

**NATIONAL WEATHER SERVICE INSTRUCTION 10-931**  
**MARCH 16, 2005**

*Operations and Services*  
*Hydrologic Services Program, NWSPD 10-9*

**NATIONAL OPERATIONAL HYDROLOGIC REMOTE SENSING CENTER**

---

**NOTICE:** This publication is available at: <http://www.nws.noaa.gov/directives/>

---

**OPR:** OS 33 (T. Carroll)

**Certified by:** OS3 (T. Graziano)

**Type of Issuance:** Routine.

---

**SUMMARY OF REVISIONS:** This directive supersedes NWS Instruction 10-931, dated September 17, 2002. The following revisions were made to this instruction:

- 1) In section 2, updated the number of states and Canadian provinces supported by the National Operational Hydrologic Remote Sensing Center (NOHRSC).
- 2) In section 3.1 and in several subsequent sections, discontinued use of the terminology “regional hydrologic services division (HSD)” and replaced it with more generic references to “regional headquarters.”
- 3) In section 3.2, deleted a clause in the first sentence which suggested an unnecessary limitation to the areas shown in NOHRSC map products.
- 4) In section 4.2, identified AWIPS as the system used to distribute NOHRSC products to NWS offices.

Signed

March 16, 2005

---

Dennis H. McCarthy  
Director, Office of Climate,  
Water, and Weather Services

Date

# National Operational Hydrologic Remote Sensing Center

<u>Table of Contents</u>	<u>Page</u>
1. Introduction.....	2
2. Information Sources.....	2
3. Operations.....	3
3.1 Airborne Gamma Radiation Snow Survey Program .....	3
3.2 Satellite Hydrology Program .....	3
3.3 Snow Data Assimilation Program .....	3
3.4 Geographic Information System Support Program .....	4
4. Products and Services .....	4
4.1 Airborne Snow Survey and Satellite Hydrology Products .....	4
4.2 Simulated Snow Cover Products .....	4
4.3 Geographic Information System Support.....	4
5. Internal/External Interactions .....	4
5.1 River Forecast Centers .....	4
5.2 Weather Forecast Offices .....	5
5.3 Office of Climate, Water, and Weather Services .....	5
5.4 Regional Headquarters .....	5
5.5 NOAA Aircraft Operations Center.....	5
5.6 Local, State, Federal, and International Agencies and Commissions .....	5

1. **Introduction.** The National Weather Service (NWS) Office of Climate, Water, and Weather Services maintains a National Operational Hydrologic Remote Sensing Center (NOHRSC). The NOHRSC (a.k.a. “the Center”) is based in Chanhassen, Minnesota and is collocated with the North Central River Forecast Center (RFC) and the Minneapolis/St. Paul Weather Forecast Office (WFO). RFCs and WFOs serving areas where seasonal snow cover is a significant hydrologic variable use the Center’s products when developing a variety of hydrologic products such as spring flood outlooks, water supply outlooks, river and flood forecasts, and reservoir inflow forecasts. Additionally, the Center provides and supports GIS data sets and applications used by the RFCs in generating automated hydrologic forecast basin boundaries. This directive describes the functions of the NOHRSC.

2. **Information Sources.** The NOHRSC maintains an airborne snow survey program which provides airborne snow water equivalent data for portions of 31 states and 8 Canadian provinces. The Center ingests a broad variety of point, gridded, and modeled data sets from various sources within the National Oceanic and Atmospheric Administration (NOAA) including: the National Environmental Satellite, Data, and Information Service (NESDIS), National Centers for Environmental Prediction (NCEP), Forecast Systems Laboratory (FSL), and the NWS Advanced

Weather Interactive Processing System (AWIPS). The NOHRSC maintains a NOAA Polar Orbiting receive station to ingest real-time, advanced very high resolution radiometer (AVHRR) satellite data. A contractor provides full resolution, real-time data to the Center from the Geostationary Operational Environmental Satellite (GOES) East and West satellites. Additionally, the Center receives data sets from other Federal, state, and Canadian cooperators.

3. Operations. The NOHRSC manages the: (1) airborne gamma radiation snow survey program, (2) satellite hydrology program, (3) snow data assimilation program, and (4) geographic information system support program. Remotely sensed and simulated snow cover products provided through these programs support the NWS Hydrologic Services Program.

3.1 Airborne Gamma Radiation Snow Survey Program. The NOHRSC uses low-flying aircraft to make near real-time, airborne surveys of snow water equivalent over large regions of the country where snow is a significant hydrometeorological variable. The Center coordinates the schedule for airborne surveys with the appropriate RFCs and WFOs and provides this schedule to regional headquarters. Cancellations of scheduled survey missions are coordinated with the RFCs and WFOs in coordination with regional headquarters.

WFOs and RFCs may request emergency or non-scheduled airborne snow surveys in coordination with regional headquarters. When possible, these requests should be submitted to the NOHRSC seven to ten days before the required survey date. Meeting requests with shorter lead-time may cause schedule conflicts with other airborne surveys. In evaluating conflicting requests involving two or more areas, the criticality of airborne data to the hydrologic forecasting effort for each area should be evaluated in coordination with the affected offices and regional headquarters.

For field offices located in the same region, conflicting requests for airborne surveys are resolved by the regional headquarters. Conflicting schedule requests between regions should be resolved through coordination and if necessary, are resolved by the Chief, Hydrologic Services Division at the Office of Climate, Water, and Weather Services.

3.2 Satellite Hydrology Program. The satellite hydrology program uses data from polar orbiting and geostationary satellites to map areal extent of snow cover, in near real-time, over the coterminous U.S. and Alaska. Satellite-based products are produced and made available in SHEF and image format in a reasonable time frame after satellite overpass. Regional headquarters provide requirements to the NOHRSC for satellite-based products within the regions. Specific basins where satellite snow cover mapping is needed should be provided to the Center by the RFCs and WFOs.

