



REPORT TO CONGRESS

NATIONAL MARINE FISHERIES SERVICE: RESPONSE TO NATIONAL ACADEMIES OF SCIENCES, ENGINEERING, AND MEDICINE 2021 RECOMMENDATIONS

*Developed pursuant to: The Modernizing Recreational Fisheries
Management Act of 2018 (Public Law 115-405)*

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SECTION 202(H) OF THE MODERNIZING RECREATIONAL FISHERIES
MANAGEMENT ACT OF 2018 (PUBLIC LAW 115-405) INCLUDED THE
FOLLOWING LANGUAGE

(h) Action by Secretary.--The Secretary shall--

(1) within 90 days after the date of the enactment of the Modernizing Recreational Fisheries Management Act of 2018, enter into an agreement with the National Academy of Sciences to evaluate, in the form of a report--

(A) how the design of the Marine Recreational Information Program, for the purposes of stock assessment and the determination of stock management reference points, can be improved to better meet the needs of in-season management of annual catch limits under section 303(a)(15); and

(B) what actions the Secretary, Councils, and States could take to improve the accuracy and timeliness of data collection and analysis to improve the Marine Recreational Information Program and facilitate in-season management; and

(2) within 6 months after receiving the report under paragraph (1), submit to Congress recommendations regarding--

(A) changes to be made to the Marine Recreational Information Program to make the program better meet the needs of in-season management of annual catch limits and other requirements under such section; and

(B) alternative management approaches that could be applied to recreational fisheries for which the Marine Recreational Information Program is not meeting the needs of in-season management of annual catch limits, consistent with other requirements of this Act, until such time as the changes in subparagraph (A) are implemented.

THIS REPORT RESPONDS TO THE REQUEST.

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I. EXECUTIVE SUMMARY

The Modernizing Recreational Fisheries Management Act of 2018, Public Law 115-405, mandated that the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) commission a National Academies of Sciences, Engineering, and Medicine (NASEM) study that evaluates:

“(A) how the design of the Marine Recreational Information Program [MRIP], for the purposes of stock assessment and the determination of stock management reference points, can be improved to better meet the needs of in-season management of annual catch limits under section 303(a)(15); and (B) what actions the Secretary, Councils, and States could take to improve the accuracy and timeliness of data collection and analysis to improve the Marine Recreational Information Program and facilitate in-season management.”

It also required NMFS to submit a report to Congress responding to the NASEM recommendations. The first requirement was completed in 2021, and this report responds to the second requirement.

In its consensus study report, the NASEM Committee made 12 recommendations with an accompanying set of conclusions regarding data collection, data use, and alternative management strategies that NMFS and its partners, including Regional Fishery Management Councils, Interstate Marine Fisheries Commissions, and state agencies, could consider. This report describes NMFS' and its partners' detailed assessment of NASEM's recommendations, including evaluations of each recommendation and associated set of conclusions, and NMFS' proposed course of action for each. In summary:

- Many of the NASEM recommendations suggest continuing ongoing agency practices and NMFS intends to do so, and to recommend equivalent actions by partners in all such cases.
- There are several recommendations that call for exploration and development of forecasting methods for in-season catch and management. In those regions in which the regional managers are practicing or considering practicing catch forecasting, NMFS will recommend that the regional managers consider following the report's recommendations.
- The NASEM report recommends conducting research and pilot studies of a number of statistical methods to improve the precision and accuracy of catch and forecasting estimates. NMFS will explore these recommended methods where applicable and recommend their consideration by partners, including members of the MRIP Regional Implementation Teams described in Section II. Undertaking such research and development will be subject to availability of funds and will generally be prioritized based on MRIP Regional Implementation Plan priorities and the requirements of NMFS Transition Plans.
- The NASEM report includes recommendations to pursue alternative management approaches to better align management actions and accountability with data availability. In most cases, these methods are available for use at present, and NMFS will continue to recommend the Regional Fishery Management Councils consider them.

NMFS' proposed courses of action described in Section III are preliminary. The timeframe allotted by the Modernizing Recreational Fisheries Management Act to produce this report allowed for productive, initial conversations with all involved parties toward which each recommendation is directed. More discussion, planning, and coordination will be needed among NMFS, Councils, Commissions, and states to be able to develop more detailed plans to address those of the recommendations and conclusions that are identified for further action by NMFS. Any consideration by NMFS to implement these recommendations would occur in the context of NOAA, Department of Commerce, and Administration priorities and resource tradeoffs.

II. NMFS REVIEW OF DATA AND MANAGEMENT STRATEGIES FOR FISHERIES WITH ANNUAL CATCH LIMITS

NASEM published its consensus study report, *Data and Management Strategies for Recreational Fisheries with Annual Catch Limits*¹, in December 2021. The study committee recognized that MRIP has improved the recreational catch data used in stock assessments, and the program produces “critically important” data that are unlikely to be replaced “as a source of spatially and temporally consistent catch information for monitoring and stock assessment of [Regional Fishery Management] Council-managed stocks.” The committee also acknowledged that MRIP was not designed to produce the near real-time monitoring data needed to support in-season management tools, and that it would take a substantial increase in funding to expand the program for in-season management. The report presents approaches for optimizing available recreational fishing data for in-season management and alternatives for managing recreational fisheries with annual catch limits (ACLs). The report further notes:

- In-season management is not required for most fisheries nationwide due to broad regional diversity in management needs. The report identifies those fisheries for which in-season management is currently practiced or desired by Regional Fishery Management Councils, Marine Fisheries Commissions, and States.
- Electronic reporting data collection systems relying on voluntary self-reported data are “unlikely to advance MRIP over the coming years²,” especially app-based voluntary reporting, due to low participation in such programs and the high potential for bias in the resulting catch estimates. Mandatory self-reporting, however, coupled with probability-based validation surveys could be considered on a case-by-case basis for specific recreational fisheries where precise monitoring and management are considered crucial, and where sufficient compliance can be achieved. The report highlights other potential uses of self-reported data, such as for projection modeling rather than for direct catch

¹ National Academies of Sciences, Engineering, and Medicine (2021) *Data and Management Strategies for Recreational Fisheries with Annual Catch Limits*. The National Academies Press, Washington, DC. www.nationalacademies.org/our-work/data-and-management-strategies-for-recreational-fisheries-with-annual-catch-limits

² https://nap.nationalacademies.org/resource/26185/RecFish%20Report%20Highlight_2021.pdf

estimation. It also acknowledges that tablet-based field data collection³ associated with probability sampling has led to improved data quality and decreased processing time.

- The MRIP Regional Implementation Teams⁴ (RITs), whose membership includes NMFS, Fishery Management Councils, Commissions and state agencies, and other regional partners play an important role in identifying and addressing unique regional processes and needs. Many of the report's recommendations are directed at this broader coalition of partners.

