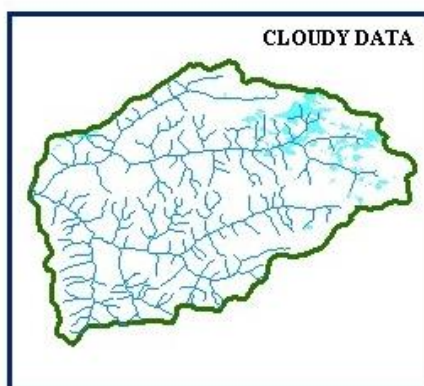
01 Feb 2015



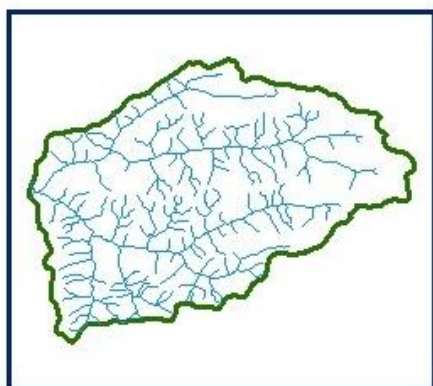
DATA NOT AVAILABLE



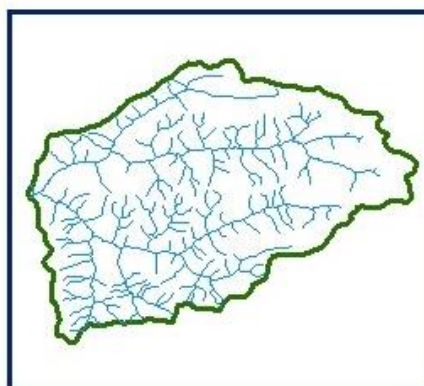
DATA NOT AVAILABLE



17 Feb 2015



DATA NOT AVAILABLE

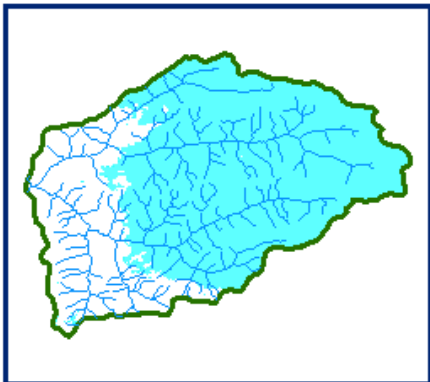


DATA NOT AVAILABLE

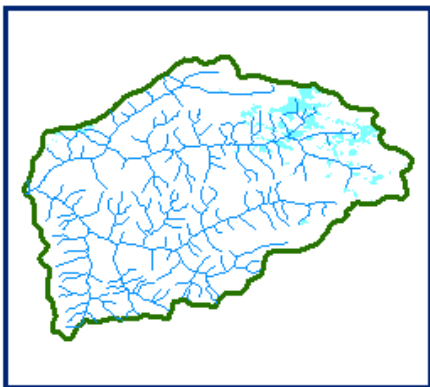
SNOW

0 10 20 40 60 80  
Kilometers

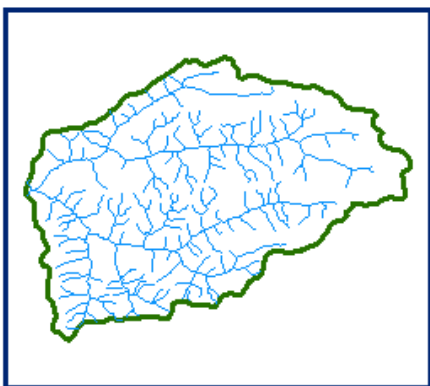
**10 DAILY SNOW COVER MAP: JIWA BASIN**



DATA USED  
**01 Feb 2015**



DATA USED  
**17 Feb 2015**



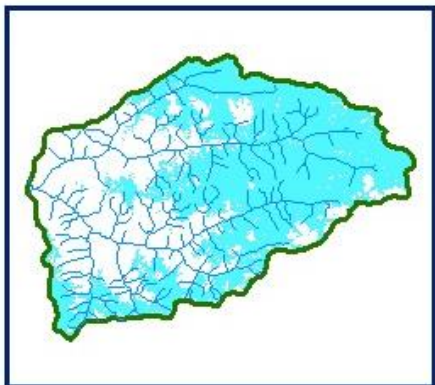
DATA USED  
**DATA NOT AVAILABLE**

 SNOW

0 5 10 20 30 40  
  
Kilometers



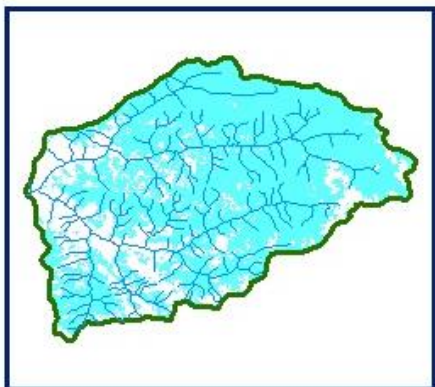
# SNOW COVER MAP : JIWA BASIN



**04 Mar 2015**



**06 Mar 2015**



**09 Mar 2015**



**DATA NOT AVAILABLE**



**DATA NOT AVAILABLE**

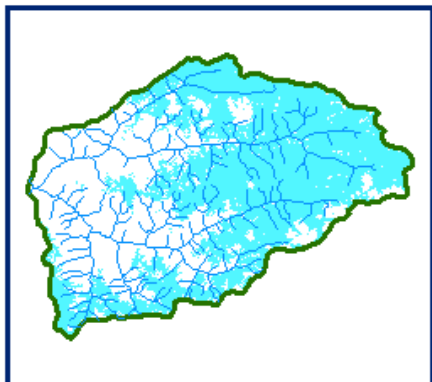


**DATA NOT AVAILABLE**

 SNOW

0 2.5 5 10 15 20 25  
Kilometers

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

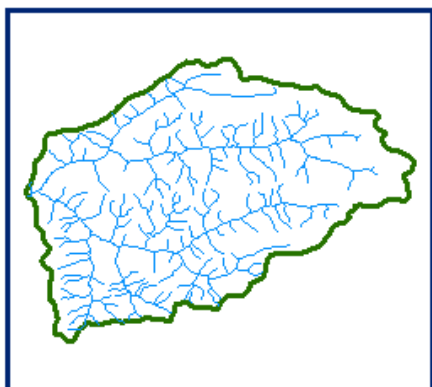


DATA USED

**04 March 2015**

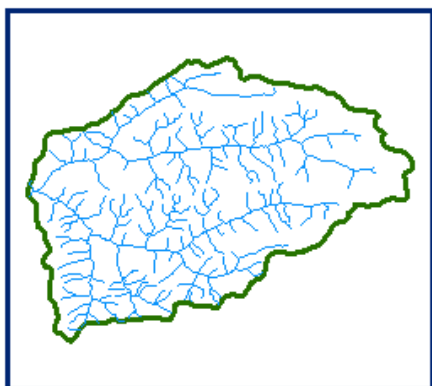
**06 March 2015**

**09 March 2015**



DATA USED


**DATA NOT AVAILABLE**



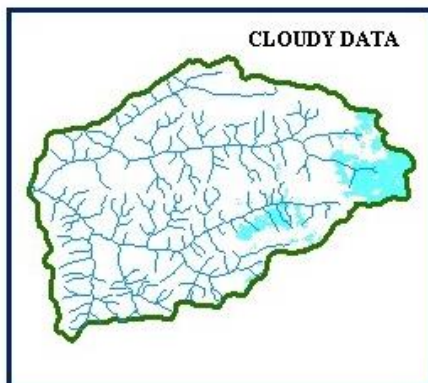
DATA USED

**DATA NOT AVAILABLE**

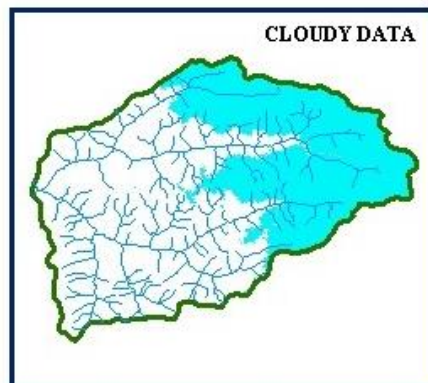
 SNOW

0 5 10 20 30 40  
  
Kilometers

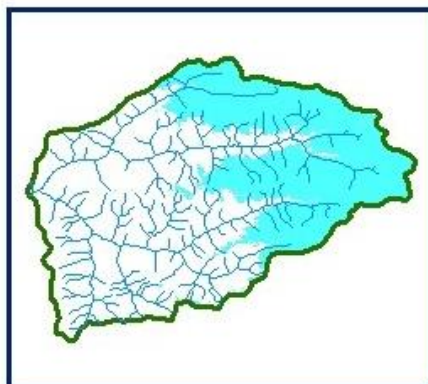
# SNOW COVER MAP : JIWA BASIN



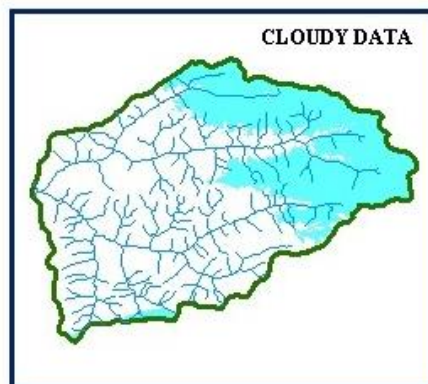
02 April 2015



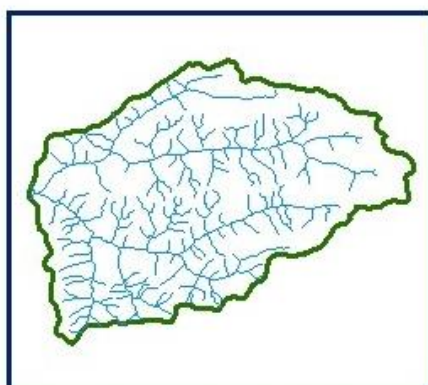
06 April 2015



11 April 2015



12 April 2015



DATA NOT AVAILABLE



26 April 2015

 SNOW

0 10 20 40 60 80  
Kilometers

# 10 DAILY SNOW COVER MAP: JIWA BASIN



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



DATA USED  
**11 April 2015**  
**12 April 2015**



DATA USED  
**26 April 2015**

 SNOW

0 10 20 40 60 80  
Kilometers



# SNOW COVER MAP : JIWA BASIN



03 May 2015



06 May 2015



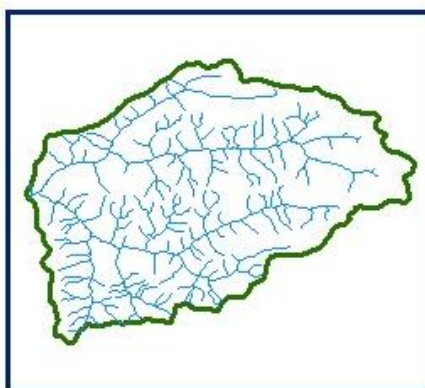
DATA NOT AVAILABLE



DATA NOT AVAILABLE



24 May 2015

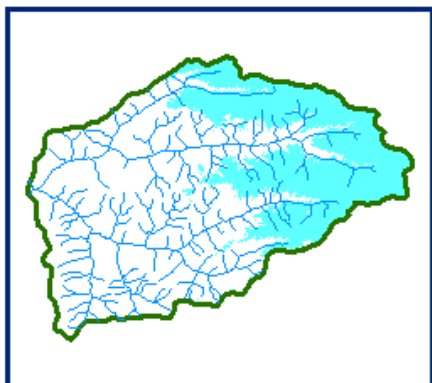


DATA NOT AVAILABLE

 SNOW

0 2.5 5 10 15 20 25  
Kilometers

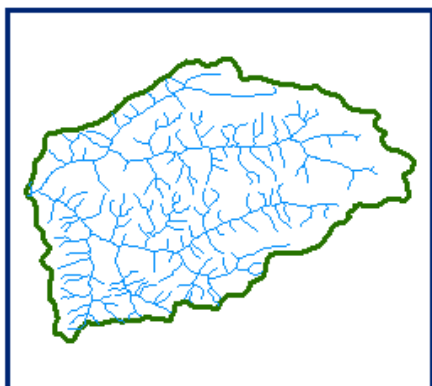
**10 DAILY SNOW COVER MAP: JIWA BASIN**



DATA USED

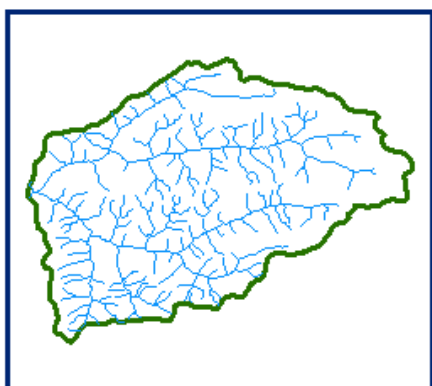
**03 May 2015**

**06 May 2015**



DATA USED

**DATA NOT AVAILABLE**



DATA USED

**DATA NOT AVAILABLE**

 SNOW

0 5 10 20 30 40  
  
Kilometers

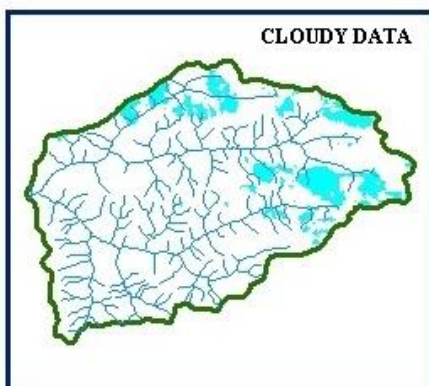
# SNOW COVER MAP : JIWA BASIN



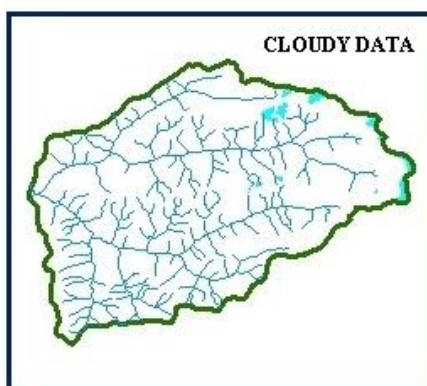
**DATA NOT AVAILABLE**



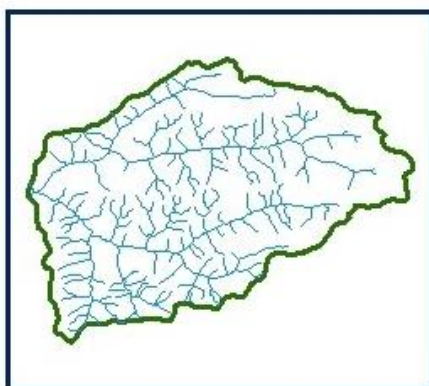
**10 June 2015**



**15 June 2015**



**20 June 2015**




**DATA NOT AVAILABLE**

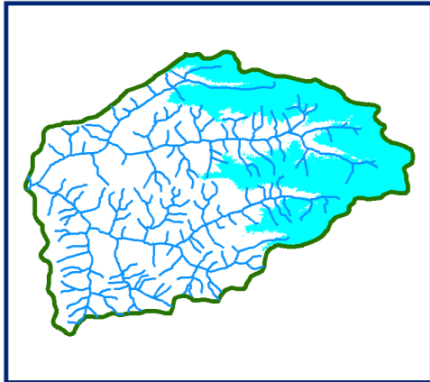


**29 June 2015**

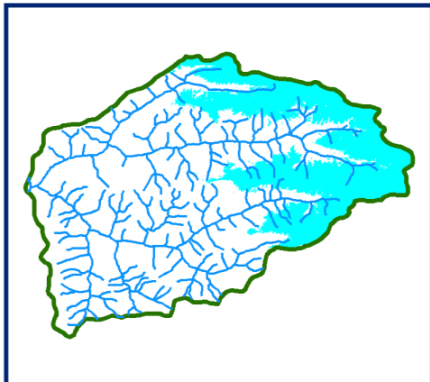
 SNOW