3.3 Snow Data Assimilation Program. The snow data assimilation program simulates gridded snow water equivalent, and other snow pack properties, using a distributed energy-and-mass-balance snow model. Mesoscale atmospheric model output data are used to force the snow model. All available ground-based, airborne, and satellite-derived snow observations are assimilated into the gridded snow fields to produce a "best" estimate of snow water equivalent, and other snowpack properties.

3.4 Geographic Information System Support Program. The NOHRSC uses high-resolution geographic information system (GIS) databases in carrying out its mission to produce remote sensing products. GIS-based applications and data sets are provided to RFCs and WFOs in support of hydrologic modeling and flash flood operations. The NOHRSC has developed and supports the Integrated Hydrologic Automated Basin Boundary System (IHABBS) and the associated data sets for use by RFCs when generating, updating, modifying, or editing hydrologic basin boundaries. RFCs use IHABBS (or other software) to create GIS basin boundaries and, upon completion, provide a set of the RFC basin boundaries to the NOHRSC where all current RFC basin boundary data sets are available for use in AWIPS, NEXRAD, and other applications.

4. Products and Services. The NOHRSC generates products and data sets in a resolution, format, and time frame required to support the NWS Hydrologic Services Program. Products are distributed, in near real-time, over AWIPS to NWS users and over the Internet to non-NWS users at: <http://www.nohrsc.noaa.gov>.

4.1 Airborne Snow Survey and Satellite Hydrology Products. The airborne snow survey and satellite hydrology programs produce a variety of alphanumeric and image products which are distributed in near real-time, over AWIPS and the Internet, to NWS headquarters and field offices.

4.2 Simulated Snow Cover Products. The snow data assimilation program produces a variety of simulated alphanumeric, image, and gridded products that are distributed in near real-time, via the Internet and over AWIPS, to NWS and external-NWS offices. The *National Snow Analyses* (NSA), generated by the snow data assimilation program, is produced daily and used by RFCs, WFOs, and headquarters offices in support of the NWS Hydrologic Services Program. The NCEP uses the NSA product as input to operational mesoscale atmospheric models.

4.3 Geographic Information System Support. The geographic information system support program provides IHABBS software and database support to RFCs upon request. Additionally, the NOHRSC provides and supports selected GIS data sets for use by headquarters and field personnel, as well as programs such as AWIPS and NEXRAD.

5. Internal/External Interactions. In carrying out its mission, the NOHRSC interacts with NWS and external entities according to guidelines in the following sections.

5.1 River Forecast Centers. The NOHRSC coordinates operational airborne snow survey and satellite data collection activities with appropriate RFCs. These RFCs incorporate NOHRSC-assimilated data into their hydrologic modeling and forecast operations. In interacting with the NOHRSC, RFCs are responsible for: (1) requesting establishment of new flight lines and (2) providing requirements for airborne snow measurements to be taken for existing flight lines. RFCs work with their supported WFOs to ensure that all ground-based snow data collected by WFOs (e.g., snow water equivalent, snow depth, and snow density) are encoded in SHEF and distributed over AWIPS for use by the NOHRSC snow data assimilation program and incorporation into the NSA. The NOHRSC interacts with RFCs to provide IHABBS software and database support upon request.

5.2 Weather Forecast Offices. The NOHRSC coordinates operational airborne snow survey and satellite data collection activities with appropriate WFOs. WFOs incorporate NOHRSC data into products disseminated to the public, mass media, and other customers. Through their supporting RFCs, WFOs request: (1) establishment of new NOHRSC flight lines, and (2) airborne snow measurement missions along specific, existing flight lines. Additionally, WFOs encode all available ground-based snow data (e.g., snow water equivalent, snow depth, and snow density) in SHEF and distribute it over AWIPS.

5.3 Office of Climate, Water, and Weather Services. The Chief of the NOHRSC provides reports on status of the Center to the Chief, Hydrologic Services Division in the Office of Climate, Water, and Weather Services. These status reports include data collection schedules, airborne and satellite data sets, program accomplishments, and future plans.

5.4 Regional Headquarters. Regional headquarters are the receiving point for all NOHRSC requests concerning acquisition of information from WFOs and RFCs. The NOHRSC provides the regional headquarters with information of concern to WFOs and RFCs regarding NOHRSC status and products. Regional headquarters relay information on NOHRSC status and products to the regional director and appropriate WFOs and RFCs and provide guidance to the NOHRSC on airborne and satellite data collection and dissemination activities within the region.

5.5 NOAA Aircraft Operations Center. The NOHRSC coordinates with the NOAA Aircraft Operations Center to ensure that suitable, reliable, snow survey aircraft and NOAA Corps pilots are available to support the airborne snow survey program.

5.6 Local, State, Federal, and International Agencies and Commissions. The NOHRSC maintains contacts with key local, state, and Federal agencies and organizations across the U.S. and Canada. Periodic contacts are required to ensure the appropriate exchange of data, products, and technology between the NOHRSC and these external interests. The NOHRSC represents the NWS and NOAA at various local, state, Federal, and international agencies and commissions on issues associated with the generation and use of satellite and airborne remotely sensed data, the simulation of snow pack properties for the U.S. using an energy-and-mass-balance snow model, and operational products used in the NWS Hydrologic Services Program.

The NOHRSC serves as a liaison between the NWS and Natural Resources Conservation Service (NRCS). The Center maintains a database of reference information on NRCS SNOWpack TELEmetry (SNOTEL) and snow course observation locations. This reference information is made available to WFOs and RFCs upon request.