The NASEM Committee made 12 recommendations with an accompanying set of conclusions regarding data collection, data use, and alternative management strategies the agency and its partners could consider. These recommendations and conclusions were complex and variable in terms of subject matter and to whom they were directed. Only one recommendation was directed exclusively at NMFS, while the other 11 were jointly directed at NMFS (spanning NMFS Headquarter Offices and the Regional Offices and Science Centers around the country), and numerous external partner entities, including Regional Fishery Management Councils, Interstate Marine Fisheries Commissions, and state agencies. As such, NMFS coordinated a dual-track evaluation effort to obtain input that would allow this report to reflect national and regional (as well as federal and partner) needs, interests, and capabilities related to recreational fisheries in-season management. On one track, an internal team with nationwide representation and a wide range of expertise from across NMFS evaluated each recommendation and set of associated conclusions. In parallel, the agency engaged the MRIP Regional Implementation Council, or the leadership of each MRIP RIT, who facilitated partner evaluation of the recommendations and conclusions. This report reflects the following entities' input:

- **From the NMFS Internal Team:**
 - Office of Science and Technology (OST)
 - Fisheries Statistics Division
 - Office of Sustainable Fisheries (OSF)
 - Domestic Fisheries Division
 - Atlantic Highly Migratory Species Management Division (OSF's Atlantic HMS Division)
 - National Saltwater Recreational Fisheries Program (RecFish)
 - Greater Atlantic Regional Fisheries Office (GARFO)
 - Northeast Fisheries Science Center (NEFSC)
 - Southeast Regional Office (SERO)
 - Southeast Fisheries Science Center (SEFSC)
 - West Coast Regional Office (WCRO)
 - Northwest Fisheries Science Center (NWFSC)
 - Southwest Fisheries Science Center (SWFSC)
 - Pacific Islands Regional Office (PIRO)
 - Pacific Islands Fisheries Science Center (PIFSC)
 - NMFS Directorate – Senior Scientist for Stock Assessments

³ www.fisheries.noaa.gov/recreational-fishing-data/recreational-electronic-reporting-glance#how-is-electronic-reporting-used-to-collect-recreational-fishing-data

⁴ www.fisheries.noaa.gov/recreational-fishing-data/marine-recreational-information-program-teams#regional-implementation-teams

- **From the MRIP RITs:**
 - Atlantic RIT
 - Atlantic States Marine Fisheries Commission (ASMFC)
 - New England Fishery Management Council (NEFMC)
 - Mid-Atlantic Fishery Management Council (MAFMC)
 - South Atlantic Fishery Management Council (SAFMC)
 - New Jersey Department of Environmental Protection (NJ DEP)
 - Maryland Department of Natural Resources (MD DNR)
 - North Carolina Department of Environmental Quality (NC DEQ)
 - South Carolina Department of Natural Resources (SC DNR)
 - Florida Fish and Wildlife Conservation Commission (FL FWC)
 - Gulf of Mexico RIT
 - Gulf States Marine Fisheries Commission (GSMFC)
 - Gulf of Mexico Fishery Management Council (GMFMC)
 - Florida Fish and Wildlife Conservation Commission (FL FWC)
 - Mississippi Department of Marine Resources (MDMR)
 - Louisiana Department of Wildlife and Fisheries (LDWF)
 - Pacific (West Coast) RIT
 - Pacific States Marine Fisheries Commission (PSMFC)
 - Caribbean RIT
 - NMFS Southeast Regional Office – Caribbean Experts
 - United States Virgin Islands Department of Planning and Natural Resources (USVI DPNR)
 - Pacific Islands RIT
 - Hawaii Division of Aquatic Resources (HI DAR)
 - West Pacific Fishery Management Council (WPFMC)
 - Alaska RIT
 - The Alaska RIT did not provide evaluations of the recommendations and conclusions. The team stated the findings of the report are of limited applicability to managing recreational fisheries in Alaska. It noted that its region does not have federally managed recreational fisheries with annual catch limits and/or requiring in-season management action by NMFS. The team further noted that in-season management action may be necessary for Chinook salmon recreational fisheries due to language in the Pacific Salmon Treaty, but those actions are taken by the state on fisheries occurring solely, or nearly so, in state waters.
 - Atlantic HMS RIT
 - SEFSC HMS Scientist
 - OST Large Pelagics Survey (LPS) Experts

In synthesizing the input provided by all the entities above, we found:

- All recommendations in the NASEM report have been considered, fully or in part, by NMFS and/or partner entities in the regions with the most in-season management needs (e.g., in the Southeastern United States). Many are actively being explored regionally,

where applicable, with opportunities to cooperatively build on existing efforts. A few have been investigated regionally and not further pursued due to resource limitations.

- The NASEM report's recommendations and conclusions are particularly relevant to the members of the RITs. The RITs were created to address the variability in data collection based on fisheries and management needs. These recommendations highlight the critical role these bodies play in developing data collection improvements based on the unique management needs and priorities of each region.
- NMFS and RITs generally supported pursuit of many of NASEM's recommendations, noting that different regional management needs necessitate potentially different approaches in response. They highlighted the Atlantic and Gulf regions as having the most in-season management needs for recreational fisheries, and the West Coast, Pacific Islands, Caribbean, and Alaska as having numerous differing needs.

III. SUMMARY OF NASEM STUDY COMMITTEE RECOMMENDATIONS AND CONCLUSIONS WITH NMFS’ ACCOMPANYING EVALUATION AND PROPOSED COURSES OF ACTION

A. NASEM Study Committee Recommendation 1: Inter-Calibration and Determining Causes of Differences Among Surveys

“Current efforts by MRIP and its partners in the area of survey inter-calibration should continue and, where significant differences among surveys exist in terms of final estimates or precision, the causes of the differences should be determined and communicated to the public.”

Summary of Input Received From NMFS and External Partners

Entities that Have Considered this Recommendation	Status
Atlantic and Gulf: <ul style="list-style-type: none"> ● NMFS ● Councils: GMFMC ● Commissions/FINs: GSMFC ● States: NJ, MD, NC, FL, AL, MS, LA 	<ul style="list-style-type: none"> ● This recommendation has been implemented for MRIP survey design improvements (Access Point Angler Intercept Survey [APAIS] and Fishing Effort Survey [FES]). ● This recommendation has been implemented for the Large Pelagics Survey (LPS), and will continue to be implemented with LPS redesign. ● This recommendation is being implemented currently for FL, AL, MS, and LA state surveys in the Gulf of Mexico through the MRIP Transition Team, whose membership consists of NMFS Headquarters, Regional Offices and Science Centers as well as state and regional partners. ● This recommendation is being implemented in the Atlantic where differences between the effort estimates provided on for-hire Vessel Trip Reports and effort estimates obtained from ride-along MRIP APAIS interview data aboard headboats are being examined.
Pacific Islands: <ul style="list-style-type: none"> ● NMFS ● Councils: WPFMC ● States: HI 	<ul style="list-style-type: none"> ● This recommendation will be implemented in the future for the Hawaii Marine Recreational Fishing Survey and territorial surveys in American Samoa, Guam, and Commonwealth of the Northern Mariana Islands (CNMI), following MRIP survey review and certification in the region.

Evaluation of Recommendation 1

This recommendation has been considered by the agency and external partners and is being actively implemented in regions where there are multiple overlapping data streams and/or where survey improvements are being made (e.g., the Atlantic, Gulf, and Pacific Islands). Lessons have been learned from these efforts that can be implemented in the future (e.g., collaborative research to understand differences and efforts to communicate those differences in advance of implementing survey design changes).

NASEM Study Committee Conclusions Associated with Recommendation 1

- a. *“Within their intended scope and design constraints, MRIP data are critically important for fisheries management. Recognizing the limitations of these data, including concerns about precision, most states desire access to raw MRIP data.*
- b. *By utilizing existing infrastructure developed by regional Fishery Information Networks (FINs), MRIP Regional Implementation Teams provide the framework for integrating regional and state partner input, identifying regional priorities, and ensuring coordination in the development of strategies for addressing stock assessment and management needs for Council-managed recreational fisheries. In many instances, these needs include the development and implementation of specialized recreational surveys (either supplemental or alternative) to address limitations of a general survey such as MRIP.*
- c. *Compared with MRIP surveys, alternative or supplemental (state) surveys have achieved a variety of benefits, including greater timeliness of estimates; greater spatial resolution; provision of additional information; and possibly in some cases, greater precision of estimates.*
- d. *Alternative and supplemental surveys have improved timeliness through the use of new technologies (e.g., mobile apps and tablets), as well as reduced lag times in data processing and release.*
- e. *Compared with MRIP surveys, alternative or supplemental surveys have been shown to provide different estimates for recreational catches for the same fishery (stock and area). Differences between estimates can be moderate, or quite substantial.*
- f. *Public perceptions of differences between MRIP and alternative surveys in methodology, final catch estimates, and the precision of the estimates are a source of consternation among anglers, fisheries managers, and other stakeholders.*
- g. *While the implementation of MRIP surveys is generally standardized, there is precedent for adapting coverage to regional characteristics and needs. For instance, both APAIS and FES are conducted during only the warmer part of the year in the northeast region.”*

Evaluation of Associated Conclusions

Given the number of conclusions accompanying Recommendation 1, responses varied from NMFS and partners. MD DNR provided in response to conclusion 1e that their HMS catch card program produces very similar estimates to MRIP’s LPS. NJ DEP elaborated on conclusion 1c, stating that state volunteer angler surveys and logbooks, while imperfect and not integrated into MRIP, provide essential length data on released fish that isn’t collected by MRIP, but needed for state-level assessments. NJ DEP further suggested resources would be helpful to assist states in designing statistically valid programs that can more optimally supplement MRIP. Also related to conclusion 1c, NC DEQ indicated a desire for alternate approaches to short season fisheries, specifically southern flounder, and red snapper. In addition, NC DEQ suggested that, in relation to conclusion 1f, there are increased demands (from the recreational community, state lawmakers and federal lawmakers) to develop real time data collection for ACL/quota managed species, which relates to the report’s potential solutions and approaches noted in the above conclusions.