03.57 14 21 28  
  
 Kilometers

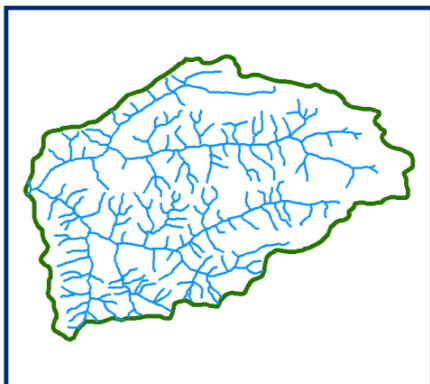
## 10 DAILY SNOW COVER MAP: JIWA BASIN



DATA USED  
**03 June 2014**  
**06 June 2014**




DATA USED  
**13 June 2014**  
**16 June 2014**



DATA USED  
**DATA NOT AVAILABLE**

 SNOW

0.5 6 9 12  
  
Kilometers



## *PARBATI SUB-BASIN*

# AREAL EXTENT OF SNOW (5 DAILY)

**BASIN NAME: PARBATI**

**BASIN AREA: 1773 sq km**

S No	Date	Snow cover (sq km)	Snow cover (%)	S No	Date	Snow cover (sq km)	Snow cover (%)
<b>October 2014</b>							
1.	01 Oct 2014	321 ☉	18	3.	04 Oct 2014	409 ☉	23
2.	02 Oct 2014	334	19	4.	30 Oct 2014	691	39
<b>November 2014</b>							
5.	02 Nov 2014	710	40				
<b>December 2014</b>							
6.	07 Dec 2014	331	19	7.	20 Dec 2014	1461	82
<b>January 2015</b>							
8.	01 Jan 2015	1243	70	10.	10 Jan 2015	1278	72
9.	05 Jan 2015	1324	75	11	24 Jan 2015	1240	70
<b>February 2015</b>							
<b>March 2015</b>							
12.	06 Mar 2015	1553	88	13	09 Mar 2015	1629	92
<b>April 2015</b>							
14.	04 April 2015	1434	81	17	12 April 2015	1331	75
15.	06 April 2015	1317	74	18	26 April 2015	12444	70
16.	11 April 2015	1368	77				
<b>May 2015</b>							
19.	03 May 2015	1245	70	21.	24May 2015	949 ☉	54
20.	06 May 2015	1156	65				
<b>June 2015</b>							
22.	10 June 2015	1336 ☉	75	24.	20 June 2015	643 ☉	36
23.	11 June 2015	1177	66	25.	29 June 2015	845	48

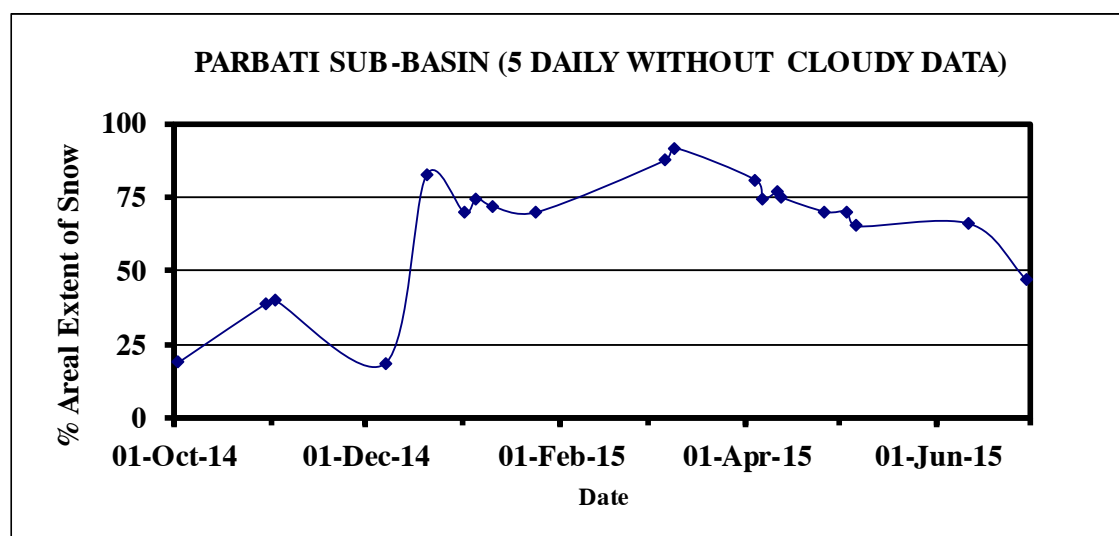
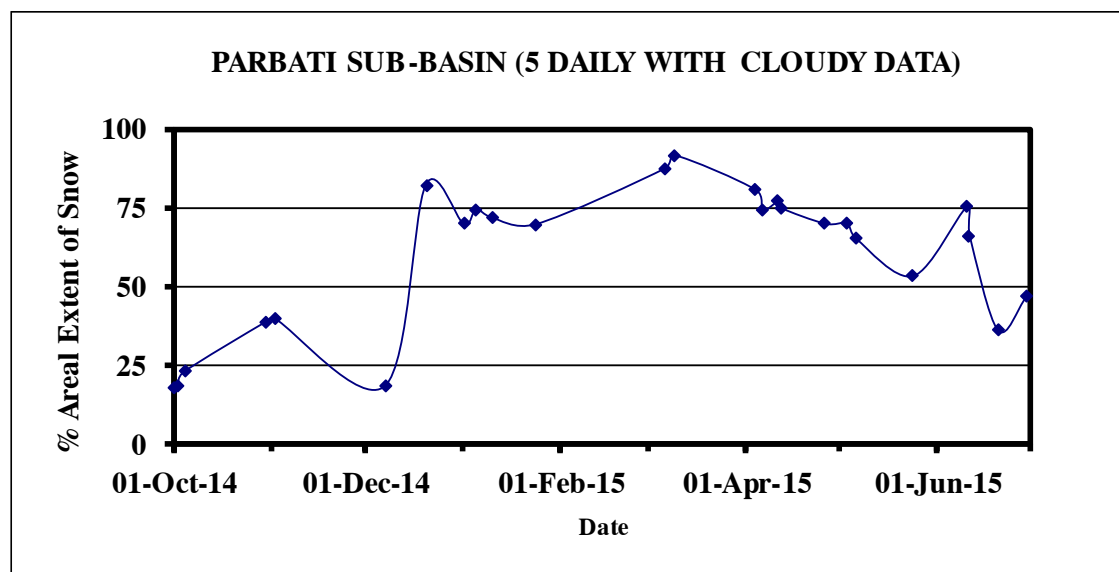
# AREAL EXTENT OF SNOW (10 DAILY)

**BASIN NAME: PARBATI**

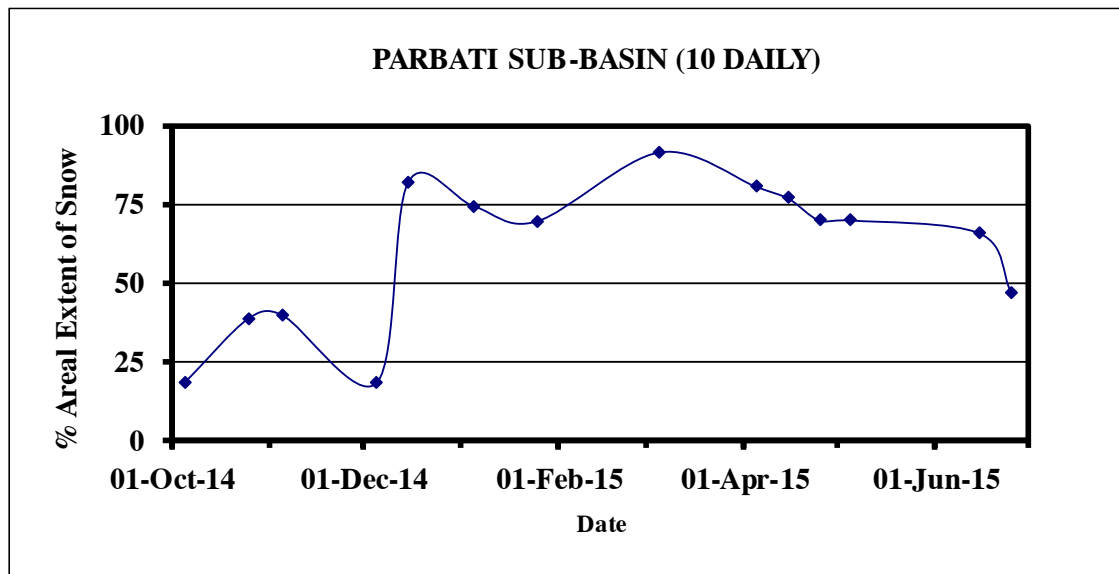
**BASIN AREA: 1773 sq km**

S No	Date	Snow cover (sq km)	Snow cover (%)	S No	Date	Snow cover (sq km)	Snow cover (%)
<b>October 2014</b>							
1	05 Oct 2014	334	19	2.	25 Oct 2014	691	39
<b>November 2014</b>							
3.	05 Nov 2014	710	40				
<b>December 2014</b>							
4.	05 Dec 2014	331	19	5.	15 Dec 2014	1461	82
<b>January 2015</b>							
6.	05 Jan 2015	1324	75	7	25 Jan 2015	1240	70
<b>February 2015</b>							
<b>March 2015</b>							
8.	05 Mar 2015	1628	92				
<b>April 2015</b>							
9	05 Apr 2015	1437	81	10	15 Apr 2015	1368	77
11	25 Apr 2015	1244	70				
<b>May 2015</b>							
12	05 May 2015	1245	70				
<b>June 2015</b>							
13	15 June 2015	1170	66	14	25 June 2015	833	47

## SNOW ACCUMULATION AND ABLATION CURVE



## SNOW ACCUMULATION AND ABLATION CURVE



# *SNOW COVER MAP*

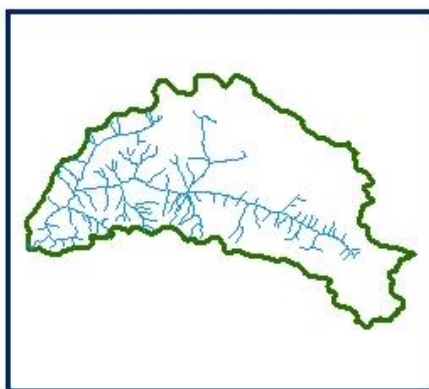
# SNOW COVER MAP : PARBATI BASIN



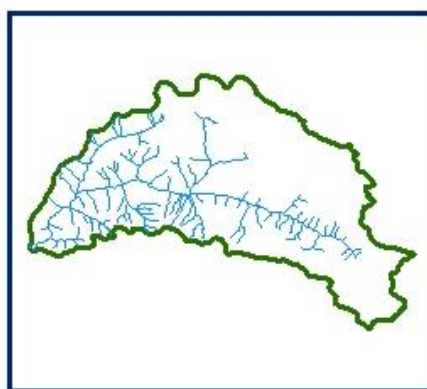
**01 Oct 2014**



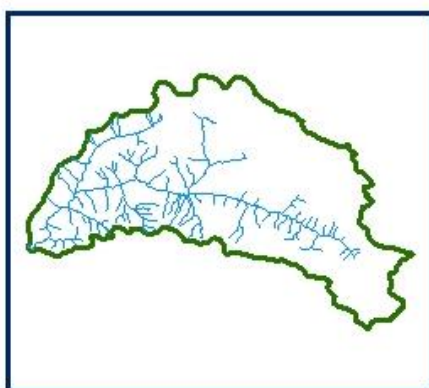
**DATA NOT AVAILABLE**



**DATA NOT AVAILABLE**



**DATA NOT AVAILABLE**



**DATA NOT AVAILABLE**



**30 Oct 2014**

 SNOW

0 2.5 5 7.5 10 12.5 15 17.5 20 22.5 25 27.5 30 32.5 35  
Kilometers

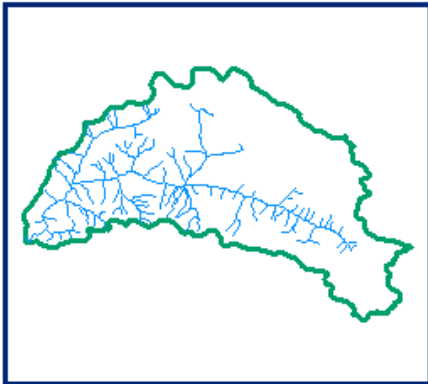
**10 DAILY SNOW COVER MAP: PARBATI BASIN**



