National Aeronautics and Space Administration

Applying NASA Remote Sensing Capabilities to Improve Water Resources Management in the Rio Grande Basin Through a Better Understanding of Supply and Demand

SWE Analysis Tool (SWEAT)

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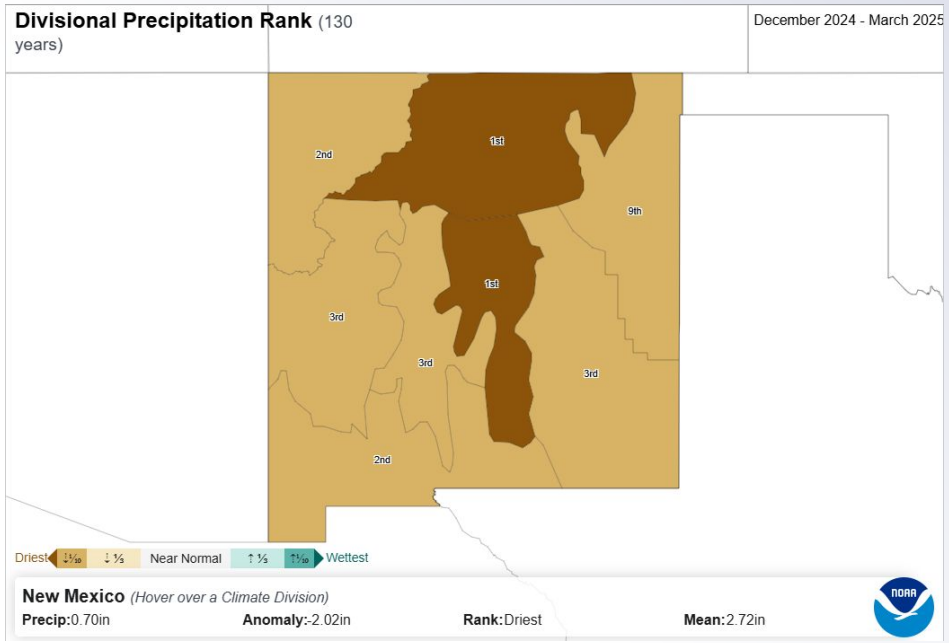
2025 Water Year

- One word to sum it up – abysmal!
- This year has been one of the driest winters on record.
- December 2024 – March 2025 ranked in the top 3 driest winters on record for seven of the eight regions (**driest on record throughout most of the Rio Grande Basin**).
- Basin-wide SWE conditions across the Rio Grande Basin were well below the 1991-2020 median values.
- Currently, the Rio Grande Basin is at approximately 29% median SWE (May 12, 2025).



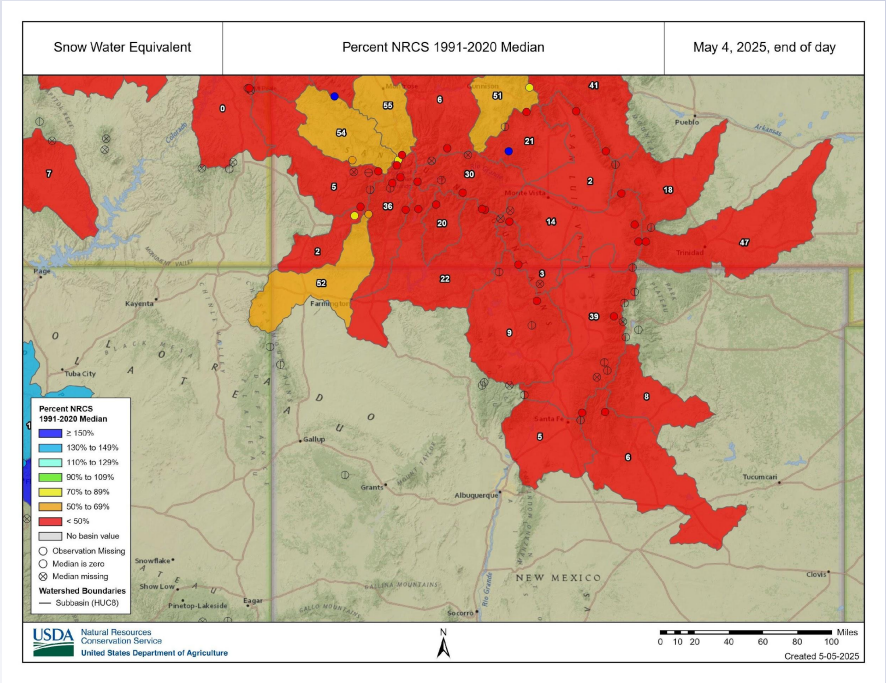


Figure. December 2024 – March 2025 precipitation rankings for New Mexico (left; credit: NOAA) and NRCS basin-wide SWE percent of the 1991-2020 median in New Mexico on May 4, 2025 (right; credit: NRCS)