On the West Coast, NMFS and the Pacific RIT expressed some disagreement with conclusions 1d, 1e, and 1f, largely due to lack of applicability in this region. Also in the Pacific Islands region, the WPFMC disagreed with 1e, saying their creel surveys are designed to estimate both commercial and non-commercial total catch, and that their region is moving away from a catch-based system towards a rate-based management system.

Proposed Course of Action

NMFS will continue to conduct calibrations in conjunction with partners and the MRIP Transition Team, where applicable, and in adherence with NMFS Policy Directive 04-114.⁵ This policy pertains to ensuring new survey designs are scientifically sound, and that estimates derived via new methods are incorporated into existing time series of recreational catch with minimal disruption.

Where differing MRIP-certified survey designs subject to inter-calibration produce catch estimates that differ significantly, NMFS will (subject to availability of funds):

- Undertake research and pilot projects designed to shed light on the causes of the differences, with particular emphasis on determining the nature and extent of non-sampling error in the surveys;
- Make survey improvements as possible to address research findings regarding non-sampling error;
- Recommend, and provide technical support for, partner efforts to conduct similar studies to determine causes of survey differences and potential improvements;
- Continue ongoing outreach and education efforts to provide partners and stakeholders with information about sources of survey error⁶ and the basis and need for calibration.⁷

NMFS will continue to work with the MRIP Regional Implementation Teams, including Councils, Commissions, and States, to address the recreational community's perceptions of current surveys and the ability to produce real-time data for management decisions, and to clarify the complexities of achieving this in the future for all managed fish species. Regional Implementation Plans provide a place for identifying unmet or emerging needs for data to support in-season management.

⁵ National Marine Fisheries Service (2021) Policy 04-114: Implementing Recreational Fisheries Catch and Effort Survey Design Changes, https://media.fisheries.noaa.gov/2021-06/04-114_2021.6.9_final%20for%20Doreumus%20Signature_signed.pdf?null

⁶ www.fisheries.noaa.gov/feature-story/ask-mrip-answering-your-questions-about-survey-errors

⁷ www.fisheries.noaa.gov/recreational-fishing-data/statistical-calibration-overview

B. NASEM Study Committee Recommendation 2: Continuous Access to Raw Data

“MRIP should explore the costs and benefits of providing its partner fishery research and management programs in the regions and states with direct access to the continuous streams of raw MRIP data as they are being captured by the MRIP’s APAIS and For-Hire Survey (FHS), and the for-hire electronic logbook data programs (Vessel Trip Reporting [VTR], Southeast Regional Headboat Survey, Southeast Region For-Hire Electronic Reporting [SEFHIER]). Legitimate and appropriate accessibility to these data should be coordinated through Regional Interstate Fishery Commission programs such as Gulf Fisheries Information Network (GulfFIN) and the Atlantic Coastal Cooperative Statistics Program (ACCSP).”

Summary of Input Received from NMFS and External Partners

Entities that Have Considered this Recommendation	Status
Atlantic and Gulf: <ul style="list-style-type: none"> ● NMFS ● Commissions/FINs: ACCSP, Gulf Fisheries Information Network (FIN) ● States: ME-FL 	Microdata, or the individual, per-unit response data obtained from a survey, are made available after full quality assurance and quality control (QA/QC). However, OST has provided data users with expedited access to data to address specific needs (for example, providing Gulf of Mexico partners early access to MRIP data to assist in monitoring impacts of the Deepwater Horizon oil spill on the for-hire sector).
West Coast: <ul style="list-style-type: none"> ● NMFS ● Commissions/FINs: Recreational Fisheries Information Network (RecFIN) ● States: CA, OR, WA 	Some microdata are made available through RecFIN after full QA/QC, but not all states provide their complete datasets used to generate estimates.

Evaluation of Recommendation 2

Near-real-time raw data are not made available by NMFS or partner entities. In several regions, processed survey microdata are made available to the public after they have undergone QA/QC, except in special cases where requests are received from partners (e.g., OST providing expedited access to raw data to help Gulf of Mexico partners monitor Deepwater Horizon impacts). There is some interest in exploring the cost-benefits of making raw data available from the sources listed by the recommendation and reducing the production time of those data. Strong concerns were expressed by NMFS and external partners regarding:

- The susceptibility to risk that comes with using raw data;
- High potential for general misinterpretation and/or misuse;
- The value of raw catch data without corresponding effort data (for programs that couple in-person intercept catch surveys with off-site effort surveys, given that

raw catch data alone may not have a strong correlation with final estimated landings); and,

- Making data available before QA/QC.

NASEM Study Committee Conclusions Associated with Recommendation 2

- a. “With strong support from fishery managers and stakeholders, MRIP and other recreational fisheries data collection programs have greatly improved the development and use of mobile apps and other electronic data collection and reporting platforms. While the use of these technologies can improve the efficiency of data collection, these technologies alone will not speed up the process if other systemic bottlenecks exist.*
- b. With additional resources, MRIP may be able to shorten by roughly 2 weeks the time between the end of its current bimonthly reporting period and the release of preliminary estimates. This change would put additional stress on existing MRIP staff and systems, and for purposes of in-season management, the benefits of a modest advance in the release of preliminary estimates for bimonthly waves would not be likely to justify the costs of accelerating the data processing and estimation phases of each bimonthly cycle. It is possible that the raw MRIP data streams could be used to inform more timely catch estimates through such approaches as nowcasting or other in-season projection methods.”*

Evaluation of Associated Conclusions

In response to 2a, NMFS and partners highlighted a number of electronic data collection and reporting tools used in the Atlantic (e.g., a tilefish app for private anglers⁸, e-logbooks for the for-hire sector, an HMS catch reporting app⁹, tablet-based data collection for MRIP surveys), Gulf (state apps for red snapper¹⁰, tablet-based data collection for MRIP surveys), and in the Pacific Islands (Lokahi Fishing app¹¹ and Catch-it, Log-it app¹²), and potential opportunities for more use of electronic data capture in MRIP surveys (as noted by ASFMC). While all input acknowledged that leveraging technology could indeed improve the efficiency of data collection, most regions cited impediments to broad adoption of app-based data collection, such as limited awareness and compliance with applicable regulations, and generally recommended that such programs should only be considered for targeted fisheries. Others cited bottlenecks in data transfer, QA/QC, and data accessibility issues that may arise with the use of apps.

NMFS and partner responses to conclusion 2b depended on the survey data in question and the region. For the Atlantic and Gulf, NMFS felt APAIS and FHS data could be made available faster with additional resources but that this wasn’t feasible for the FES (private boat and shore effort), for which data are not collected until the conclusion of the

⁸ www.harborlightsoftware.com/efin-logbook

⁹ <https://hmspermits.noaa.gov/mobileApp>

¹⁰ <https://tailsnscales.org/#/>; <https://research.dcnr.alabama.gov/Snapper/>

¹¹ <https://lokahifishing.com/>

¹² www.wpcouncil.org/catchit-logit/

two-month periods for which estimates are produced (referred to as waves). However, the agency agreed with NASEM's conclusion that the benefit of accelerating data availability by two weeks was not sufficient for in-season management to justify the costs therefore, a cost-benefit assessment was not completed. On the West Coast, NMFS concluded that there is little benefit to accelerating data availability because timeliness is not currently an issue for management in this region. In the Southeast, the SAFMC also perceived limited benefits of speeding up data availability by two weeks relative to the cost.