DATA USED

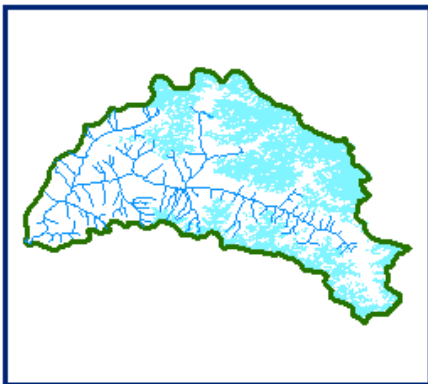
**01 Oct 2014**

**02 Oct 2014**



DATA USED


**DATA NOT AVAILABLE**



DATA USED

**30 Oct 2014**

 SNOW

0 10 20 40 60 80  
  
Kilometers



# SNOW COVER MAP : PARBATI BASIN



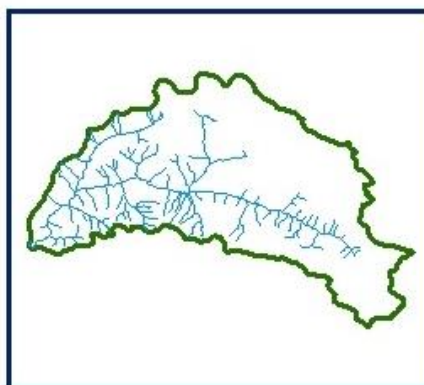
**02 Nov 2014**



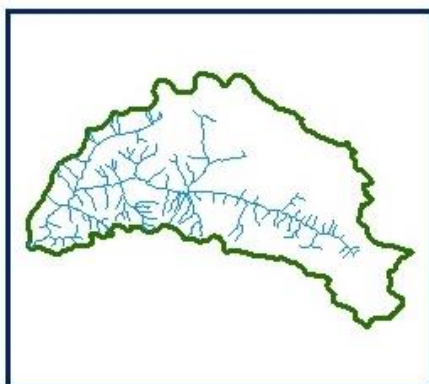
**DATA NOT AVAILABLE**



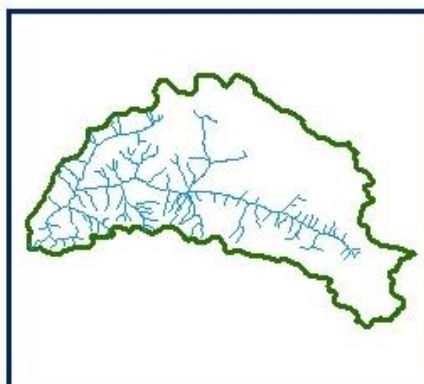
**DATA NOT AVAILABLE**



**DATA NOT AVAILABLE**



**DATA NOT AVAILABLE**

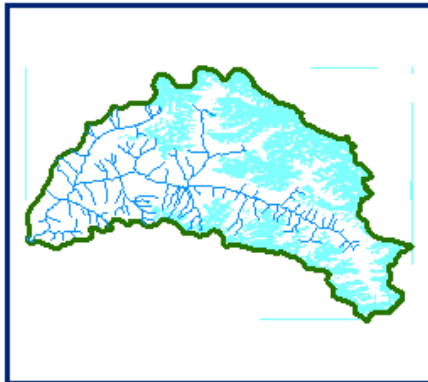


**DATA NOT AVAILABLE**

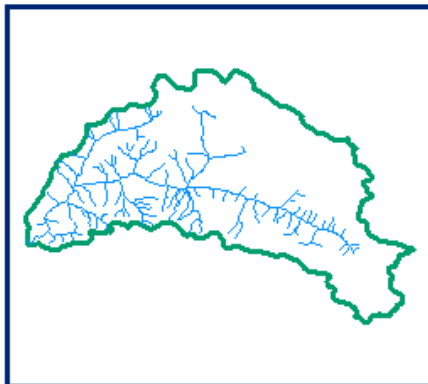
 SNOW

04.59 18 27 36  
  
 Kilometers

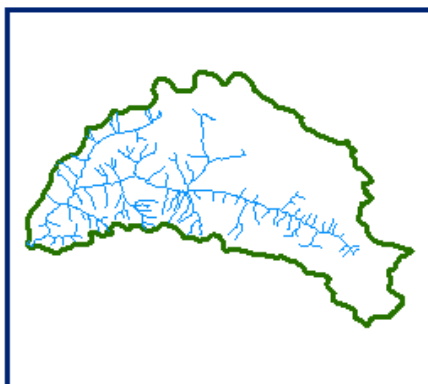
**10 DAILY SNOW COVER MAP: PARBATI BASIN**



DATA USED  
**02 Nov 2015**




DATA USED  
**DATA NOT AVAILABLE**

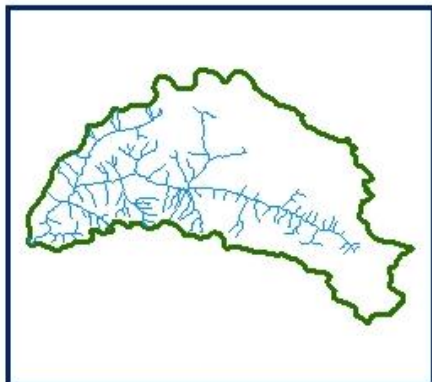


DATA USED  
**DATA NOT AVAILABLE**

 SNOW

0 10 20 40 60 80  
  
Kilometers

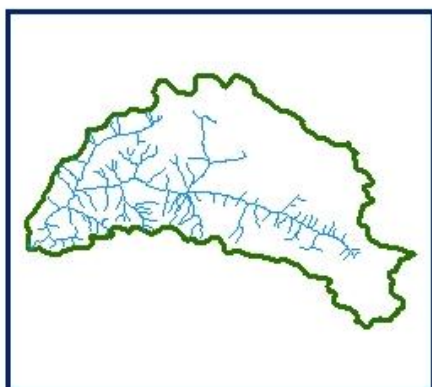
# SNOW COVER MAP : PARBATI BASIN



DATA NOT AVAILABLE



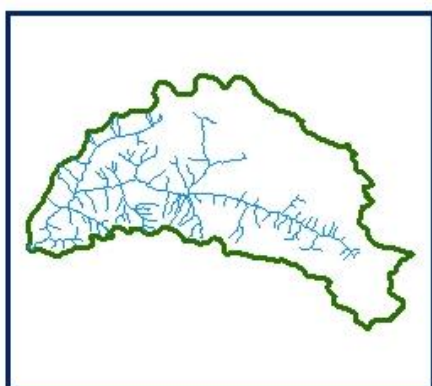
07 Dec 2014



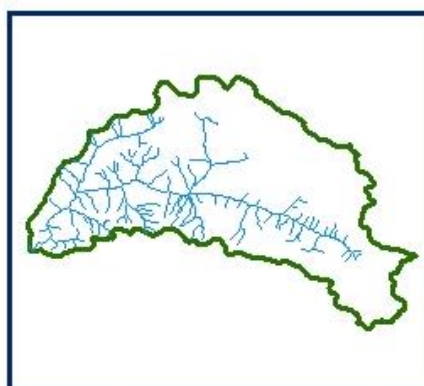
DATA NOT AVAILABLE



20 Dec 2014



DATA NOT AVAILABLE

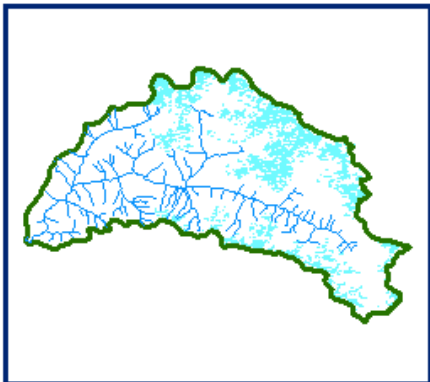


DATA NOT AVAILABLE

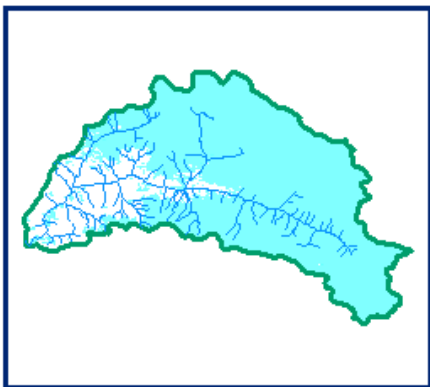
 SNOW

0 2.5 5 10 15 20 25 30 35  
Kilometers

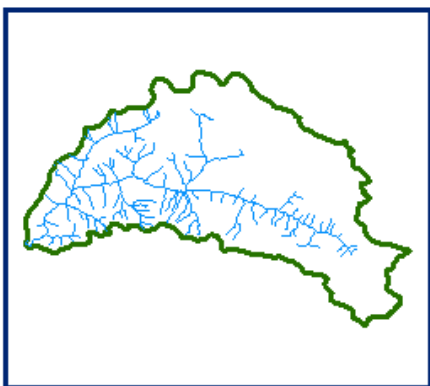
**10 DAILY SNOW COVER MAP: PARBATI BASIN**