Introduction

SWE Analysis Tool (SWEAT)

- Our mission is to enhance real-time spatial estimates of snow water equivalent (SWE) across the Rio Grande Basin by developing the SWE Analysis Tool (SWEAT), leveraging existing NASA data products to improve the understanding of SWE volume, distribution, and melt timing.
- Supply scientists and decision-makers with an improved insight into the spatial distribution of SWE.
- Analyze existing SWE products that utilize NASA satellite data to produce an ensemble of near-real-time spatial estimates of SWE.
- SWEAT operations began April 1, 2025.

Partner Impact

- OSE is working closely with INSTAAR to produce SWEAT results
- INSTAAR developed the manual download for SWEAT for the SNODAS gridded SWE product
- Weekly communication that aligns with the transfer of real-time SWE data
- Data goes into a standard report and is sent to internal OSE colleagues and external users

Spatial Estimates of SWE for the Rio Grande Basin

May 6, 2025

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Overview Map – Rio Grande Basin Study Area

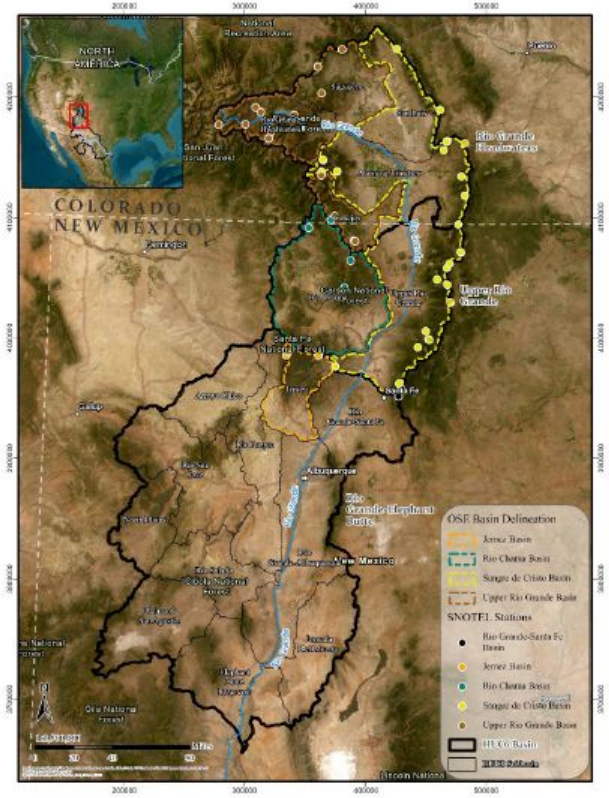


Figure 1. Overview map of the Rio Grande (RG) Basin study area. The Rio Grande Headwaters, Upper Rio Grande, and Rio Grande-Elephant Butte Basins are presented as the standard HUC6 basins. HUC8 groupings (Jemez – orange, Rio Chama – green, Sangre de Cristo – yellow, and Upper Rio Grande – brown) are symbolized.

Project Impact

- SWEAT operations began April 1, 2025
  - Six reports have been released (last on May 6, 2025)
- Currently, SWEAT incorporates the SNODAS gridded SWE data product