Proposed Course of Action

There are only limited cases in which immediate access to raw catch data may facilitate in-season decisions (i.e., when such data can be used as indicators or model inputs to catch projection models). In those cases, NMFS will continue to respond to specific requests from state and regional managers to support more timely access to preliminary data. These requests should be submitted to the appropriate FIN, or, in regions with no FIN, directly to NMFS Regional Offices/Science Centers, which will then work with the NMFS survey administrators to facilitate expedited data access. This expedited data access will be done in full transparency and awareness of the preliminary nature of the data and the risks associated with using raw data prior to full QA/QC and review.

C. NASEM Study Committee Recommendation 3: Anticipating Inter-Calibration Needs and Communications

“Interstate Fisheries Commissions, States, NMFS, and other members of MRIP Regional Implementation Teams should anticipate and take into account the need for inter-calibration and continued survey development when new recreational fisheries surveys and survey methods are considered. These needs should also be clearly communicated to anglers, fishery managers, and other stakeholders.”

Summary of Input Received from NMFS and External Partners

Entities that Have Considered this Recommendation	Status
Atlantic and Gulf: <ul style="list-style-type: none"> ● NMFS ● Commissions/FINs: GulfFIN ● States: AL, MS, FL, LA 	<ul style="list-style-type: none"> ● This recommendation is being implemented in conjunction with MRIP design improvements (APAIS, FES, LPS), and for state surveys in the Gulf of Mexico through the Gulf Subgroup of the MRIP Transition Team, whose membership consists of NMFS Headquarters, Regional Offices, and Science Centers as well as state and regional partners. A workshop was held in February 2022¹³ to bring this team together to make the decisions necessary to complete a Transition Plan for the use of state recreational fishing data in the Federal stock assessment and management process in the Gulf.
West Coast: <ul style="list-style-type: none"> ● NMFS ● Commissions/FINs: RecFIN ● States: CA, OR, WA 	<ul style="list-style-type: none"> ● In this region, NMFS and partners indicated they will prioritize the need for inter-calibration if they develop new surveys and will communicate those needs to the public.

Evaluation of Recommendation 3

This recommendation has been considered by the agency and by external partners, and is being actively implemented in regions where there are multiple overlapping data streams and/or where survey improvements are being made. State partner entities in the Gulf of Mexico suggested improvements could be made to increase inter-agency communication, which NMFS is working to address through the Gulf of Mexico Subgroup of the MRIP Transition Team and a supporting Communications Working Group. GulfFIN and West Coast partners suggested that this recommendation may be further developed via revision of NMFS Procedure 04-114-02¹⁴ regarding the survey certification process. For example, they suggested the procedure could more clearly describe the process and require that states provide transparency in survey changes and inter-calibration methods. In addition, several other issues were identified where this recommendation may become relevant and need to be implemented in the future:

- If a supplemental survey is developed for Gulf of Maine cod – NMFS identified it as a species for which currently available data do not meet management needs due to small sample sizes driven by reductions in stock levels in recent years.
- If the Catch-it, Log-it¹⁵ app-based program in the Pacific Island territories becomes part of MRIP via certification.

¹³ www.fisheries.noaa.gov/event/gulf-state-recreational-catch-and-effort-surveys-transition-workshop

¹⁴ National Marine Fisheries Service (2021) Procedure 04-114-02: Guidance and Procedures for the MRIP Certification Process, https://media.fisheries.noaa.gov/2021-06/04-114-02_06.28.2021_Howell%20signed.pdf?null

¹⁵ www.wpcouncil.org/catchit-logit/

- When NMFS and partners begin to restart and/or initiate new surveys in the Caribbean region, engagement of stakeholders will be needed to communicate those needs.

NASEM Study Committee Conclusions Associated with Recommendation 3

- “Given an approximate doubling of the resources that could be allocated to its survey programs, MRIP could transition to monthly catch estimates that would have levels of precision comparable to those of the current estimates for bimonthly waves.¹⁶ For in-season management applications that rely on tracking MRIP estimates of cumulative catch against annual catch limits (ACLs), the greatest advantage of moving to a 1-month cycle would lie in monitoring cumulative catch at the end of odd-numbered months. Other applications of MRIP data, including stock assessment and cross-year management of recreational fisheries (e.g., seasons, catch and size limits), would also benefit from an MRIP transition to larger sample sizes required to maintain precision for monthly estimation of catch.*
- It is impractical to further improve the precision and timeliness of MRIP catch estimates to levels that could be achieved in the near-census catch reporting schemes used for the commercial sector, such as the VTR and SEFHIER programs. Any further improvements in MRIP precision and timeliness are therefore unlikely to be sufficient in and of themselves to achieve more effective in-season management of recreational fisheries. However, the Committee identified a number of supplementary data sources and analytical approaches likely to improve the precision, timeliness, and adaptability of MRIP data for the purpose of improving catch forecasts for recreational fisheries subject to ACLs.*
- Further development of in-season management approaches utilizing novel statistical methods and additional data sources, such as state surveys, voluntary reporting, and analyses of social media posts, has the potential to improve incrementally the timeliness and precision of annual catch management. It is unlikely, however, that such approaches can replace MRIP as a source of spatially and temporally consistent catch information for monitoring and stock assessment of Council-managed stocks.*
- Since stock assessments rely on long time series of consistently collected data, and many federally managed stocks straddle state and survey boundaries, inter-calibration of surveys is essential whenever a single survey is insufficient to support all assessment and management needs. Rigorous survey inter-calibration requires temporal and spatial overlap between surveys. The need for inter-calibration and the consequences of using different, uncalibrated surveys for various aspects of assessment and management are evident where different surveys provide very different estimates of the same unknown quantity (in the same units) and where the precision of surveys is perceived or known to differ.”*

Evaluation of Associated Conclusions

Conclusion 3a, transitioning the MRIP general surveys to 1-month waves, was highlighted as something that should be pursued if resources permit in the Atlantic and

¹⁶ Catch and effort estimates are produced throughout the year in two-month increments, known as waves.

Gulf regions. NMFS suggested that the costs could be less than cited in this conclusion due to MRIP's planned switch to cumulative estimates in 2023, as specified in the NMFS Recreational Fishing Survey and Data Standards.¹⁷ ASMFC also suggested costs might be reduced by producing monthly estimates only in the critical midsection of the year (e.g., May-October) to benefit in-season management for fisheries with at least a 4-month season. The exception was SAFMC, which suggested additional resource investments should go toward the greater need: improving estimates on an annual basis for all managed stocks rather than transitioning to monthly estimates. The West Coast and Pacific Island regions, where MRIP's general surveys are not implemented, expressed differing needs for monthly catch estimates. On the West Coast, NMFS concluded the benefit would likely not justify the cost. NMFS and WPFMC indicated that this recommendation would be considered in the future in the Pacific Islands if the region further pursues in-season management and if resources are made available.

NMFS and partners generally recognized conclusions 3a, b, and d (although NMFS noted that the for-hire sector monitored by the VTR and SEFHIER programs is considered recreational rather than commercial), but partially disagreed with 3c. NMFS indicated that research suggests volunteer reporting is likely to result in biased estimates and disagreed that it should be used to inform catch estimates. In addition, MD DNR suggested that social media data streams would rapidly be lost or compromised once social media users realize how the information is being used, especially if the use of that information results in management decisions that are perceived as unfavorable.