DATA USED  
**07 Dec 2014**




DATA USED  
**20 Dec 2014**

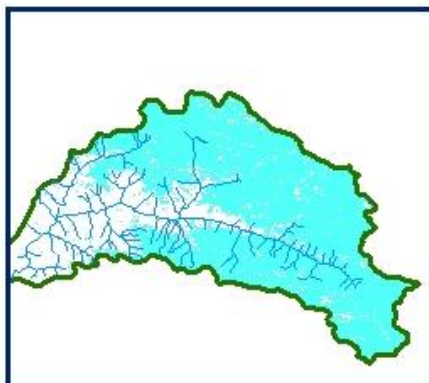


DATA USED  
**DATA NOT AVAILABLE**

 SNOW

0 5 10 20 30 40  
  
Kilometers

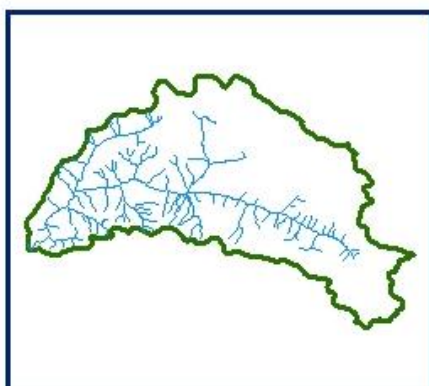
# SNOW COVER MAP : PARBATI BASIN



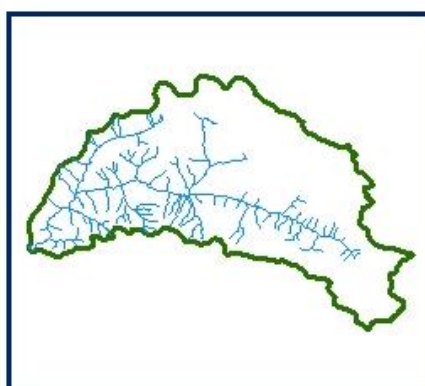
**01 Jan 2015**



**10 Jan 2015**



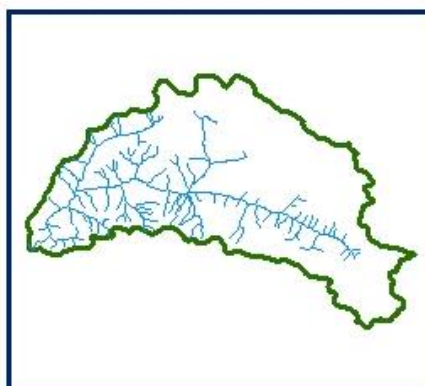
**DATA NOT AVAILABLE**



**DATA NOT AVAILABLE**




**24 Jan 2015**



**DATA NOT AVAILABLE**

 SNOW

0 4 8 16 24 32  
  
 Kilometers

# 10 DAILY SNOW COVER MAP: PARBATI BASIN

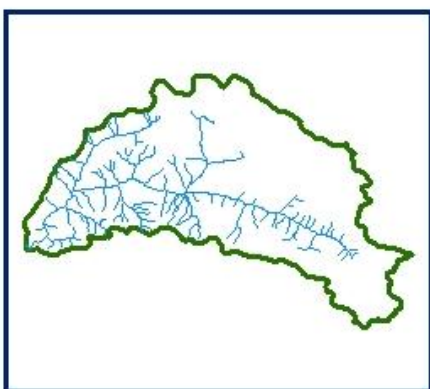


DATA USED

**01 Jan 2015**

**05 Jan 2015**

**10 Jan 2015**



DATA USED


**DATA NOT AVAILABLE**



DATA USED

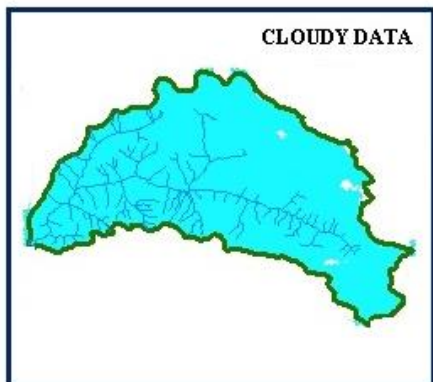
**24 Jan 2015**

 SNOW

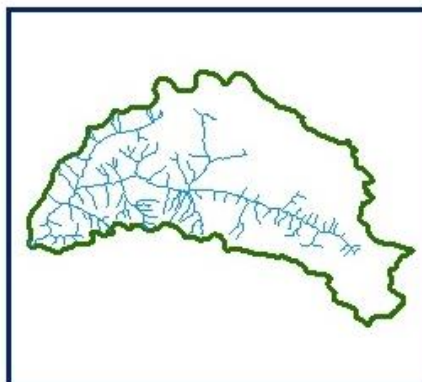
0 2.5 5 17 25.5 34  
  
 Kilometers



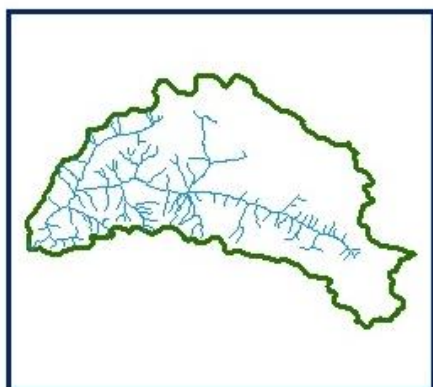
# SNOW COVER MAP : PARBATI BASIN



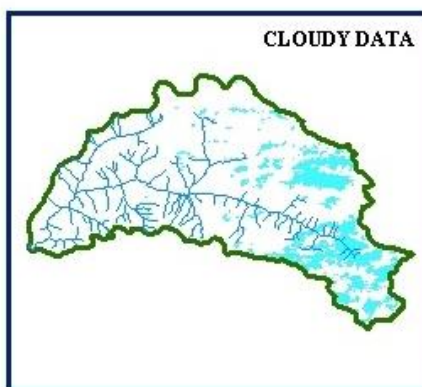
01 Feb 2015



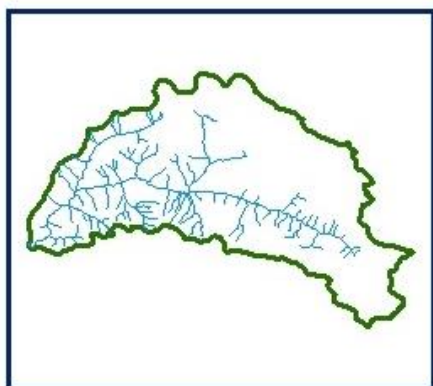
DATA NOT AVAILABLE



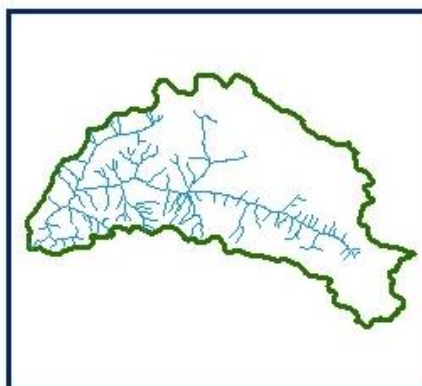
DATA NOT AVAILABLE



17 Feb 2015



DATA NOT AVAILABLE

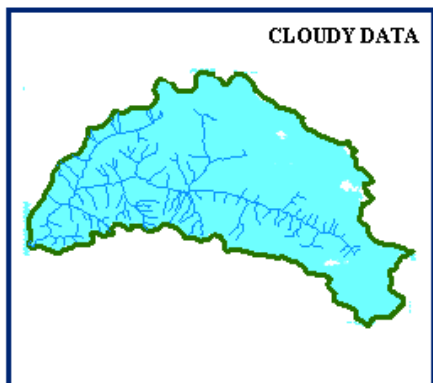


DATA NOT AVAILABLE

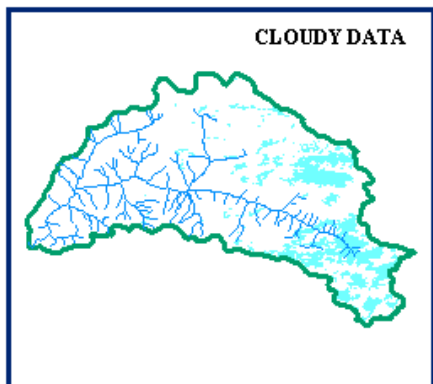
 SNOW

0 2.5 5 10 15 20 25 30 35  
Kilometers

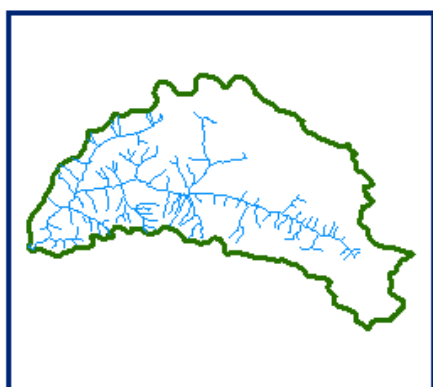
# 10 DAILY SNOW COVER MAP: PARBATI BASIN



DATA USED  
**01 Feb 2015**




DATA USED  
**17 Feb 2015**



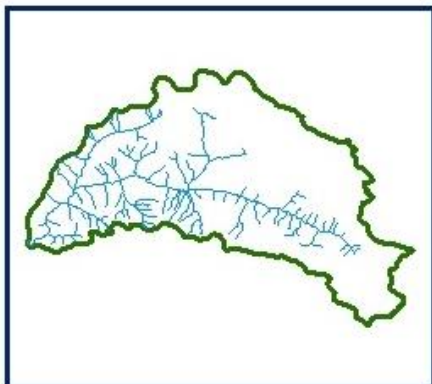
DATA USED  
**DATA NOT AVAILABLE**

 SNOW

0 5 10 20 30 40  
  
Kilometers



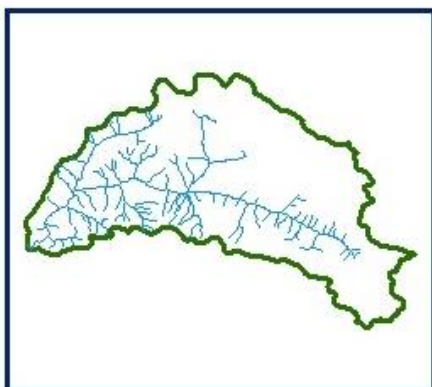
# SNOW COVER MAP : PARBATI BASIN



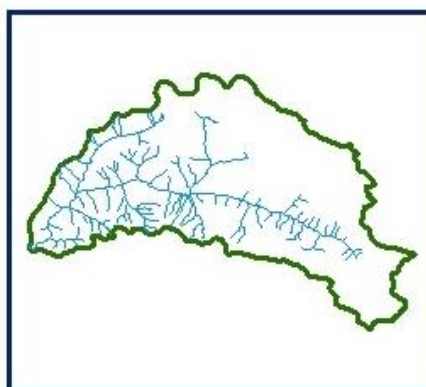
DATA NOT AVAILABLE



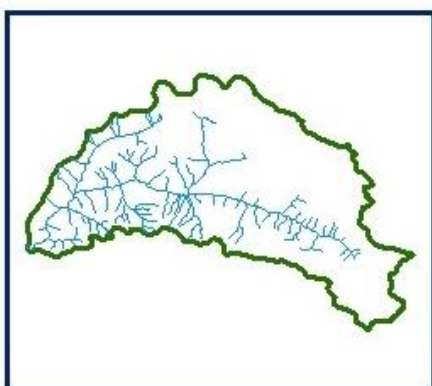
06 March 2015



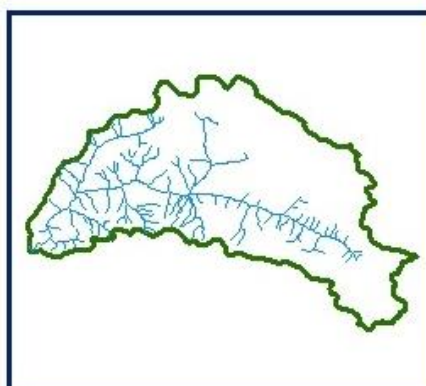
DATA NOT AVAILABLE



DATA NOT AVAILABLE



DATA NOT AVAILABLE

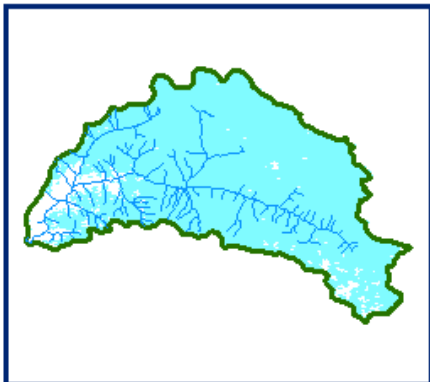


DATA NOT AVAILABLE

 SNOW

04.59 18 27 36  
  
 Kilometers

# 10 DAILY SNOW COVER MAP: PARBATI BASIN

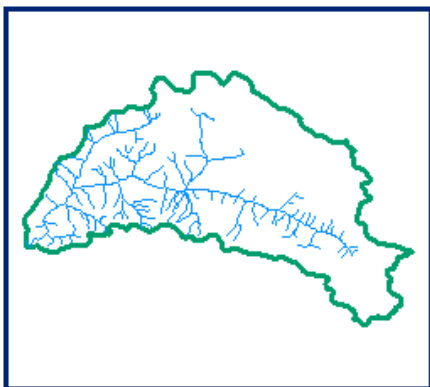


DATA USED

04 March 2015

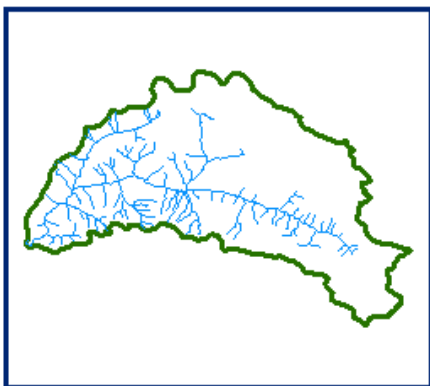
06 March 2015

09 March 2015



DATA USED


**DATA NOT AVAILABLE**



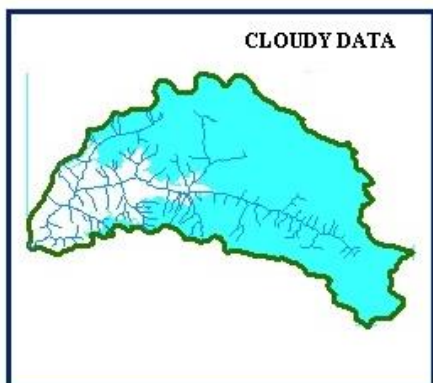
DATA USED

**DATA NOT AVAILABLE**

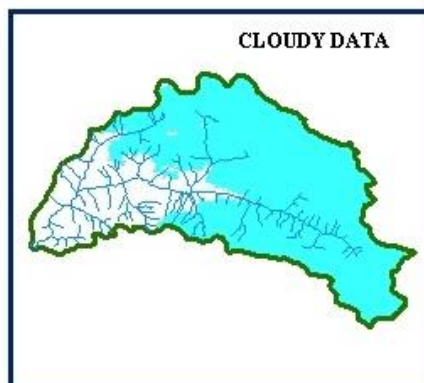
 SNOW

0 10 20 40 60 80  
  
Kilometers

# SNOW COVER MAP : PARBATI BASIN



04 April 2015



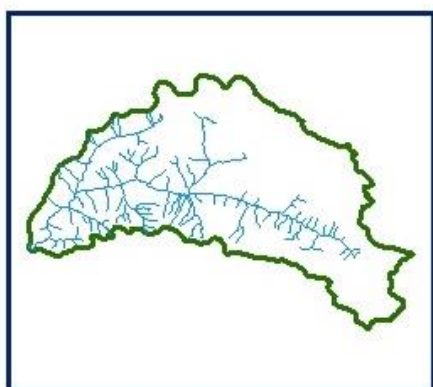
06 April 2015



11 April 2015



DATA NOT AVAILABLE



DATA NOT AVAILABLE

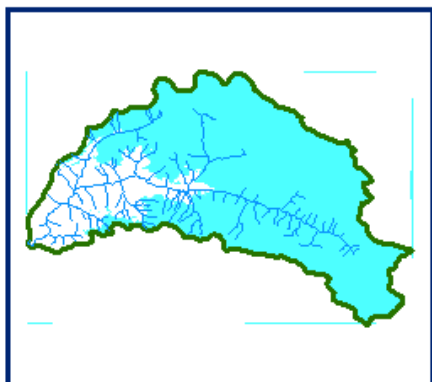


26 April 2015

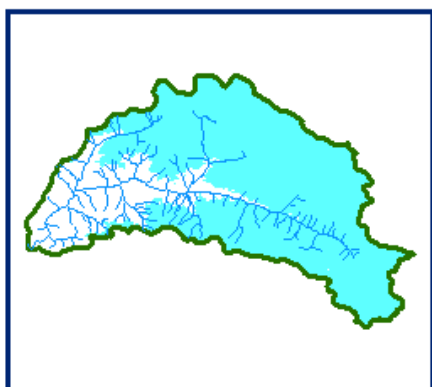
 SNOW

0 2.5 5 17 25.5 34  
  
 Kilometers

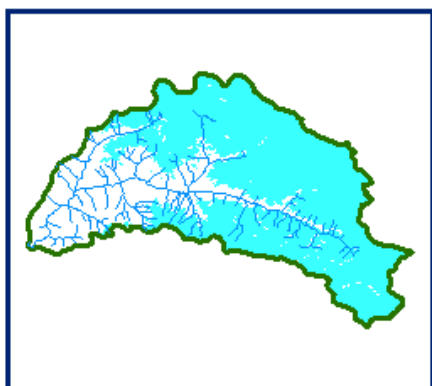
# 10 DAILY SNOW COVER MAP: PARBATI BASIN