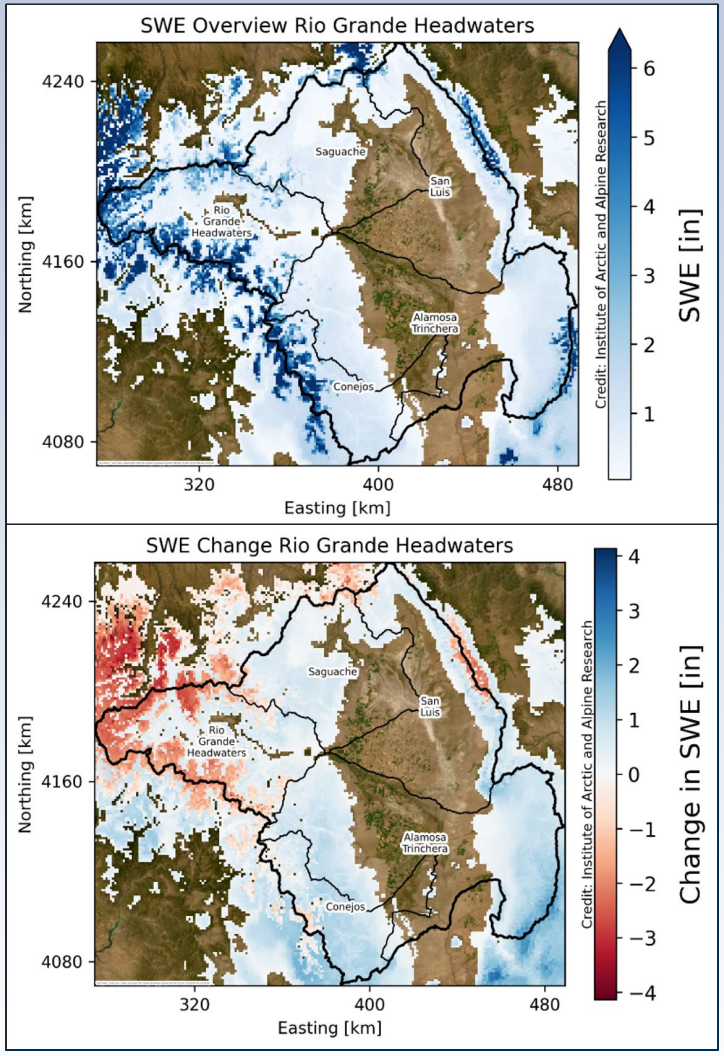
Table 1. Estimated SWE by HUC6 Basin for May 6, 2025. Shown are median SWE (in.), mean SWE (in.), estimated volume (af), and volume change (af) since the last report. Values are separated by HUC8 subbasin and totaled for each HUC6 basin (bold).

HUC6 Basin	HUC8 Subbasin	Median SWE (in.)	Mean SWE (in.)	Estimated Volume (af)	Volume Change since April 29, 2025 (af)
Rio Grande Headwaters	Rio Grande Headwaters	0.6	1.8	132,309	-32,077
	Alamosa-Trinchera	0.3	0.5	72,303	59,819
	San Luis	0.0	0.3	23,459	8,512
	Saguache	0.2	0.4	26,752	12,650
	Conejos	1.1	1.6	66,542	25,303
	Total	**0.4**	**0.8**	**321,364**	**74,207**
Upper Rio Grande	Upper Rio Grande	0.2	0.8	144,174	106,761
	Rio Chama	0.1	0.6	99,131	74,012
	Total	**0.1**	**0.7**	**243,305**	**180,773**
Rio Grande-Elephant Butte	Rio Grande-Santa Fe	0.0	0.0	2,392	2,392
	Jemez	0.0	0.2	8,522	8,522
	Rio Grande-Albuquerque	0.0	0.0	29	29
	Arroyo Chico	0.0	0.0	7	7
	North Plains	0.0	0.0	4	4
	Rio San Jose	0.0	0.0	259	259
	Plains of San Agustin	0.0	0.0	170	170
	Rio Salado	0.0	0.0	0	0
	Jornada Del Muerto	0.0	0.0	0	0
	Elephant Butte Reservoir	0.0	0.0	0	0
	Rio Puerco	0.0	0.0	2,003	2,003
	Total	**0.0**	**0.0**	**13,386**	**13,386**

Table 2. Estimated SWE by Specified Subbasin Groupings for May 6, 2025. Shown are median SWE (in.), mean SWE (in.), estimated volume (af), and volume change (af) since the last report. Values are separated by HUC8 subbasin and totaled for each specified subbasin grouping (bold).