Proposed Course of Action

NMFS will continue to address the need for calibration in implementing new survey methods as called for in NOAA Policy Directive 04-114.¹⁸ NMFS also will ensure that MRIP RITs are aware of, and prioritize, inter-calibration as necessary. The MRIP Transition Team, and any Regional Subgroup that it establishes, will bear primary responsibility for carrying out the Policy Directive.

D. NASEM Study Committee Recommendation 4: Exploring Ancillary Variables for Catch Forecasts

“The National Marine Fisheries Service (NMFS) Regional Offices, Science Centers, and state agencies should explore and identify ancillary variables that have high correlations with the FES and APAIS response propensities, effort, catch per unit effort, and catch estimates and supplemental survey estimates for potential use in annual and in-season forecasting models. Ancillary variables available electronically with high frequency (i.e., daily or weekly) would be most useful for in-season management catch forecasts.”

¹⁷ National Marine Fisheries Service (2020) Recreational Fishing Survey and Data Standards, www.fisheries.noaa.gov/recreational-fishing-data/recreational-fishing-survey-and-data-standards

¹⁸ National Marine Fisheries Service (2021) Policy 04-114: Implementing Recreational Fisheries Catch and Effort Survey Design Changes, https://media.fisheries.noaa.gov/2021-06/04-114_2021.6.9_final%20for%20Doreumus%20Signature_signed.pdf?null

Summary of Input Received from NMFS and External Partners

Entities that Have Considered this Recommendation	Status
<p>Atlantic and Gulf:</p> <ul style="list-style-type: none"> ● NMFS ● States: FL AL, LA 	<ul style="list-style-type: none"> ● This recommendation is beginning to be implemented by the NEFSC, which is evaluating the utility of search volumes of species-specific regulations in an app called Fish Rules¹⁹ for “nowcasting” when MRIP data is unavailable. ● This recommendation is being partially implemented by OSF’s Atlantic HMS Division, which uses ancillary variables to decide whether to close certain fisheries (e.g., marine weather forecast). However, OSF’s Atlantic HMS Division has not used ancillary variables for formal forecasting models. ● Three state agencies are investigating this recommendation: <ul style="list-style-type: none"> ○ FL FWC uses angler intercept data for in-season forecasts. ○ AL DCNR uses weather data for predicting fishing effort and forecasting season lengths. ○ LDWF uses ancillary variables as part of the LA red snapper quota monitoring. Variables such as sea state from an offshore monitoring station, numbers of intercepted offshore parties, numbers of electronically reported offshore trips are used as tracking metrics. LDWF has found some correlation among these variables and final estimates of private angler harvest for the species.
<p>West Coast:</p> <ul style="list-style-type: none"> ● NMFS ● Commissions/FINs: RecFIN ● States: CA, OR, WA 	<ul style="list-style-type: none"> ● This recommendation is being investigated through MRIP-funded projects in this region looking at external data indicators as predictors of fishing effort.
<p>Pacific Islands:</p> <ul style="list-style-type: none"> ● States: HI 	<ul style="list-style-type: none"> ● This recommendation has not yet been specified as a priority need in the region’s Regional Implementation Plan. However, HI DAR has considered exploring ancillary variables and hopes to obtain resources to pursue this in the future.

Evaluation of Recommendation 4

Forecasting is outside the current scope of MRIP, but this recommendation has been considered on a regional level where most applicable on the Atlantic, Gulf and West Coasts, and in the Pacific Islands. NMFS and partners in the Atlantic, Gulf, and West Coast regions are actively investigating ancillary variables, but only FL FWC and AL DCNR use them for formal recreational catch forecasting models. The Pacific Islands Regional Implementation Team has not yet specified forecasting with ancillary variables as a priority in their region, but HI DAR has expressed interest in pursuing this recommendation when resources allow.

¹⁹ <https://fishrulesapp.com/>

In evaluating the possible benefits and limitations of using ancillary variables, ASMFC suggested consideration of reporting burden on all fishing entities and the intended use of data be evaluated before asking for shorter timelines and/or additional data elements. There was also collective concern over the reliability of ancillary variables in being able to support accurate forecasts. However, there is precedent to use ancillary variables to decide when to close certain fisheries in-season (e.g., NMFS has used this approach for Atlantic highly migratory species; AL DCNR and LDWF have also used this approach for certain species at the state level), the practice of which could be expanded further. For instance, weather may have a strong correlation with fishing effort (e.g., as suggested by NMFS for Atlantic highly migratory species, HI DAR, and PSMFC). FL FWC and MDMR further suggested ancillary variables may have other potential uses that should be explored, such as reducing variability in past estimates, or determining validity of trends observed in different surveys.

NASEM Study Committee Conclusions Associated with Recommendation 4

- a. *“Supplemental data in the form of state-specific recreational fishery surveys, species-specific surveys (e.g., Red Snapper), location-specific data, fishing tournament data, and voluntarily reported data (e.g., web portal- and smartphone-reported data) could be used in combination with MRIP estimates to improve in-season management. However, significant challenges would remain concerning the calibration and coordination of supplemental recreational catch and effort data with MRIP estimates. In addition to MRIP’s existing programs to calibrate state survey data collection and estimates with MRIP data and estimates, some of the methods discussed in this chapter could facilitate the integration of data from multiple sources.*
- b. *A great variety of ancillary variables in readily accessible electronic format exist and potentially could be combined with MRIP catch estimates to improve the annual and in-season catch forecasts made in support of fishery management. When choosing which of the variety of ancillary variables available to use, one can consider that a variable will be more useful when the correlation (either positive or negative) between that variable and the catch of one or more recreational species is high. Ancillary variables that are also correlated with survey response propensity may be useful for reducing nonresponse bias. Furthermore, a particular ancillary variable will be more useful for the specific purpose of deciding when to close a fishery within fishing season when that variable is available electronically with high frequency (i.e., daily or weekly).”*

Evaluation of Associated Conclusions

NMFS largely agreed with conclusion 4a, but concluded that this type of supplemental data collection would be most useful for species that require a specific permit that would allow for targeted sampling, rather than for the mixed fisheries of the West Coast. NMFS also was uncertain of the utility of using ancillary variables for forecasting for certain fisheries (e.g., Atlantic highly migratory species), given the perceived cost-benefit.

Externally, Gulf state and regional partners agreed with these conclusions, and several Atlantic state agencies expressed support for pursuing the data integration described in conclusion 4a in particular. ASMFC also agreed with these conclusions, but suggested NMFS and partners prioritize completion of inter-calibration where needed prior to evaluating ancillary variables. WPFMC cited very limited supplemental data in the Pacific Islands region, and suggested its limited resources would be better spent on their region’s top priority – improving the precision and representativeness of the region’s current surveys.

Proposed Course of Action

NMFS is currently exploring and utilizing ancillary variables for developing and applying projection models in those regions and management programs that have interest in applying the method. We will continue current efforts in exploring ancillary variables in regions that consider this a priority (Atlantic, Gulf, and West Coast), since they have a variety of benefits beyond forecasting, and will recommend the same course of action for partners where applicable. However, NMFS and partner entities must consider the costs, benefits, and limitations of formal forecasting with ancillary variables (e.g., uncertainty and susceptibility to risk), before incorporating ancillary variables into annual and in-season forecasting models.

E. NASEM Study Committee Recommendation 5: Evaluating Tradeoffs Between Bias and Precision in Catch Forecasts

“The National Marine Fisheries Service (NMFS) and Fishery Management Councils should discuss whether achieving perhaps substantial reductions in the percentage standard errors (PSEs) of catch forecasts is worth a moderate increase in the bias of catch forecasts. If so, then NMFS Regional Offices and state agencies should investigate whether Stein rule–related estimation methods can be developed that would achieve meaningful reductions in PSEs (with acceptably low increases in bias) and associated reductions in the mean square error of catch forecasts for fisheries with high PSEs.”

