

**NOAA National Severe Storms Laboratory**

**Science Review**

**November 16-19, 2021**

**NOAA National Severe Storms Laboratory Response to Panel  
Review  
Recommendations**

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Submitted by:

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## Introduction

The review of the National Severe Storm Laboratory (NSSL) occurred virtually from November 15-19, 2021. This review focused on the research of NSSL over the last six years. The purpose of the review is to evaluate the quality, relevance, and performance of research conducted by NOAA NSSL. Such reviews ensure that NSSL's research is linked to strategic plans, and priorities; is of high quality; and is conducted efficiently and effectively. This response addresses the compilation and synthesis of individual panel member comments. The three activity areas of the review were: 1) Observations and Understanding; 2) Engagement of Customers, Stakeholders, and Users; and 3) Numerical Modeling and Forecast/Warning Applications. The NSSL lab review website is online at [https://www.nssl.noaa.gov/about/events/review2021/#home\\_tab](https://www.nssl.noaa.gov/about/events/review2021/#home_tab).

*In this report, each actionable recommendation provided by the Science Review Panel is italicized and followed by an NSSL response. A table summarizing the actions with timelines for completion is included below. Detailed responses can be found in the Appendix.*

## Recommendations, Responses, and Action Plans

FMC Science Review Action Sheet				
Recommendation	Action	Champion	Target start & Completion Dates	Status/Notes
Lab-wide; Relevant to the Entire Laboratory				
<p><i>L1. The Laboratory should develop a strategy for prioritization of projects and for cross collaboration and for the various teams within NSSL that can help break down silos and encourage further collaboration and integration of research initiatives and can also provide an opportunity for more enhanced external research partners, stakeholder, and user engagement.</i></p>	<p>NSSL will address this recommendation using a variety of approaches chosen to inclusively engage the full diversity of positions and individuals within our workforce. Milestones include:</p> <ul style="list-style-type: none"> <li>● Creation of individual web profiles to more easily engage in cross-collaboration</li> <li>● Conduct strategic and implementation planning efforts with staff to help create strategic team charters for NSSL teams and strategic/implementation plans for the lab as a whole.</li> <li>● Conduct NSSL Science Days for cross-division sharing of research</li> <li>● Conduct annual NSSL Leadership Advance/Retreat and laboratory wide Advance/Retreat</li> <li>● Continue interactions with external research partners, stakeholders, and users via experiments within the Hazardous Weather Testbed</li> </ul>	<p>DaNa Carlis</p>	<p>FY24 Q1</p> <p>FY24 Q4</p> <p>FY23 Q4</p> <p>FY24 Q1</p> <p>Ongoing</p>	<p>Completed</p> <p>Completed</p> <p>Completed</p> <p>Completed</p> <p>HWT collaborators in FY24 experiments:</p> <ul style="list-style-type: none"> <li>- NWS Radar Operations Center</li> <li>- NWS Warning Decision Training Division</li> <li>- OAR Global Systems Laboratory</li> <li>- NESDIS JPSS/GOES-R Proving Ground</li> <li>- NCAR</li> </ul>