Subbasin Grouping	HUC8 Subbasin	Median SWE (in.)	Mean SWE (in.)	Estimated Volume (af)	Volume Change since April 29, 2025 (af)
Upper Rio Grande	Rio Grande Headwaters	0.6	1.8	132,309	-32,077
	Saguache	0.2	0.4	26,752	12,650
	Conejos	1.1	1.6	66,542	25,303
	Total	**0.5**	**1.2**	**225,603**	**5,876**
Sangre de Cristo	San Luis	0.0	0.3	23,459	8,512
	Alamosa-Trinchera	0.3	0.5	72,303	59,819
	Upper Rio Grande	0.2	0.8	144,174	106,761
	Total	**0.1**	**0.6**	**239,936**	**175,092**
Rio Chama		**0.1**	**0.6**	**99,131**	**74,012**
Jemez		**0.0**	**0.2**	**8,522**	**8,522**

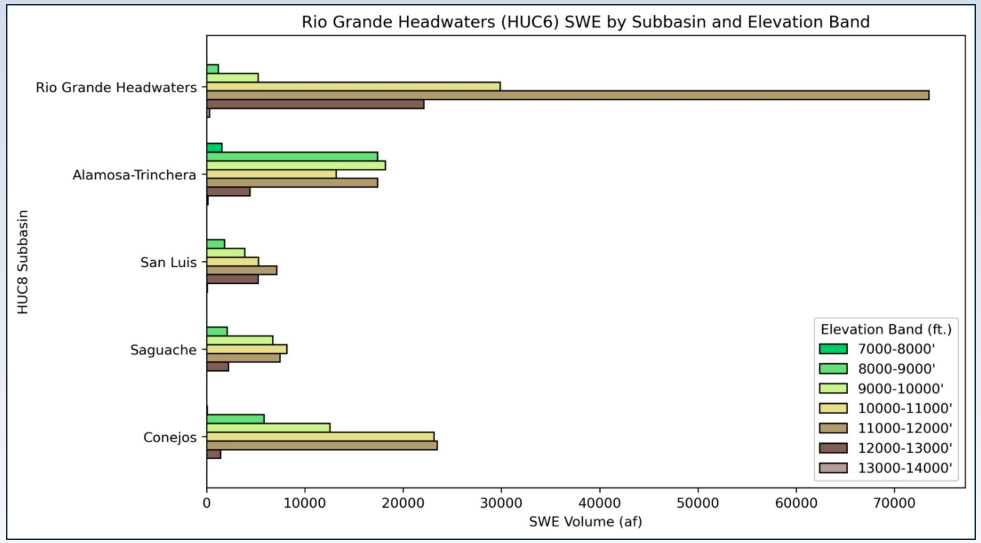
Project Visuals



Estimated SWE (in.) for May 6, 2025 (top) and change in SWE (in.) since the last report date (bottom) for the Rio Grande Headwaters

Table 3. Estimated SWE by HUC6 Basin and Elevation Band for May 6, 2025. Shown are median SWE (in.), mean SWE (in.), estimated volume (af), and volume change (af) since the last report. Values are separated by elevation band (1000 ft. increments) and HUC8 subbasin.

HUC6 Basin	HUC8 Subbasin	Elevation Band (ft.)	Median SWE (in.)	Mean SWE (in.)	Estimated Volume (af)	Volume Change since April 29, 2025 (af)
	Rio Grande Headwaters	7000-8000'	0.0	0.0	11	11
		8000-9000'	0.1	0.1	1,205	1,205
		9000-10000'	0.4	0.4	5,253	4,504
		10000-11000'	0.6	1.4	29,895	-894
		11000-12000'	3.2	3.4	73,511	-26,461
		12000-13000'	3.6	3.7	22,128	-10,311
		13000-14000'	2.9	2.5	306	-130



SWE volume (af) by subbasin and elevation band for the Rio Grande Headwaters

Conclusion

- The purpose of SWEAT is to provide real-time spatial SWE estimations to understand the volume, distribution, and melt timing across the Rio Grande Basin.
- SWEAT is currently operating using the SNODAS data product.
- We have released 6 spatial SWE estimate reports for the Rio Grande Basin for the 2025 water year (every Tuesday beginning on April 1, 2025).
- We will be focusing on upgrades to SWEAT (including incorporating more SWE data products) this summer.
- All reports, data, figures, and tables will be hosted on a repository (most likely on the NM OSE website).

Closing Remarks and Questions

- Thank you to the WWAO team and our partners at INSTAAR
- If you would like to be added to the list to receive SWEAT reports, please reach out
- Contact Info:

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