Summary of Input Received from NMFS and External Partners

Entities that Have Considered this Recommendation	Status
Atlantic: <ul style="list-style-type: none"> ● NMFS 	<ul style="list-style-type: none"> ● Tradeoffs between PSE and bias in catch estimation, rather than catch forecasting, has been explored – arguably the current and historical design of the LPS was predicated on balancing moderate increases in bias to substantially reduce PSEs on Atlantic HMS catch estimates.
West Coast:	<ul style="list-style-type: none"> ● <i>Dick, et al. 2021</i>²⁰ looked at hierarchical models for average

²⁰ E.J. Dick, J. Edwards, T.S. Tsou (2021) Model-based estimation of average fish weights from recreational fisheries. Fisheries Research, Volume 241, 106002, <https://doi.org/10.1016/j.fishres.2021.106002>.

<ul style="list-style-type: none"> ● NMFS ● Commissions/FINs: RecFIN ● States: WA 	<p>weight estimation as an alternative to the current ad hoc deterministic imputation methods. WDFW is exploring ways to fund implementation of this method. However, apart from this one example, the focus has generally been on reduction of bias, without much regard for the effects on variance. These efforts are also focused on catch estimation, rather than forecasting.</p>
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Evaluation of Recommendation 5

NMFS and partners generally agreed with exploring the tradeoffs between bias and PSE, but felt that the second half of the recommendation should only be pursued if the introduced bias is low. The agency was against introducing unknown bias and, given how difficult bias is to quantify, was uncertain how viable the proposed approach would be. NMFS and partners pointed to higher priority alternatives that may make better use of limited resources, such as implementing sample reallocation strategies for high profile regional species and making other needed improvements to existing programs (e.g., understand and minimize the existing bias before potentially introducing more, or improve estimates for states/species with low sampling rates).

It is important to note, however, that NMFS and partner input on this recommendation focused on the tradeoffs between bias and PSE reduction of catch estimates themselves rather than those of catch forecasts. There was very limited input evaluating the use of these methods for forecasting, which is likely reflective of the limited use of forecasting and/or that improving catch estimates themselves is generally of higher priority to the agency and partners than the testing of new catch forecasting methods. The proposed course of action below focuses on forecasting to reflect the subject matter of this recommendation, but the described input suggests examining tradeoffs between bias and PSE reduction of catch estimates may also be another research avenue worth pursuing.

NASEM Study Committee Conclusions Associated with Recommendation 5

- a. *“If fishery managers are willing to accept some amount of bias in catch forecasts, it may be possible to use “Stein rule”-related statistical estimation methods to reduce the variance (PSEs) of catch forecasts and lower the overall MSE of the estimates. If justifiable restrictions (either equality or inequality restrictions) on model parameters can be identified, then incorporating such restrictions into the estimation methodology may reduce the MSE of the estimates.”*

Evaluation of Associated Conclusions

NMFS and partners reacted similarly to this conclusion as to the parent recommendation – they were willing to accept the introduction of bias if it can be quantified and is found to be low. MDMR disagreed with this conclusion, cautioning that in-season management will not be improved through use of these methods if managers use estimates as “true values”, without considering factors like PSE, sample sizes, or year-to-year consistency.

Proposed Course of Action

In those limited instances in which regional fisheries managers are exploring or utilizing catch forecasting, NMFS will recommend the regional managers consider this recommendation.

F. NASEM Study Committee Recommendation 6: Improving Accuracy and Precision of Catch Forecasts

“The National Marine Fisheries Service (NMFS) Regional Offices and state agencies should explore the following to improve the accuracy and precision of catch forecasts:

- 1. The extent of autocorrelation in MRIP catch estimates across years and across waves within years, including seasonal patterns, should be investigated.*
- 2. The magnitude of any bias in the variance (percentage standard error [PSE]) of catch forecasts due to autocorrelation should be determined, and if necessary, projection/forecast models should be modified appropriately to address autocorrelation.*
- 3. The effects of ancillary variables (e.g., in the form of distributed lags) on catch should also be investigated to address autocorrelation. Managers should explore refinement of the Farmer and Froeschke (2015) time series model and its application, along with similar models, to other fish species and geographic areas.*
- 4. The incorporation of similar time series models into a “Seemingly Unrelated Regression” (SUR) modeling framework that leverages contemporaneous correlation across species and/or areas should be considered.*
- 5. The development of similar time series models within a Bayesian modeling framework should be investigated.”*

Summary of Input Received from NMFS and External Partners

Entities that Have Considered this Recommendation	Status
West Coast: <ul style="list-style-type: none">• Commissions/FINs: PSMFC	<ul style="list-style-type: none">• Input provided by PSMFC suggested an effort was taken to look at ancillary variables for potential use in forecasting, but it did not go as far as recommendations 6.3.
Atlantic: <ul style="list-style-type: none">• NMFS	<ul style="list-style-type: none">• A spatio-temporal autoregressive approach has been used by the agency, but for analysis of fishery-independent survey data - see Thorson <i>et al.</i> 2020.²¹
Alaska: <ul style="list-style-type: none">• NMFS	

²¹ J.T. Thorson, C.F. Adams, E.N. Brooks, L.B. Eisner, D.G. Kimmel, C.M. Legault, L.A. Rogers, E.M. Yasumiishi (2020) Seasonal and interannual variation in spatio-temporal models for index standardization and phenology studies, ICES Journal of Marine Science, Volume 77, Issue 5, Pages 1879-1892, <https://doi.org/10.1093/icesjms/fsaa074>.

Evaluation of Recommendation 6

NMFS and partners were supportive of exploring these options, citing the use of these approaches to analyze fishery-independent survey data that might be adapted for use with fishery-dependent data in certain regions for certain fisheries. In the Northeast, NMFS concluded this recommendation would be beneficial as the agency currently bases several greater Atlantic management decisions on catch forecasts. In other regions and/or for certain fisheries, however, the agency concluded that additional work would be needed prior to pursuing this recommendation and that inter-calibration of catch estimates and PSE reduction may be higher priorities. For Atlantic highly migratory species, the agency would first need to evaluate potential sources of bias in the recommended approaches before pursuing any one of them, and in the Southeast, the agency concluded it would require additional resources and expertise. On the West Coast and in the Pacific Islands, the recommendation was found to not yet be applicable to current management needs in those regions.

ASMFC suggested recommendation 6.1 and 6.2 should be prioritized over the others, given 6.1 and 6.2 would help identify the scope of the issue. FL FWC cited that a preferable approach to this recommendation may be to make raw fishery survey data available for use in in-season projected landings.

NASEM Study Committee Conclusions Associated with Recommendation 6

- a. *“Combining MRIP survey data with supplemental survey data using multiple-frame methods could decrease the variance (PSE) of catch estimates, depending on the relative sample sizes and catch variances of the combined surveys. Increasing the MRIP sample size decreases the value (in terms of variance reduction) of a supplemental survey. Increasing the sample size of a supplemental survey increases the value of that survey. An increase in the variance in catch within a supplemental survey increases the value of that survey. An increase in the variance in catch in the portion of the MRIP sample frame outside a supplemental survey sample frame decreases the benefit of that supplemental survey. As the size of a supplemental survey sample frame increases relative to the size of the MRIP sample frame, the benefit of that supplemental survey decreases.*
- b. *Covariances between catch estimates from two different domains or between a catch estimate and an ancillary variable may be useful for reducing the variance and PSE of annual and in-season catch forecasts made by fishery managers who use MRIP output estimates in catch forecasting models. Conditional expectations of catch, conditional variances of catch, and the method of control variates may also be useful for improving catch forecasts.*
- c. *Spatial-temporal forecasting models, such as time series cross-section models, SARIMA models, and SUR models, may be useful for developing catch forecasts for in-season management where data are sufficient. It may be necessary to combine MRIP catch estimates with data from supplementary surveys and on ancillary variables to achieve needed forecast accuracy and precision. These models can be*

used to address the statistical issues of heteroskedasticity, temporal autocorrelation, and contemporaneous correlation to improve the accuracy and precision of catch forecasts. The time series forecasting models of Farmer and Froeschke (2015) and Farmer and colleagues (2020) are good examples of the potential use of time series SARIMA methods for building applied, managerially relevant, in-season catch forecasting models. These models integrate MRIP and supplementary survey data as well as ancillary variables (stock status, weather, economic conditions, etc.) to forecast in-season catch, determine appropriate season length, and control the probability of exceeding an ACL.”