			<ul style="list-style-type: none"><li>- NOAA Geophysical Fluid Dynamics Laboratory</li><li>- NWS/NCEP Environmental Modeling Center</li><li>- OU Institute for Public Policy Research and Analysis</li></ul> <p>Anthony Lyza - NOAA</p> <p>Federal can you add a list of external research partners that we've worked with in the HWT. I'm thinking of Universities, other NOAA entities (i.e. NESDIS) that we've hosted experiments for in the HWT.</p>
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<p><i>L2. NSSL should add social scientists to the Federal staff as well as the CIWRO. This will enable better long-term research and development planning and improved program continuity.</i></p>	<p>NSSL will hire a federal research scientist to lead the social science program at the lab. This scientist will have an interdisciplinary background and be a recognized expert on the integration of social and behavioral science into weather research.</p> <p>As part of the strategic planning discussed in L1, NSSL is determining the optimum balance of federal and CIWRO staffing needs for the social science program.</p>	<p>Alan Gerard</p>	<p>FY23 Q4</p> <p>FY24 Q2</p>	<p>Completed</p> <p>Completed. As of the end of FY24, NSSL is completing a reorg. As part of this reorg process, NSSL and CI leads are working together to develop a strategy and structure for the SBES programs that will leverage the unique capacity of both NSSL and CI as well as other key partners such as the OU Institute for Public Policy Research (IPPRA), and target optimum staffing for NSSL and CI.</p>
<p><i>L3. The FOFS mini-division should have a staff size commensurate with its responsibility to “support the entire Lab’s observational needs and develop and deploy innovative technologies”. Development and implementation of formal safety plans and training should be a high priority.</i></p>	<p>A review of future/planned field work will be completed and additional staff resources (Federal, CI, or contract) will be made available as needed. Commitments to future field projects will be reviewed annually to ensure staffing resources are available. The number of staff days in the field has increased with the number of NSSL staff and the increase in the number of instrument platforms since the previous NSSL Laboratory Review. And there have been a number of time adjacent multi-year interagency coordinated field programs that have stressed the capability of the FOFS staff.</p> <p>NSSL will implement a policy of required safety training for all field programs.</p>	<p>Erik Rasmussen</p>	<p>FY25 Q4</p> <p>FY23 Q2</p>	<p>Completed. Through the NSSL Reorg implemented, FOFS has been absorbed into a new branch focused on radar engineering and observations. Field observing now has 6 federal and 7 CI staff members within that team.</p> <p>Completed. The training consists of view-ahead training videos regarding interpersonal safety issues, as well as a 2-hour in-person session on physical</p>













	NSSL will hire a Data Manager to increase the accessibility of our data sets and other tools with the broader community.		FY24 Q2	Completed. Hired data manager Q1FY24
<i>U2. Recommend that the successes of the VORTEX-SE program and the paradigm of basic research – operations – social impacts can be duplicated for other phenomena and hazards across the nation.</i>	<p>NSSL will work on implementing a communication strategy for VORTEX-SE that shares the paradigm of basic research-operations-social impacts more broadly across NOAA. All research plans will include a transition plan (if RL is high enough) and will be shared within the NOAA Research and Development Database (NRDD).</p> <p>With the establishment of VORTEX-USA by Congress, NSSL is working to expand the successful VORTEX-SE paradigm to the rest of the country.</p>	Alan Gerard	FY25 Q1  FY25 Q4	NSSL established a VORTEX Federal Working Group consisting of scientists from OAR and the NWS. This includes members from all three NWS Regions east of the Continental Divide, as well as scientists with expertise in physical and social science and specific operational challenges (e.g., tropical cyclone induced tornadoes).
<i>U3. NSSL (and NOAA) should consider taking social science integration with atmospheric/earth system science to the next level by supporting routine data collection for social science. This support would need to be for the data collection itself (technology and staff) and for full-time staff to support and analyze these data. As was pointed out by several staff, our current understanding of human responses is limited to the most extreme events, which is possibly skewing the findings in significant ways.</i>	NSSL will continue to collaborate with other entities funded by NOAA to collect routine social science data (e.g., OU Institute for Public Policy Research and Analysis) and have/are developing tools to support data collection where gaps in knowledge exist. Consistent NOAA funding for projects like this would improve our capabilities in this area.	Alan Gerard	Ongoing	<p><i>See response in L2 for discussion of social science related staffing</i></p> <p>Quick response severe weather SBS data collection grants in partnership with the University of Colorado National Hazards Center</p> <p>Winter weather impact citizen science through the OU/NSSL mPING app in partnership with the Weather Prediction Center</p>