DATA USED  
**04 April 2015**  
**06 April 2015**  
**07 April 2015**




DATA USED  
**11 April 2015**  
**12 April 2015**



DATA USED  
**26 April 2015**

 SNOW

0 5 10 20 30 40  
  
Kilometers

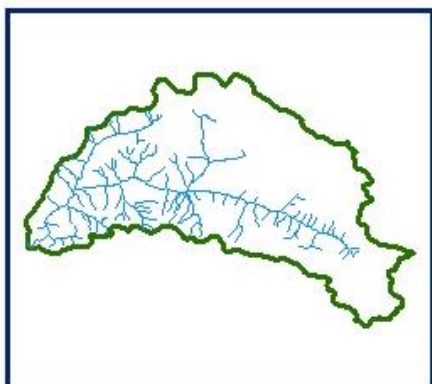
# SNOW COVER MAP : PARBATI BASIN



**03 May 2015**



**06 May 2015**



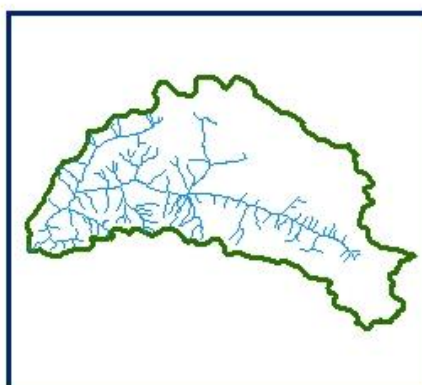
**DATA NOT AVAILABLE**



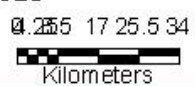
**DATA NOT AVAILABLE**



**24 May 2015**



**DATA NOT AVAILABLE**



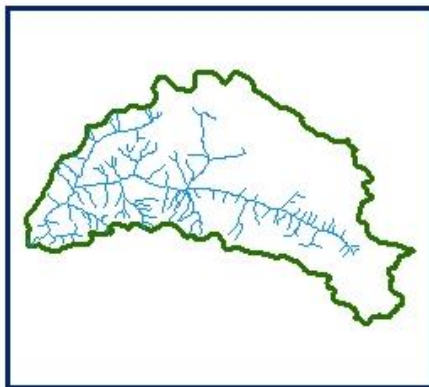
# 10 DAILY SNOW COVER MAP: PARBATI BASIN



DATA USED

**03 May 2015**

**06 May 2015**



DATA USED


**DATA NOT AVAILABLE**



DATA USED

**24 May 2015**

 SNOW

0 4.25 8.5 17 25.5 34  
  
Kilometers



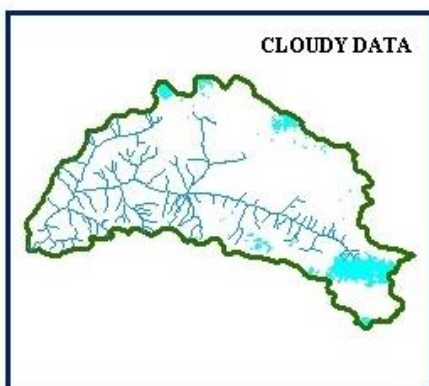
# SNOW COVER MAP : PARBATI BASIN



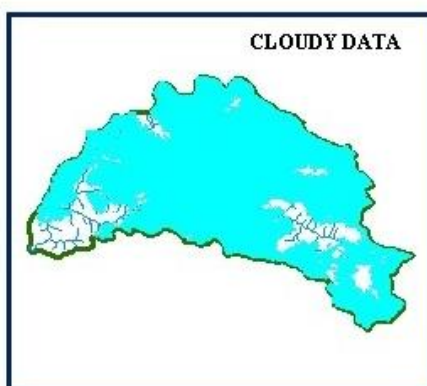
**DATA NOT AVAILABLE**



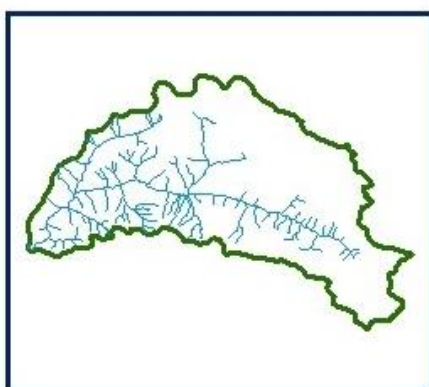
**10 June 2015**



**15 June 2015**



**20 June 2015**



**DATA NOT AVAILABLE**

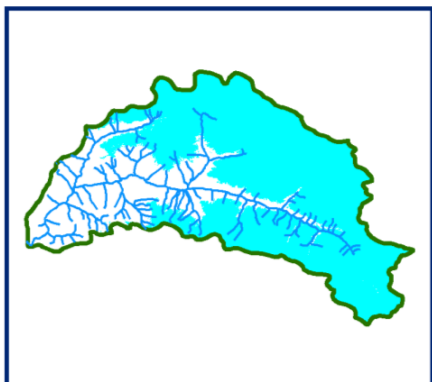


**29 June 2015**

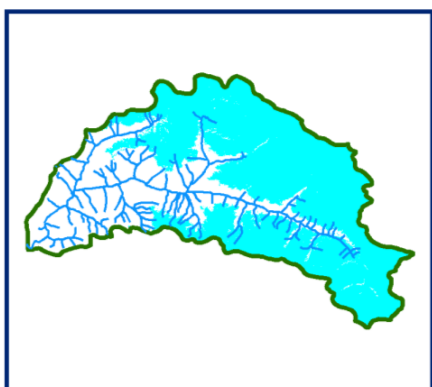
 SNOW

04.59 18 27 36  
  
 Kilometers

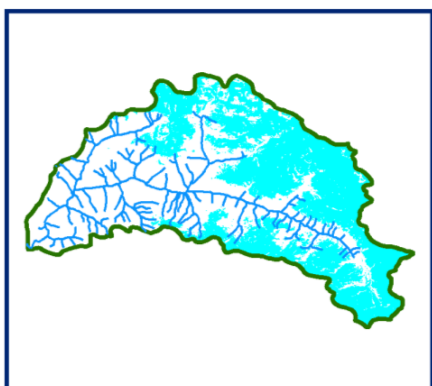
## 10 DAILY SNOW COVER MAP: PARBATI BASIN



DATA USED  
**03 June 2014**  
**06 June 2014**  
**10 June 2014**




DATA USED  
**11 June 2014**  
**16 June 2014**  
**20 June 2014**



DATA USED  
**28 June 2014**

 SNOW

04.59 18 27 36  
  
Kilometers



## *BEAS SUB-BASIN*

# AREAL EXTENT OF SNOW (5 DAILY)

**BASIN NAME: BEAS**

**BASIN AREA: 1132 sq km**

S No	Date	Snow cover (sq km)	Snow cover (%)	S No	Date	Snow cover (sq km)	Snow cover (%)
<b>October 2014</b>							
1.	01 Oct 2014	24	2	3	04 Oct2014	29 ©	3
2.	02 Oct 2014	35	3	4	30 Oct 2014	143	13
<b>November 2014</b>							
5.	02 Nov 2014	144	13				
<b>December 2014</b>							
6.	01 Dec 2014	146	13	8	20 Dec 2014	894	79
7.	07 Dec 2014	43	4				
<b>January 2015</b>							
9.	01 Jan 2015	531	47	11.	10 Jan 2015	614	54
10.	05Jan 2015	698	62	12.	24 Jan 2015	514	45
<b>March 2015</b>							
13.	06 Mar 2015	911	80	14.	09 Mar 2015	1023	90
<b>April 2015</b>							
15.	04 April 2015	752	66	17.	12 April 2015	571	50
16.	11 April 2015	679	60				
<b>May 2015</b>							
18.	03 May 2015	484	43	20.	24 May 2015	250	22
19.	06 May 2015	405	36				
<b>June 2015</b>							
21.	10 June 2015	779	69	22	11 June 2015	166©	15
				23	20 June 2015	208	18

©: cloudy

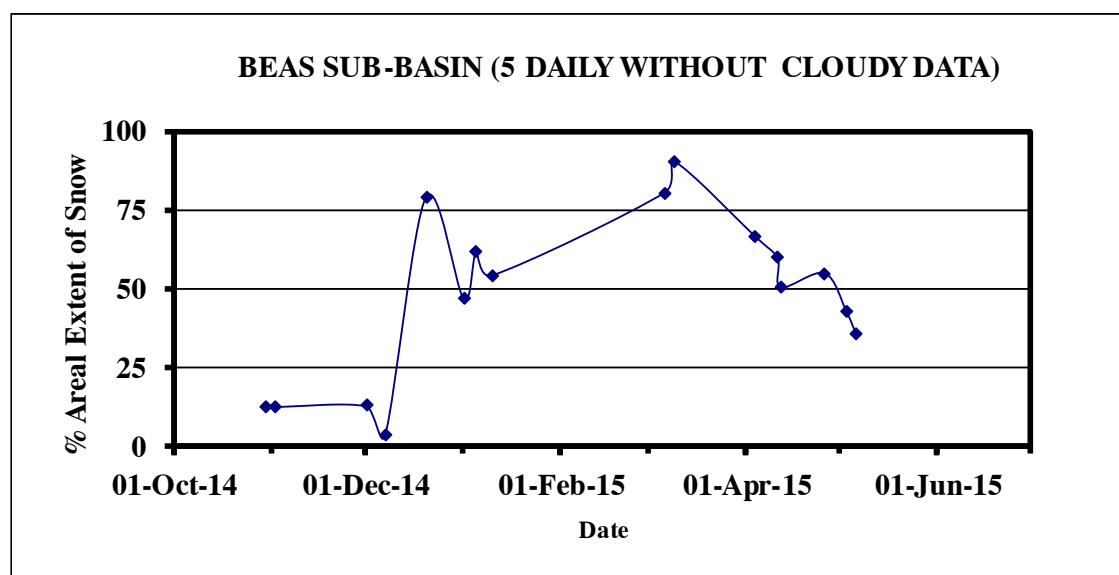
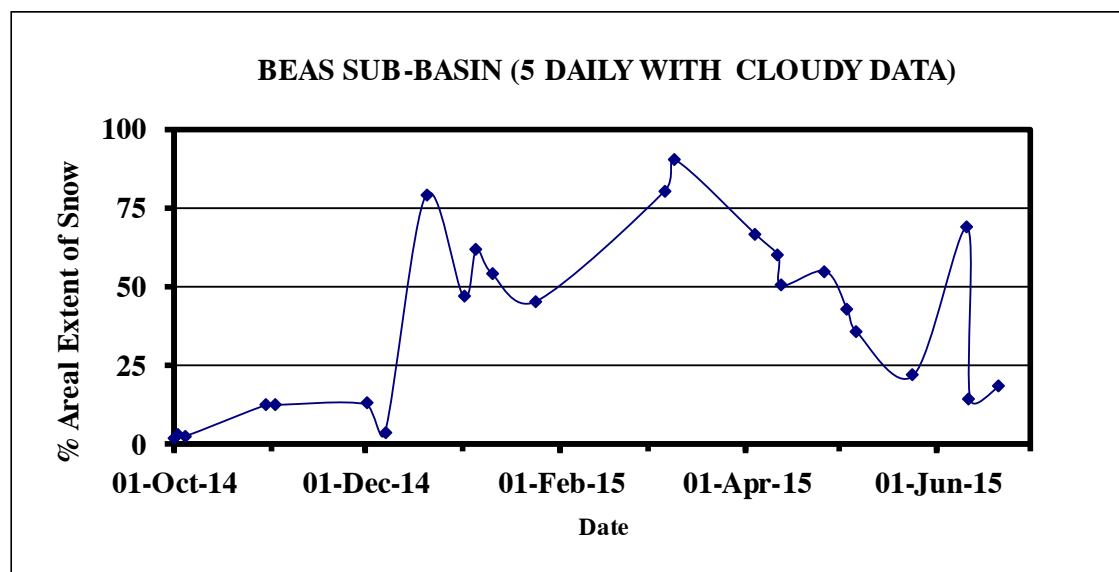
# AREAL EXTENT OF SNOW (10 DAILY)