Evaluation of Associated Conclusions

NMFS investigated dual frame estimation methods (conclusion 6a) during development of the FES, but ultimately pursued a different approach due to high risk for error. NMFS suggested there may be other use cases for multi-frame methods, but recommended that statistical assumptions of such methods be thoroughly evaluated before implementation. FL FWC stated that it generates integrated point estimates that combine APAIS data with its state Reef Fish Survey (SRFS) data to increase sample sizes and improve the precision of the estimates.

NMFS and partners suggested that conclusions 6b and 6c were worth exploring, but that additional resources would be needed to do so. Also, the Atlantic HMS RIT highlighted that studies would be needed to verify that the proposed approaches would work consistently for species of interest. LDWF suggested that state management has obviated the use of the Farmer and Froeschke model in the Gulf of Mexico for private boat angling for red snapper.

The WPFMC disagreed with these conclusions, stating that they are too advanced for its current needs and capabilities. The WPFMC stressed that the Pacific Islands region is data limited and that “*simple fisheries need simple tools.*”

Proposed Course of Action

NMFS Regional Offices will explore the feasibility of these methods where appropriate and applicable to catch forecasting being considered or conducted in their regions, if not already being considered or conducted. The agency will recommend the same course of action for state agencies where applicable.

G. NASEM Study Committee Recommendation 7: Alternative Statistical Methods for Catch Estimation and Forecasting

“The NMFS Regional Offices and state agencies should explore the possibility of using the following statistical methods, parameters, and approaches as appropriate for the issue at hand:

1. *Multiple-frame methods and related methods to combine MRIP data with data from supplemental surveys to reduce the variance (PSEs) of catch estimates;*
2. *Covariances in catch estimates across MRIP domains, conditional expectations and conditional variances of catch (encompassing identification of the best conditioning variables, including ancillary variables), and the possible use of control variates, to reduce the PSE of catch forecasts;*
3. *Bayesian modeling methods that could provide a consistent framework for updating annual and in-season catch forecasts and projections utilizing data streams of different precision and frequency, including MRIP estimates of given precision available by year and by 2-month wave, and estimates from other, supplemental sources that may have different precision and be available with different frequency;*
4. *The combination of uninformative priors, an assumption of catch proportional to abundance, and Bayesian updating for forecasting the catch of rare-event species and possibly estimating the population sizes of such species;*
5. *Alternative statistical definitions of outlier catch estimates and the adoption of standard definitions to facilitate consistency in management actions;*
6. *Change in detection methods in time series data analysis to help answer the question of when an outlier should trigger management change;*
7. *Contemporaneous correlation in the errors across MRIP domains (the Seemingly Unrelated Regression [SUR] method, its extension to situations with heteroskedasticity and autocorrelation, and its implementation within a Bayesian forecasting model, could help reduce the variance and PSEs of catch forecasts)."*

Summary of Input Received from NMFS and External Partners

Entities that Have Considered this Recommendation	Status
Atlantic: <ul style="list-style-type: none"> ● Commissions/FINs: ASMFC 	ASMFC, through their Summer Flounder, Scup, and Black Sea Bass Technical Committee, is initiating preliminary work related to recommendation 7.5 and 7.6 on outlier detection and smoothing for black sea bass.

Evaluation of Recommendation 7

This recommendation includes exploration of several statistical methods to support improved catch estimation, with particular emphasis on “outlier” or highly imprecise estimates and of catch forecasts/projections. By and large, these methods are not in use in the MRIP partner community at present, although ASMFC suggested they were beginning to consider recommendation 7.5 and 7.6 for black sea bass.

NMFS and partners agreed that it is worth exploring the recommended methods in some regions and/or applicable fisheries. However, ASMFC felt that recommendation 7.1 may not be feasible in the South Atlantic due to the resources it would take to extend the shore and effort-based components for offshore species. MDMR suggested recommendation

7.4, forecasting of rare-event species, is not likely to be productive due to low levels of data inputs and high variability in estimates for those species.

NMFS and partners suggested resource investments may be needed to determine which of the recommended approaches to pursue. In the West Coast, Pacific Islands and Caribbean regions, NMFS and partners highlighted simpler priorities that must be achieved first (e.g., developing PSEs to accompany West Coast estimates, and the need to fill basic data gaps in the Pacific Islands and the Caribbean). In the Southeast, NMFS and partners (FL FWC, MDMR, and ASMFC) supported prioritizing recommendation 7.5.

NASEM Study Committee Conclusions Associated with Recommendation 7

- a. *“The SUR method may be useful for reducing the variance and PSEs of catch forecasts when the errors across domains (for example, across fish species) are contemporaneously correlated; that is, when the errors in different domains move together. When errors are contemporaneously correlated, it may be possible to improve forecasts by estimating systems of equations together, for example, by estimating together the forecasting models for multiple fish species. The SUR method can accommodate heteroskedasticity and temporal autocorrelation.*
- b. *Bayesian modeling methodology may serve as a good overarching framework for regional federal and state fishery managers to use in integrating and updating MRIP catch estimates, supplemental survey data, and ancillary variables for the purpose of producing annual catch forecasts and in-season catch forecasts. Furthermore, many, if not all, of the other methodological approaches described in this report can be integrated within a Bayesian framework. The Bayesian methodology provides a consistent approach to handling uncertainty and risk and supporting probabilistic decision making, such as decisions about when to close seasonal fisheries to maintain the probability of exceeding ACLs below fishery managers’ tolerance level. The existence of widely available software for implementing Bayesian models facilitates their use in fishery management.*
- c. *For some rare-event species, the distribution of catch in catch forecasts may be better modeled using a probability distribution other than the normal distribution. Examples of such distributions include the Poisson, negative binomial, zero inflated Poisson, and zero-inflated negative binomial. Statistical methods exist for determining when the use of one distribution would be better (lower error in catch forecasts) than another.*
- d. *The method of inverse sampling may be useful for estimating the population or catch of some rare-event species, especially in situations in which the catch of the rare-event species is very low and sporadic, with zero catches in some locations and time periods.*
- e. *For some rare-event species, especially newly discovered species or those with very little catch data, the combined use of uninformative priors, an assumption of catch proportional to abundance, and Bayesian updating may be useful for forecasting the catch of that species. When fishery-independent estimates of the total fish population (all species together) exist, the method may also be useful for estimating the*

- population of the rare-event species as well. This method is a special case of the general Bayesian modeling framework discussed elsewhere in this report.*
- f. *Traditional statistical methods can be used to define and identify outlier catch estimates in cases in which sufficient data are available. Order statistics may be useful for defining and identifying outliers in data-limited situations in which it may not be possible to apply the traditional methods. Change detection methods in time series data analysis, including Bayesian approaches, can be used to help answer the question of when an outlier should trigger management change.”*

Evaluation of Associated Conclusions

NMFS and partner responses largely mirrored the input they provided regarding the parent recommendation, with conclusion 7f being highlighted by the SAFMC as particularly helpful for management, and by ASMFC as something they’re beginning to work on for black sea bass. However, in response to conclusion 7b, NMFS questioned whether Bayesian methods would result in superior answers relative to frequentist methods, and felt computational burden and methodological complexity needs to be considered when providing real-time advice across many fisheries with a wide range of management scenarios. NMFS’ experts in the Southeast suggested Bayesian methods may be useful for a narrow range of well-studied fisheries in their region, but may not suit all of their needs. NJ DEP also weighed in on conclusion 7b, and while it was very supportive of the exploration of Bayesian methods, it noted the importance of communicating statistical methods to the public and that using more complex methodologies may generate a new communications challenge for NMFS and partners²²

Proposed Course of Action

NMFS will continue to actively work toward seeking to have these recommended statistical methods evaluated and considered, where applicable.