				Tornado Tales online survey, post-event interviews, and NWS damage assessment tool questionnaire.
<i>U4. Recommend a greater focus on connections between severe storms and climate change within the research portfolio.</i>	NSSL will continue to conduct, explore, and identify collaborative funding opportunities on connections between severe storms and climate change with internal and external stakeholders.	Pam Heinselman	Ongoing	Supported attendance at the North American Multi-Model Ensemble Workshop. (FY23 Q4)
<i>U5. It is recommended that an internal and/or external review of the Phased Array Radar activity be conducted. This should include a more holistic assessment of what radar data will be most beneficial to forecasting. For example, do faster scans provide more value than increased low-level coverage?</i>	<p>NSSL scientists will work with NWS forecasters and other NWS stakeholders to conduct HWT experiments applying polarimetric phased array radar data from the Advanced Technology Demonstrator (ATD) that will investigate how increased volumetric scan rates and other new methods (e.g., spoiled beams) will improve NWS warning decision support.</p> <p>NSSL will work with the NWS to develop and analyze PAR use cases in support of the NWS' evaluation of the expected benefits of more rapid volumetric updates (~1-1.5 minutes vs. 4-5 minutes for WSR-88D) and expanded low-level coverage.</p> <p>External review of NSSL programs (i.e., PAR) was completed by the 2021 NSSL Lab Review Committee and internally our programs are overseen by the Program Management Council (PMC), NOAA Executive Oversight Boards, and the OAR Assistant Administrator and Deputy Undersecretary for Operations. .</p>	Larry Hopper	<p>Ongoing; First experiment planned for FY24 Q2</p> <p>Ongoing; pending approval of PAR Transition Plan in FY23 Q4</p> <p>FY21 Q4</p>	<p>First PAR HWT experiment during FY24 Q4; report on first PAR HWT to be completed in FY25 Q1.</p> <p>Use cases have been created and will be tested throughout HWT in FY24 Q4 and beyond.</p> <p>Completed</p>
<i>U6. Recommend better communication of current progress and issues concerning the PAR effort should be initiated with key stakeholders.</i>	<p>NSSL will update PAR and PAR associated NSSL websites.</p> <p>NSSL will work with OAR and NWS on PAR communications and accomplishments. In addition, NSSL scientists and engineers will continue to present research and engineering findings at both scientific and engineering conferences.</p>	Larry Hopper	<p>FY24 Q2</p> <p>Ongoing</p>	<p>PAR Reports completed and posted to NSSL website:</p> <p>Approved by Congress but not publicly available:</p> <p>Feasibility and Capability of a Rotating Phased Array Radar</p> <p>Approved by Congress and publicly available:</p> <p>Phased Array Radar Report to Congress: Weather Radar</p>

				<p>Follow-on Plan</p> <p>An Update on Polarimetric Calibration for the ATD (FY23 Q4)</p> <p>2023 Data Collection with the NSSL ATD (FY24 Q2)</p> <p>PAR R&amp;D Plan completed and socialized with NWS, OAR HQ, and NOAA AA in FY24 Q2.</p>
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	Work with NWS to develop a PAR Transition Plan that identifies key technical questions that need to be answered prior to transition.		FY23 Q4	Completed
<i>U7. In the near term, NSSL should consider performing research on other possibilities for increasing radar scan timing, especially in areas where radar coverage by NEXRAD is poor. Continue to research the use of gap-filling radars for severe weather operations, either using a network of fixed radars in high-risk areas, or through the use of deployable C- or X-Band radars based on convective outlooks.</i>	NSSL will continue to perform research for increasing radar scan timing, especially in areas where radar coverage is poor. We will continue to research the use of supplemental radars for severe weather operations.	Larry Hopper / Alan Gerard / Kurt Hondl	FY22 Q3	<p>Completed CRADA with Climavision</p> <p>NSSL uses research mobile radars as well as private-public partnerships to conduct research on areas of lesser coverage by the current operational network.</p> <p>NSSL engaged with NWS stakeholders to discuss how supplemental radar data may be used in operations particularly with respect to MRMS. NSSL used its mobile X-band radar (NOXP) which collected data during the PERiLS field campaign to investigate how supplemental radars would work in MRMS. In addition, NSSL explored the integration of radars of opportunity into MRMS evaluating them against our data quality standards.</p> <p>NSSL plans to procure a pair of mobile C- and X-band radars (using BIL funds) to track and better understand wildfire</p>

				<p>smoke plumes and observations of precipitation and convection that would lead to a better understanding of what triggers fires (via lightning), affects wildland fire spread (via convective outflow boundaries), and the resulting flooding events and debris flows in burn scar regions.</p>
<p>Engagement of Customers, Stakeholders, and Users</p>				
<p><i>E1. NSSL should ensure they have quality assurance procedures for their research products for lab and CIWRO projects. End user feedback should be gathered and reviewed by management. Problems should be identified and remedied based on that feedback.</i></p>	<p>NSSL will continue to use robust R&amp;D processes for research products and projects. NSSL will continue to review and incorporate end user feedback.</p>	<p>DaNa Carlis</p>		<p>Ongoing. NSSL collects information from end users through the HWT and regular meetings with end users like the NWS.</p>