**BASIN NAME: BEAS**

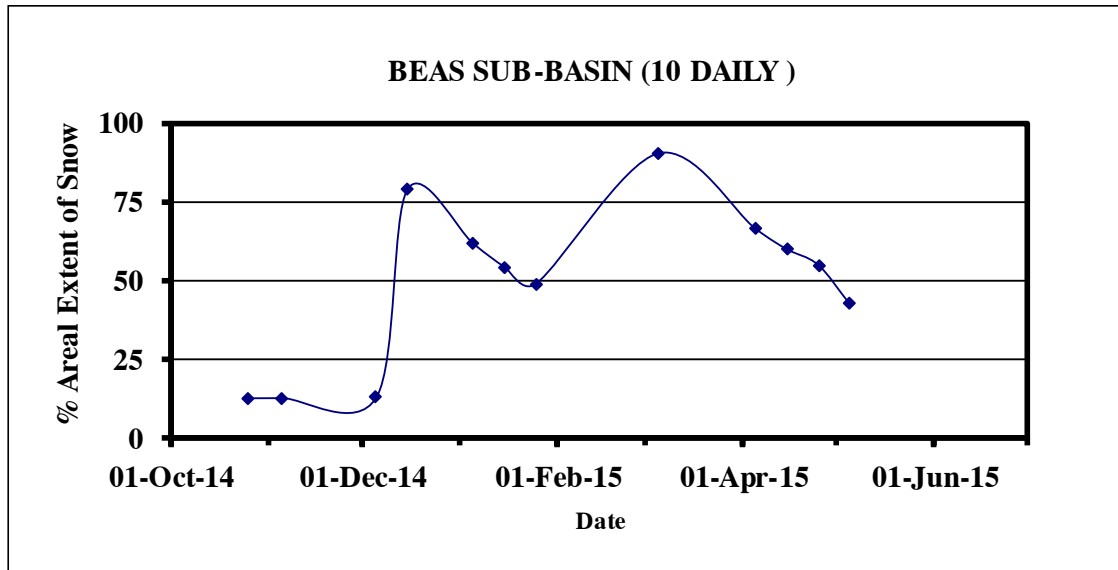
**BASIN AREA: 1132 sq km**

S No	Date	Snow cover (sq km)	Snow cover (%)	S No	Date	Snow cover (sq km)	Snow cover (%)
<b>October 2014</b>							
1.	25 Oct 2014	143	13				
<b>November 2014</b>							
2.	05 Nov 2014	146	13				
<b>December 2014</b>							
3	05 Dec 2014	146	13	4	15 Dec 2014	894	79
<b>January 2015</b>							
5	05 Jan 2015	698	62	6	15 Jan 2015	614	54
7	25 Jan 2015	555	49				
<b>February 2015</b>							
8.	05 Feb 2015						
<b>March 2015</b>							
9.	05 Mar 2015	1023	91				
<b>April 2015</b>							
10.	05 Apr 2015	752	66	11.	15 Apr 2015	678	60
	25 Apr 2015	623	55				
<b>May 2015</b>							
12.	05 May 2015	483	43	13.	15 May 2015		
14.	25 May 2015						
<b>June 2015</b>							

## SNOW ACCUMULATION AND ABLATION CURVE

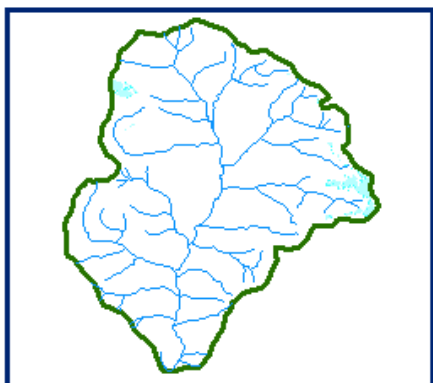


## SNOW ACCUMULATION AND ABLATION CURVE

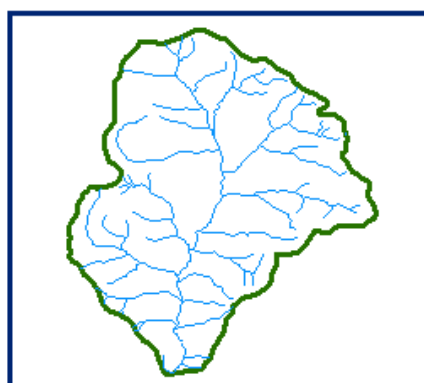


# *SNOW COVER MAP*

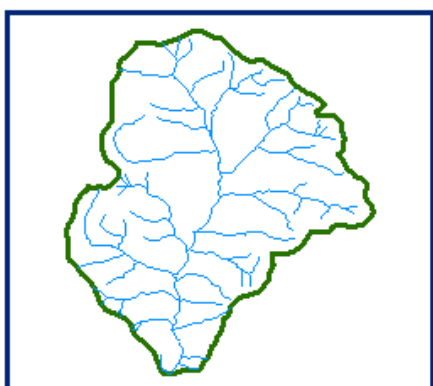
# SNOW COVER MAP : BEAS BASIN



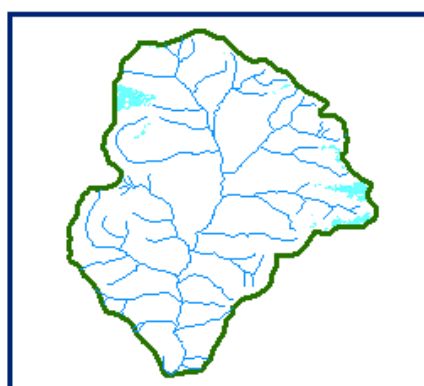
**01 Oct 2014**



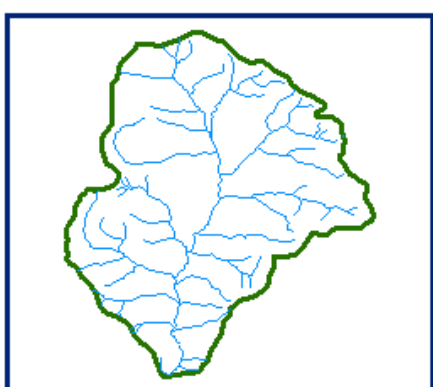
**DATA NOT AVAILABLE**



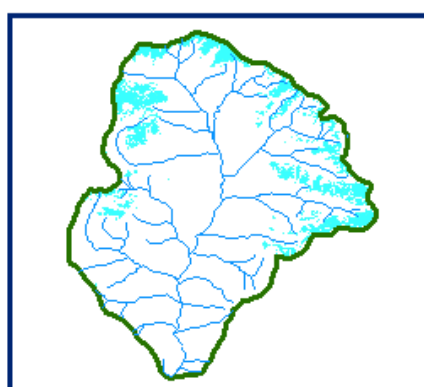
**DATA NOT AVAILABLE**




**20 Oct 2014**



**DATA NOT AVAILABLE**



**30 Oct 2014**

 SNOW

0 26.5 13 19.5 26  
Kilometers

# 10 DAILY SNOW COVER MAP: BEAS BASIN



DATA USED

**01 Oct 2014**

**02 Oct 2014**



DATA USED

**DATA NOT AVAILABLE**



DATA USED

**30 Oct 2014**

 SNOW

0 2.5 5 13 19.5 26  
Kilometers



**SNOW COVER MAP : BEAS BASIN**



**02 Nov 2014**



**DATA NOT AVAILABLE**



**DATA NOT AVAILABLE**



**DATA NOT AVAILABLE**



**DATA NOT AVAILABLE**

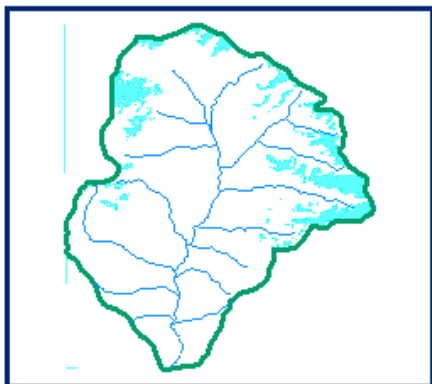


**DATA NOT AVAILABLE**

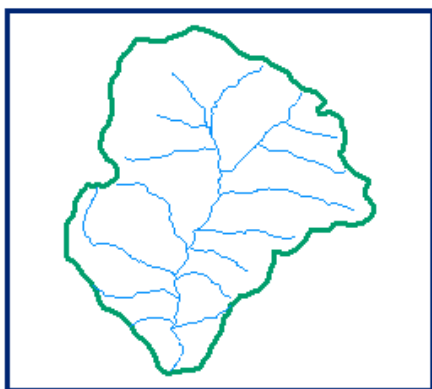
 SNOW

03.57 14 21 28  
Kilometers

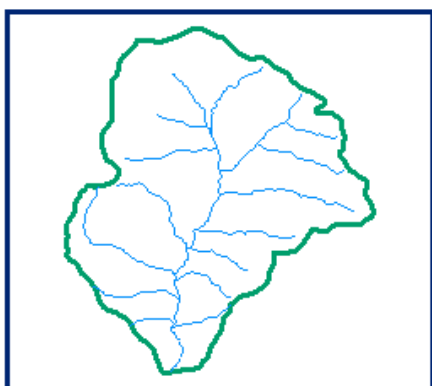
**10 DAILY SNOW COVER MAP: BEAS BASIN**



DATA USED  
**02 Nov 2014**




DATA USED  
**DATA NOT AVAILABLE**

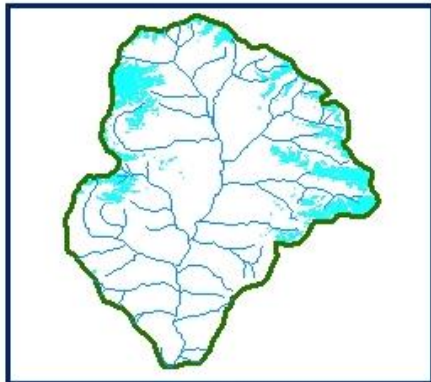


DATA USED  
**DATA NOT AVAILABLE**

 SNOW

0 5 10 20 30 40  
  
Kilometers

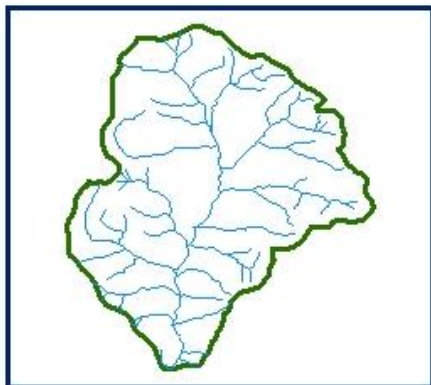
# SNOW COVER MAP : BEAS BASIN



**01 Dec 2014**



**07 Dec 2014**



**DATA NOT AVAILABLE**



**20 Dec 2014**



**DATA NOT AVAILABLE**

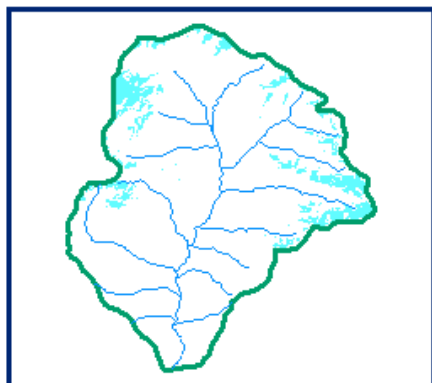


**DATA NOT AVAILABLE**

 SNOW

0 26.5 13 19.5 26  
Kilometers

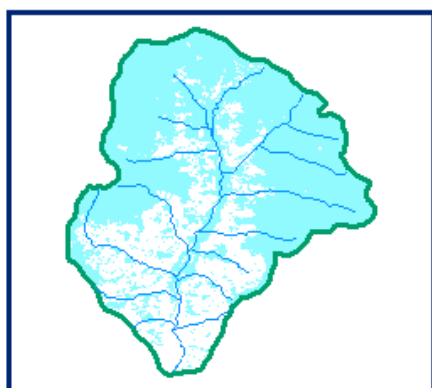
# 10 DAILY SNOW COVER MAP: BEAS BASIN



DATA USED

**01 Dec 2014**

**07 Dec 2014**



DATA USED


**20 Dec 2014**



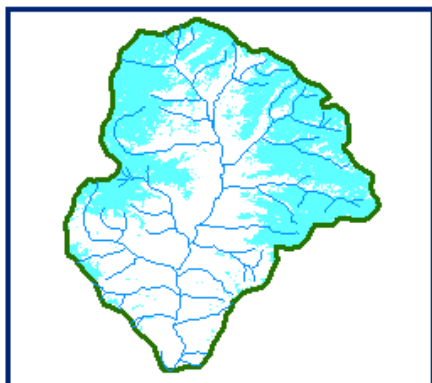
DATA USED

**DATA NOT AVAILABLE**

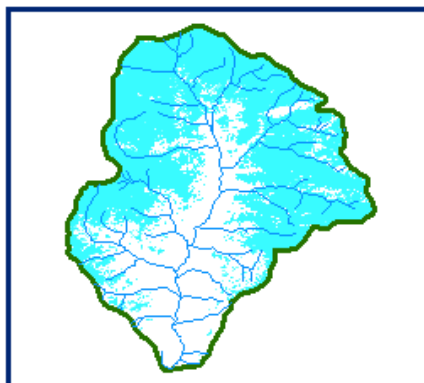
 SNOW

0 5 10 20 30 40  
  
Kilometers

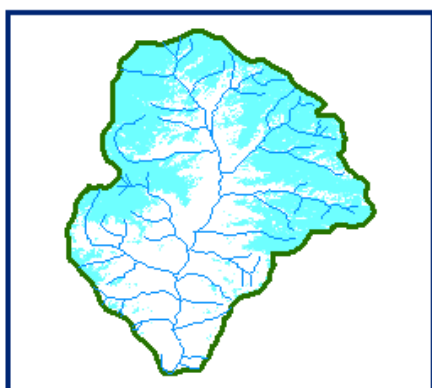
# SNOW COVER MAP : BEAS BASIN



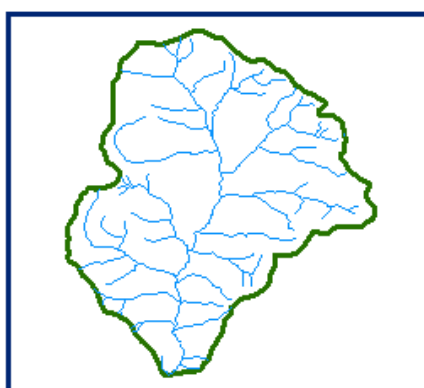
01Jan 2015



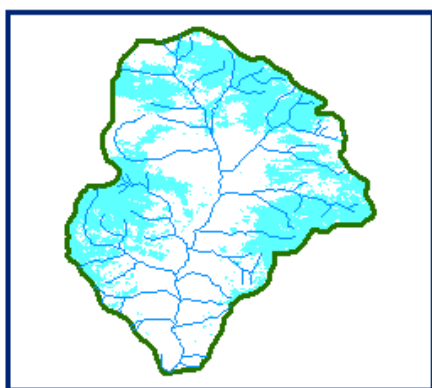
05 Jan 2015



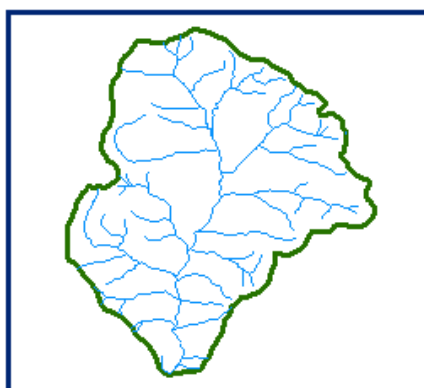
10 Jan 2015




DATA NOT AVAILABLE



24 Jan 2015

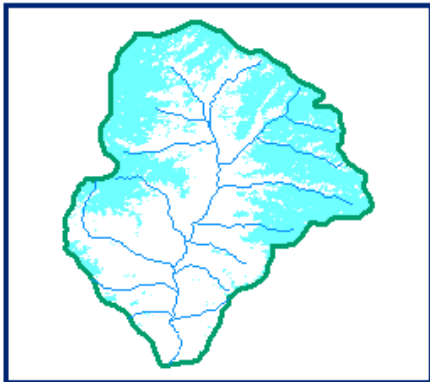


DATA NOT AVAILABLE

 SNOW

0 26.5 13 19.5 26  
Kilometers

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

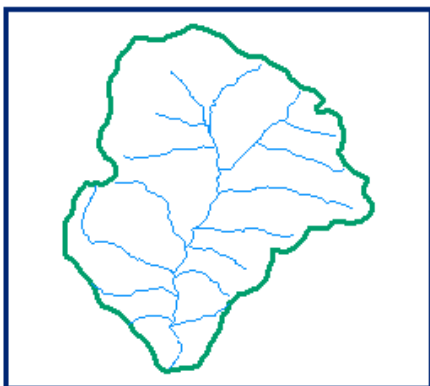


DATA USED

**01 Jan 2015**

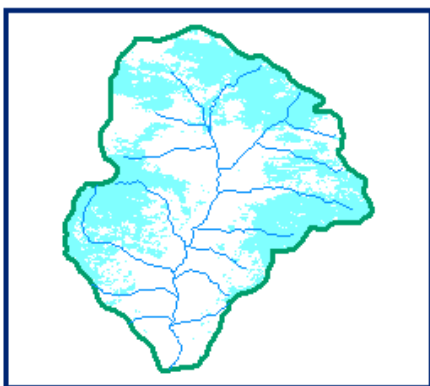
**05 Jan 2015**

**10 Jan 2015**



DATA USED

**DATA NOT AVAILABLE**

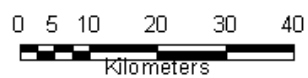


DATA USED

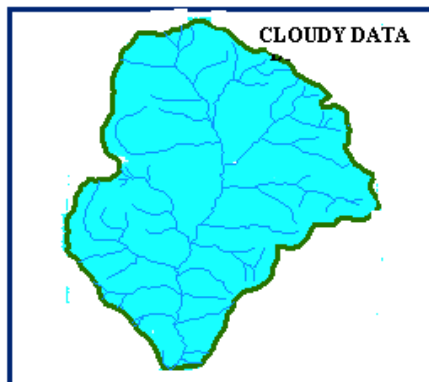
**24 Jan 2015**



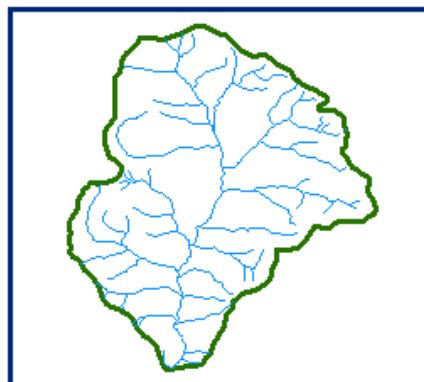
SNOW



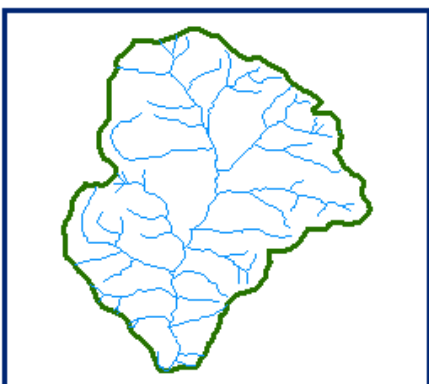
# SNOW COVER MAP : BEAS BASIN



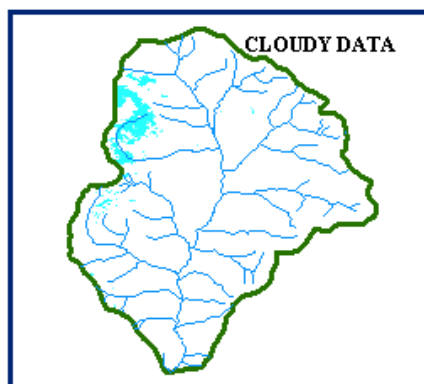
01 Feb 2015



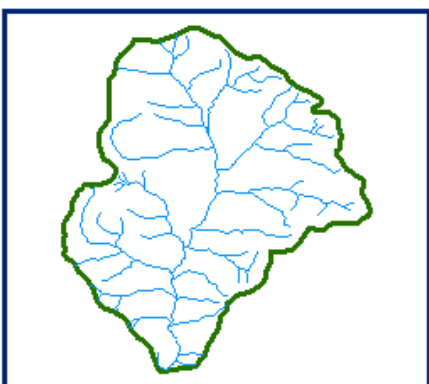
DATA NOT AVAILABLE



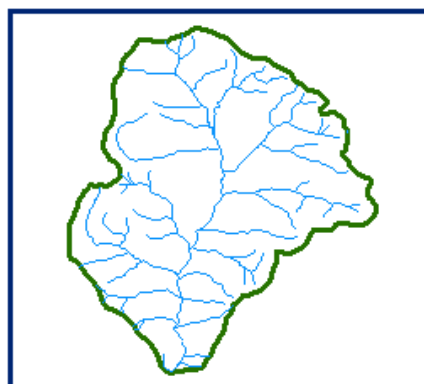
DATA NOT AVAILABLE



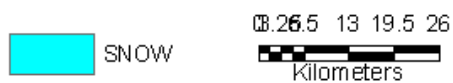
17 Feb 2015



DATA NOT AVAILABLE



DATA NOT AVAILABLE

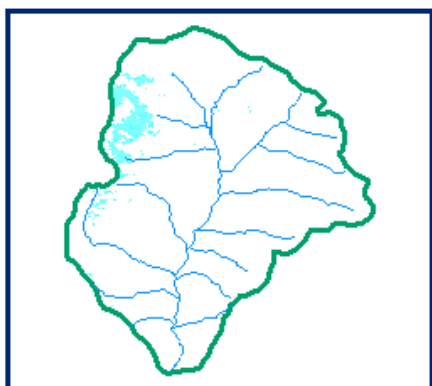