<p><i>E2. It is recommended that NSSL consider mechanisms to enhance and improve the level and methods of communication with stakeholders. There was a common theme in the survey responses and in both meetings with stakeholders that the process and frequency of communications of new developments, projects, research outcomes (including social science research) and plans needs to be improved. Development of a well-defined strategy for both interaction and communication with these groups would be beneficial, not only for NSSL, but in providing these groups with a stronger sense of inclusion and collaboration throughout the process. Even though, as was explained during the review process, feedback from stakeholders is only obtained for the purpose of the five-year review, it is recommended that NSSL conduct one additional survey or provide another formal opportunity for feedback between the formal Lab reviews to maintain better communication with all stakeholder groups.</i></p>	<p>NSSL will invest in communication strategy, engagement, planning, and resourcing to increase the frequency of information sharing on NSSL research and development.</p>	<p>Kurt Hondl</p>	<p>FY24 Q3</p>	<p>FY24: NSSL has increased social media presence and web stories.</p> <p>NSSL has initiated a newsletter for engagement with NOAA and other agency leadership.</p>
<p><i>E3. It is recommended that the Lab develop a well-defined engagement strategy for better communication, collaboration, and integration across agencies and the broader Weather, Water, Climate enterprise. NSSL might consider expanding on the existing strategy for the engagement of the emergency management community by forming an advisory committee (it was not clear if one was in the process of being developed or already exists with the new hire in BIU) that broadens the participation and deepens the inclusion of the emergency management expertise. The new partnerships through Vortex-SE will certainly aid in this effort. This is important given the complexity of the emergency management community in terms of their diverse needs based on the geographic regions and the communities they serve.</i></p>	<p>NSSL will continue to actively engage the emergency management community through our recent emergency management hire; however, a formal advisory committee is not feasible due to restrictions associated with the Federal Advisory Committee Act (FACA). We will actively seek new partnerships across the Weather, Water, and Climate enterprise.</p>	<p>Pam Heinselman/Alan Gerard</p>	<p>Ongoing</p>	<p>See response to E2.</p>



<p><i>E4. NSSL should continue to find ways to innovate and expand engagement in the ongoing pandemic and in the future post-COVID workspace. This includes facilitating virtual, in-person, and hybrid experiments, especially including participations from geographically underrepresented areas and outside of CONUS and creating regional breakout groups for more in-depth and nuanced feedback.</i></p>	<p>NSSL will continue to strategically execute HWT hybrid and in-person experiments that include diverse perspectives and experiences.</p>	<p>Pam Heinselman/Alan Gerard</p>	<p>Ongoing</p>	<p>Ran Hybrid Spring Forecasting Experiment in May 2024</p> <p>NSSL has run several HWT experiments in the last 18 months that have involved both in-person, remote and hybrid approaches.</p>
<p><i>E5. Recommend continuing expansion of open data/open science priorities by identifying datasets of value and increasing usability and accessibility of these datasets for the GIS community for broad societal benefits.</i></p>	<p>NSSL will hire a Data Manager/Archivist that will help continue the expansion of open data/open science priorities for datasets of value.</p> <p>NSSL will interface with OAR and other NOAA data groups to enhance our open data/open science abilities.</p> <p>NSSL scientists will continue to serve on the OAR Data Management working group that helps inform NSSL of high-level issues with data management and best practices.</p> <p>As DOI solutions become available, NSSL will increasingly use frameworks such as NOAA GeoPlatform to increase the GIS availability of our data sets.</p>	<p>Kurt Hondl/Erik Rasmussen</p>	<p>FY24 Q1</p> <p>Ongoing</p> <p>FY22 Q4</p> <p>TBD; dependent on DOI solutions becoming available</p>	<p>FY24: Data Manager was hired.</p> <p>Completed</p>
<p><b>Numerical Modeling and Forecast / Warning Applications</b></p>				
<p><i>N1. The strong integration between models and observations in verification, DA, and plans to merge PHI with WoFS is commendable. Prioritization of this integration across all areas (including model development) is recommended.</i></p>	<p>NSSL will foster interactions between scientists and across divisions to identify and develop means for integrating methodologies and technologies across the lab.</p>	<p>Pam Heinselman</p>	<p>Ongoing</p>	<p>OSEs using UAS observations collected during field campaigns are in progress.</p>