# 10 DAILY SNOW COVER MAP: BEAS BASIN



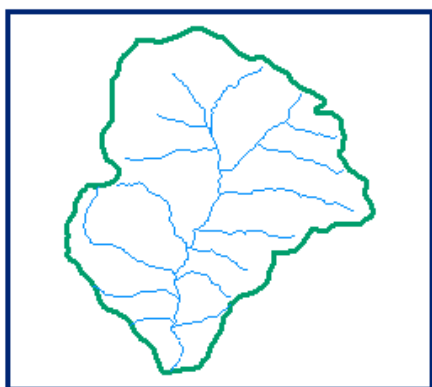
DATA USED

**01 Feb 2015**



DATA USED


**17 Feb 2015**



DATA USED

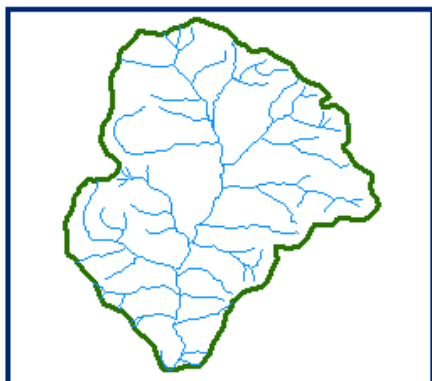
**DATA NOT AVAILABLE**

 SNOW

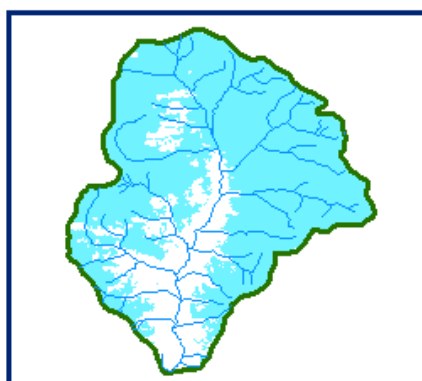
0 5 10 20 30 40  
  
Kilometers



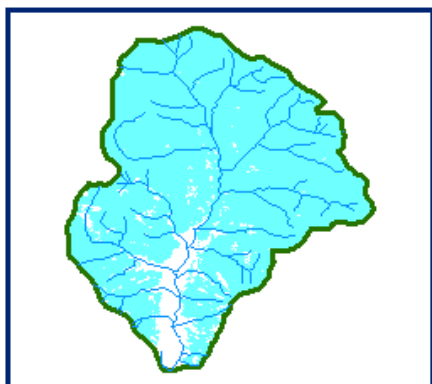
# SNOW COVER MAP : BEAS BASIN



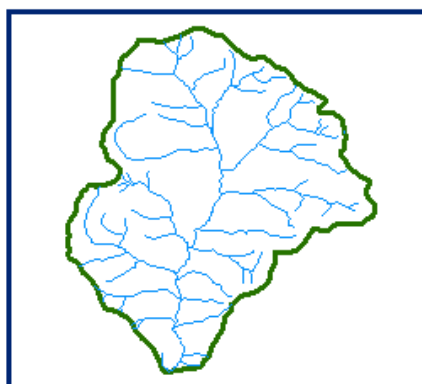
**DATA NOT AVAILABLE**



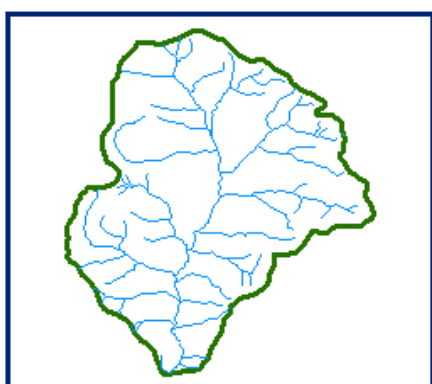
**06 March 2015**



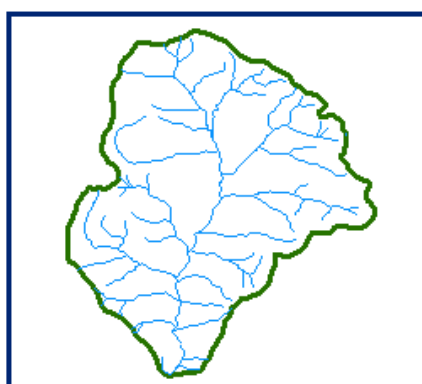
**09 March 2015**




**DATA NOT AVAILABLE**



**DATA NOT AVAILABLE**

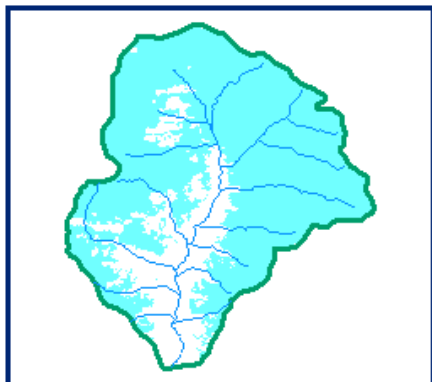


**DATA NOT AVAILABLE**

 SNOW

0 2.5 5 10 15 20 25  
Kilometers

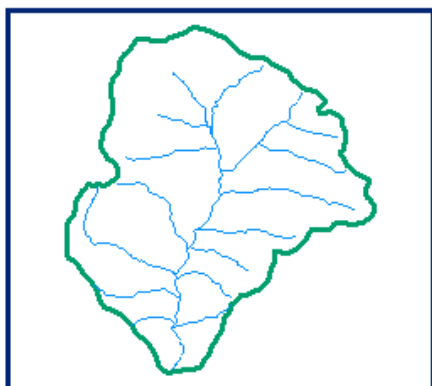
**10 DAILY SNOW COVER MAP: BEAS BASIN**



DATA USED

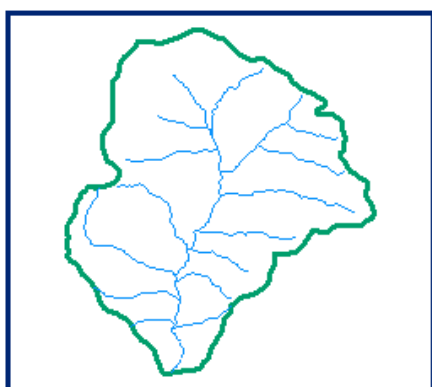
**06 March 2015**

**09 March 2015**



DATA USED


**DATA NOT AVAILABLE**



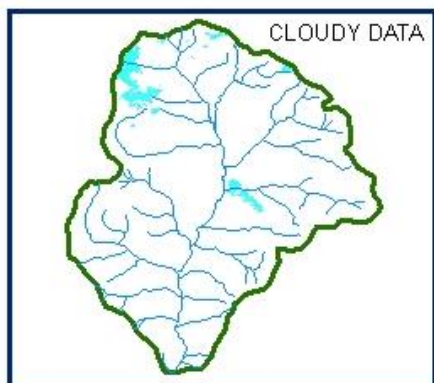
DATA USED

**DATA NOT AVAILABLE**

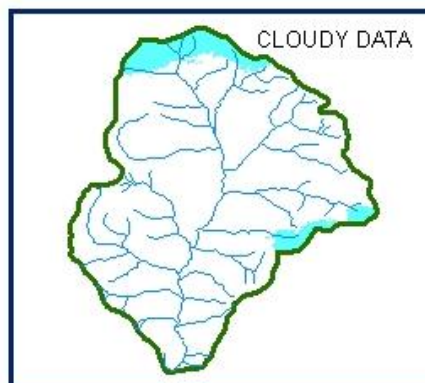
 SNOW

0 5 10 20 30 40  
  
Kilometers

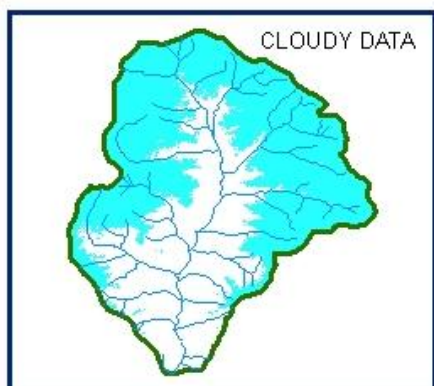
# SNOW COVER MAP : BEAS BASIN



**02 APRIL 2015**



**06 APRIL 2015**



**12 APRIL 2015**



**DATA NOT AVAILABLE**



**DATA NOT AVAILABLE**

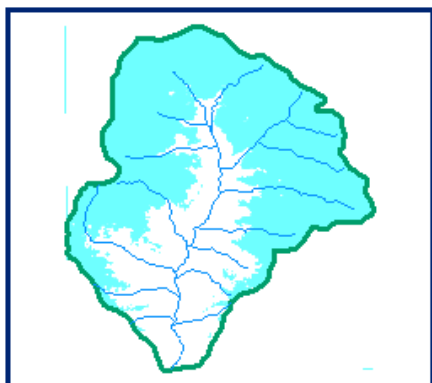


**26 APRIL 2015**

 SNOW

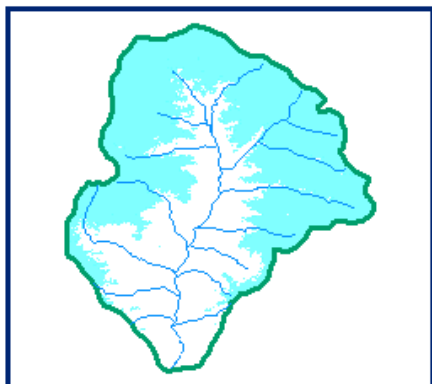
0 26.5 13 19.5 26  
Kilometers

## 10 DAILY SNOW COVER MAP: BEAS BASIN



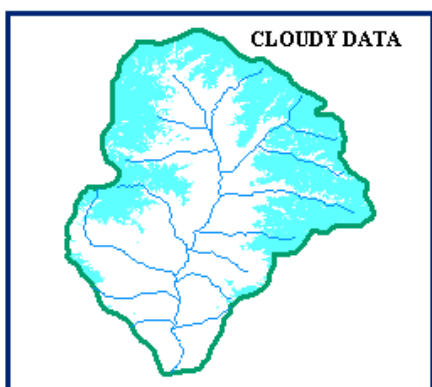
DATA USED

**02 April 2015**  
**04 April 2015**  
**06 April 2015**  
**07 April 2015**




DATA USED

**11 April 2015**  
**12 April 2015**

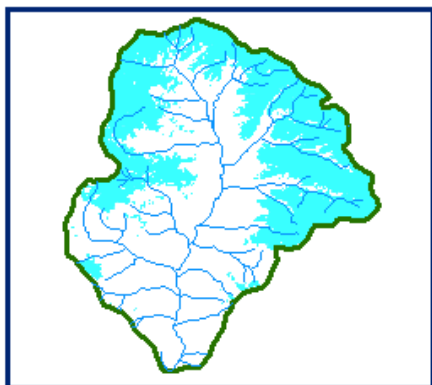


DATA USED  
**26 April 2015**

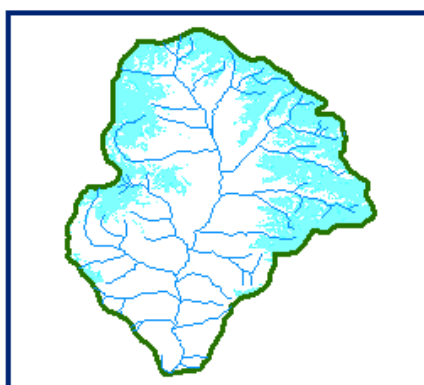
 SNOW

0 5 10 20 30 40  
  
Kilometers

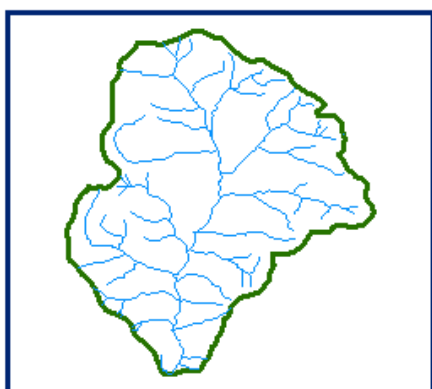
# SNOW COVER MAP : BEAS BASIN



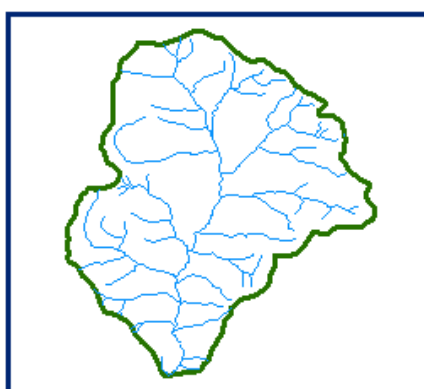
**03 May 2015**



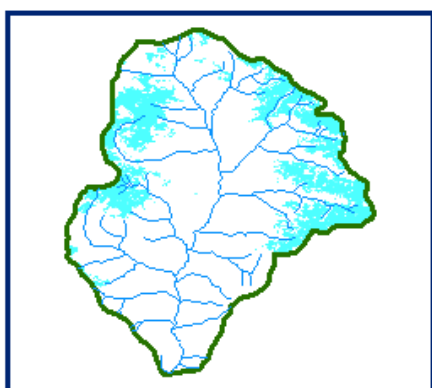
**06 May 2015**



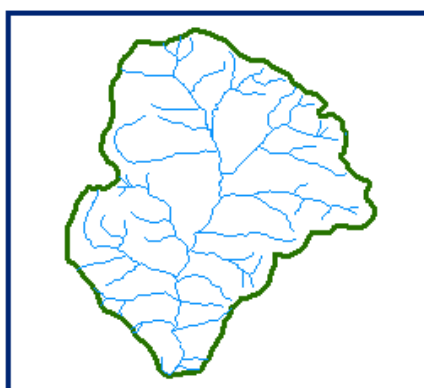
**DATA NOT AVAILABLE**




**DATA NOT AVAILABLE**



**24 May 2015**



**DATA NOT AVAILABLE**

 SNOW

0 26.5 13 19.5 26  
Kilometers

# 10 DAILY SNOW COVER MAP: BEAS BASIN



DATA USED

**03 May 2015**

**06 May 2015**



DATA USED


**DATA NOT AVAILABLE**



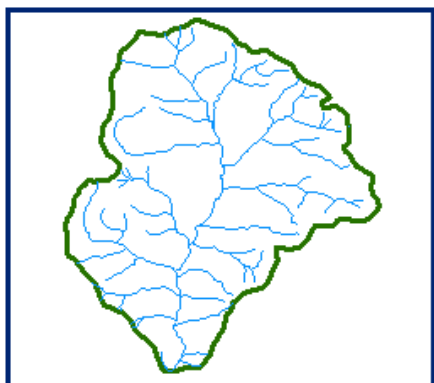
DATA USED

**24 May 2015**

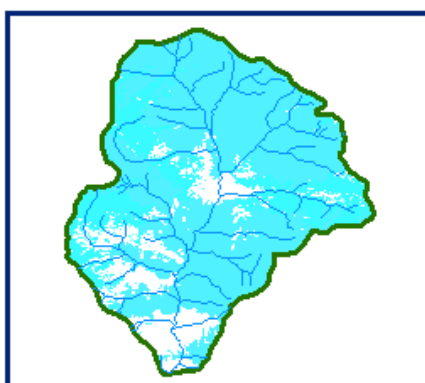
 SNOW

0 8.25 13 19.5 26  
  
Kilometers

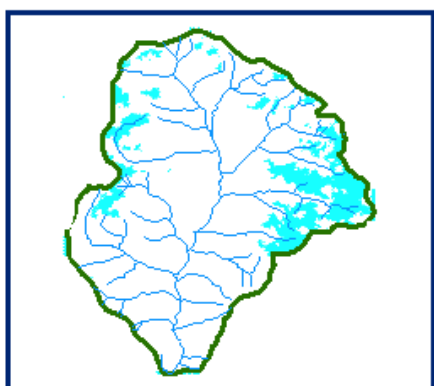
# SNOW COVER MAP : BEAS BASIN



DATA NOT AVAILABLE



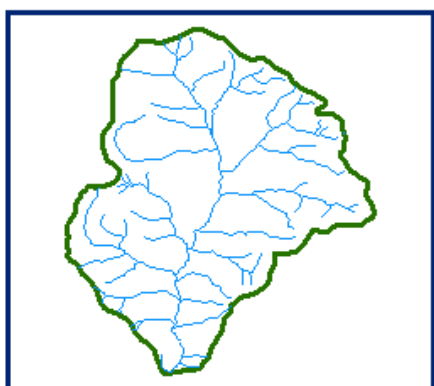
10 June 2015



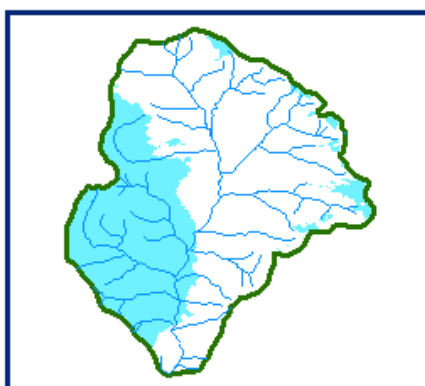
11 June 2015




20 June 2015



DATA NOT AVAILABLE

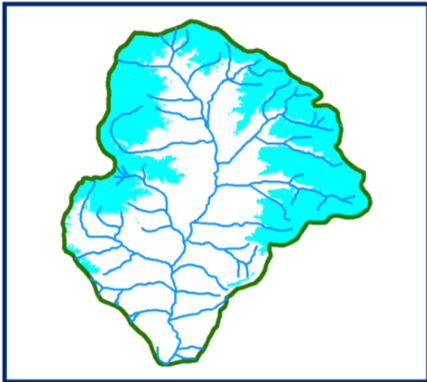


29 June 2015

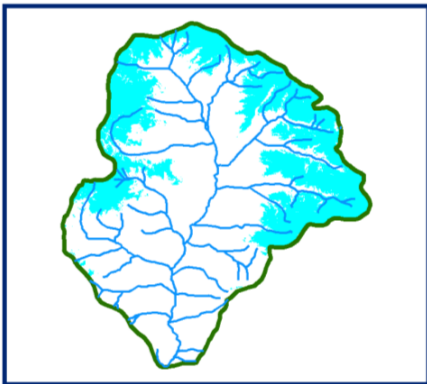
 SNOW

0 26.5 13 19.5 26  
Kilometers

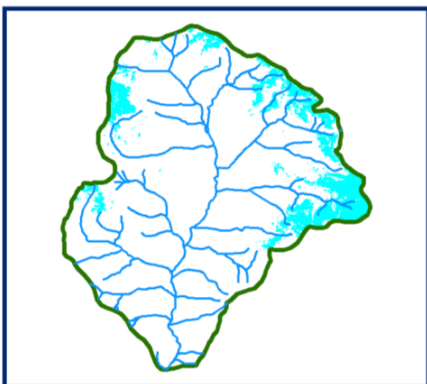
## 10 DAILY SNOW COVER MAP: BEAS BASIN



DATA USED  
**03 June 2014**  
**04 June 2014**  
**06 June 2014**




DATA USED  
**11 June 2014**  
**13 June 2014**  
**16 June 2014**



DATA USED  
**28 June 2014**

 SNOW

03.57 14 21 28  
  
Kilometers