<p><i>N2. It is great to see the development of sub-hourly HCA products. Coordination with modeling centers for sub-hourly model output to test possible improvements of these sub-hourly products is recommended. It may not yield sufficiently significant (and verified!) variation in environmental parameters to impact HCA in a substantive way, but valuable to test. Additionally, such coordination between observation and model teams is itself valuable.</i></p>	<p>NSSL disagrees with this recommendation as directing the use of HCA products within NWS modeling centers is outside the scope of our mission.</p>	<p>Pam Heinselman</p>		<p>No action for NSSL</p>
<p><i>N3. MRMS products are essential to NWS operations and of significant value to researchers. MRMS should prioritize level 2 radial winds. This is a high priority for DA applications. This was highlighted by one of the stakeholders who indicated that "current QC is dated."</i></p>	<p>NSSL will continue researching and developing MRMS products (i.e. level 2 radial winds) that would modernize the current operational QC methods, with test products being delivered internally and to external stakeholders by the end of 2023 for evaluation. However, operational requirements by the NWS stakeholders will be needed to transition these radial wind products for DA to the NWS.</p>	<p>Pam Heinselman/Alan Gerard</p>	<p>FY23 Q4</p>	<p>An initial version of the merged velocity product is running on vMRMS and being evaluated internally for quality and potential enhancements.</p>
<p><i>N4. Development of a clear strategy to transition products more efficiently to end-users in the broadcast-communication sector is recommended. This needs clarity because some of this process seems rather ad-hoc.</i></p>	<p>NSSL will continue the active engagement and co-production with end users such as the broadcast meteorology community in the research-to-operations-to research paradigm.</p> <p>NSSL will continue to develop transition plans and follow the NOAA Administrative Order on Transitions (216-105B).</p>	<p>Alan Gerard</p>	<p>Ongoing</p>	<p>NSSL has worked with CIWRO to make a permanent hire of a research scientist with a background and focus on broadcast meteorology to ensure this R2O pathway is prioritized.</p>
<p>Review Conduct, for Use in Future Laboratory Reviews</p>				

<p><i>R1. Recommend including lists of publications, patents, number/percentage of products successfully transitioned to operations, citations, awards, and other indicators of outputs, applications and recognitions, to enable better assessment of the full range and quality of research. These materials should be grouped per review area or perhaps at a lower level (e.g., linked to each presentation). They can be touched on in the presentations to emphasize a point, but it may be easier to provide these details and statistics in a written report. It would be helpful if the list of publications could identify research and work with external partners, stakeholders, and users, to better demonstrate the nature and extent of the collaborative and integrated partnerships. This will enable reviewers to gain a deeper understanding of the extent of these collaborative and partnership efforts.</i></p>	<p>NSSL provided this information in a holistic manner and will provide alternative methods of sharing materials for its 2026 lab review.</p>	<p>DaNa Carlis</p>	<p>FY2026</p>	<p>Ongoing. Recommendation will be implemented for the 2026 lab review.</p>
<p><i>R2. Recommend having the Stakeholders indicate which Research/Activity Area(s) they believed they fell under in their response to NSSL and providing this information to the reviewers.</i></p>	<p>NSSL will implement this recommendation for its 2026 lab review.</p>	<p>DaNa Carlis</p>	<p>FY2026</p>	<p>Ongoing. Recommendation will be implemented for the 2026 lab review.</p>
<p><i>R3. Recommend returning to in-person reviews as soon as safe to do so.</i></p>	<p>NSSL will implement this recommendation for its 2026 lab review.</p>	<p>DaNa Carlis</p>	<p>FY2026</p>	<p>Ongoing. Recommendation will be implemented for the 2026 lab review.</p>
<p><i>R4. Recommend that addition of an explicit review area on workforce and diversity issues should be considered, on the same level of the Science, Stakeholders, and Modeling. Otherwise, these topics will continue to be perceived as "extra" or "secondary" issues.</i></p>	<p>NSSL will prioritize and report on actions taken in the 2023-2025 NSSL DEIA Implementation Plan at annual Operations &amp; Management reviews to provide more explicit reviews on workforce and diversity issues.</p>	<p>DaNa Carlis/Pam Heinselman</p>	<p>Ongoing</p>	<p>Ongoing. A number of actions are taking place as we've released an update NSSL DEIA Strategic Implementation Plan, hosted CSC postdoc positions, and recruited at AISES and SACNAS to share the NSSL mission.</p>