- As with Recommendation 6 above, NMFS Regional Offices and Science Centers will continue to pursue the feasibility of the recommended forecasting methods where appropriate and applicable to their regions. The agency will recommend that state agencies pursue the same course of action where forecasting is being considered.
- MRIP has established a Rare Event Species Working Group of scientific experts in fisheries statistics and stock assessment to develop alternative survey and estimation methods to improve the precision of catch estimates for species rarely encountered in catch surveys (and that frequently have associated low precision rates and high uncertainty). The Working Group will evaluate the recommended methods that address “outliers” and/or “rare event” fisheries and continue its work related to outliers. NMFS will recommend that ASMFC and the Working Group coordinate to share relevant findings with one another.

²² NJ DEP stated “MRIP estimates are a bit of a black box to the public now – moving towards Bayesian methods will put the estimates that much farther out of reach for the public to understand.”

- NMFS will recommend that Regional Fishery Management Councils be involved in implementing this recommendation at the regional level. For instance, each Council’s Scientific and Statistical Committee (SSC) could provide advice regarding use of the alternative estimation and forecasting methods cited in this recommendation. The SSCs would also review the application of the recommended catch estimation and forecasting methods in analyses provided by regional NMFS and Council staff.

H. NASEM Study Committee Recommendation 8: Harvest Tags and License Endorsements for Alternative Management

“NMFS and MRIP should work in coordination with the Regional Fishery Management Councils, Interstate Fisheries Commissions, and States to, on a region-by-region basis, test the feasibility and potential benefits of alternative management approaches for some recreational fisheries. The committee recommends pilot testing of the following approaches:

1. *The use of harvest tags for low-ACL, rare-event species; species of concern; species under Endangered Species Act (ESA) recovery plans; or other species that may not be well suited for sampling by a general recreational fisheries survey like MRIP.*
2. *Implementation of a private recreational fisheries license endorsement (or permitting program) focused on identifying the subset of licensed anglers that target Council managed species (e.g., offshore components of the fisheries). This license registry could then be used to assist in the development of specialized surveys that could improve recreational fisheries data collection for sampling domains that are challenging for MRIP.”*

Summary of Input Received from NMFS and External Partners

Entities that Have Considered this Recommendation	Status
Atlantic and Gulf: <ul style="list-style-type: none"> • NMFS • Councils: MAFMC, SAFMC • Commissions/FINs: ACCSP, GulfFIN • States: LA, VA 	<ul style="list-style-type: none"> • OSF’s Atlantic HMS Division has tested numerous tagging programs related to recommendation 8.1, but they have ultimately not been pursued further due to factors like costs, underreporting, and non-compliance. Recommendation 8.2 has long been implemented by OSF’s Atlantic HMS Division, however. HMS-specific angling and charter/headboat permits have been used since the 1990s, which inform the LPS effort sample frame along with the commercial Atlantic Tunas General permit. These permitting programs have been successful at providing more precise estimates of HMS catch and effort. • LDWF experimented with harvest tags relevant to recommendation 8.1 but discontinued the program due to issues with implementation. • ACCSP relayed that VA Marine Resources Commission has developed a cobia permit with required reporting of harvest, so

	<p>while it isn't the same harvest tag approach as stated in recommendation 8.1, it is similar in that the state uses a specialized permit to track a low ACL/rare event species.</p> <ul style="list-style-type: none"> ● Recommendation 8.2 has been recently implemented by GARFO and ACCSP. They have collaboratively implemented a private recreational tilefish permit and mandatory app-based reporting in response to MAFMC regulatory action, although ASMFC notes the utility of the data is not yet fully known given how new the program is. ● OST has considered Recommendation 8.2 and tested using a sample frame of licensed anglers only, but results demonstrated large coverage gaps due to e.g., license exemptions and illegal fishing activity. ● LDWF has considered both Recommendation 8.1. and 8.2. The agency experimented with the use of harvest tags for yellowfin tuna in the mid-2010's, but the program was unsuccessful and discontinued. However, the agency's Recreational Offshore Landing Permit accomplishes almost exactly what Recommendation 8.2 recommends. ● SAFMC has considered both Recommendation 8.1 and 8.2 via inclusion of harvest tags and license endorsements when developing amendments (drafted with input from SERO and SEFSC) but has not yet implemented them. ● GulfFIN has considered both harvest tags and license endorsements, but has not implemented either type of program due to the large perceived burden at the state level, and concerns over the ability to ensure compliance with reporting requirements.
<p>West Coast:</p> <ul style="list-style-type: none"> ● NMFS ● States: CA, OR, WA 	<ul style="list-style-type: none"> ● This recommendation is not being implemented yet, but OR is considering a Pacific halibut harvest tag program relevant to Recommendation 8.1.
<p>Pacific Islands:</p> <ul style="list-style-type: none"> ● NMFS ● States: HI 	<ul style="list-style-type: none"> ● Recommendation 8.2 is being partially implemented in Hawaii through the Main Hawaiian Islands non-commercial bottomfish permit. ● Recommendation 8.2 may be implemented in the future through HI DAR's non-resident non-commercial fishing license. WPFMC may also explore Recommendation 8.1 (tagging for cultural/recreational take of green sea turtles). However, it will be a long time before it is implemented, if at all, due to intense disagreements between all involved parties on if and how it should be implemented.

Evaluation of Recommendation 8

Harvest tags have been widely considered for in-season management, but only attempted at the Federal level for various Atlantic HMS species and at the state level in Louisiana. In those instances, they were unsuccessful due to costs, underreporting, and non-compliance. There are several additional fish tagging programs in existence around the country (e.g., state-supervised tagging of Pacific salmon in freshwater and other programs for tarpon and goliath grouper), but none were identified by regional partners as being currently used for the purposes of in-season management. MDMR suggested that

alternative methods such as tagging should be approached with caution due to the disparity in prior information to use as baselines.

A variety of license endorsements have been successful in some specific cases (e.g., Atlantic HMS species, and Louisiana's LA Creel), but may be difficult to implement at large scales due to high potential for bias (highlighted by NMFS) and burden on state and regional staff (highlighted by GulfFIN). In the Southeast, NMFS indicated that identifying species that may not be well suited for estimation by traditional survey methods may be an important first step in implementing this recommendation. ASMFC stated, while it would be willing to participate in data collection for additional supplemental surveys, it felt that such programs may not provide sufficient benefits to justify the costs, given that ASMFC-managed species do not have management measures with ACLs or in-season restrictions. ASMFC expressed more support for pursuing alternative management, such as the use of multi-year averaging of harvest, because it allows some flexibility in that States do not have to drastically change their regulations for a single year that may have a high harvest estimate.

NASEM Study Committee Conclusions Associated with Recommendation 8

No additional conclusions were provided by the NASEM study committee on recommendation 8.

Evaluation of Associated Conclusions

Not Applicable.

Proposed Course of Action

When recommended by Regional Fisheries Management Councils, NMFS will pursue Recommendations 8.1 and 8.2 provided enforcement is feasible and resources are available and committed for administering and assuring compliance with permitting and self-reporting requirements. NMFS will recommend the same course of action for partner entities.

NMFS will pursue Recommendation 8.2 in close coordination with the state licensing authorities, Interstate Fisheries Commissions, and other members of the MRIP Regional Implementation Teams, as presented in Recommendation 9.

I. NASEM Study Committee Recommendation 9: Close Inter-agency Coordination to Implement MRIP-Supplemental Surveys

“Implementation of MRIP-supplemental surveys focused on regional or Council-managed species should be accomplished in close coordination with the Interstate Fisheries Commissions, NMFS, and other members of the MRIP regional implementation teams.”

Summary of Input Received from NMFS and External Partners

Entities that Have Considered this Recommendation	Status
Atlantic and Gulf: <ul style="list-style-type: none"> ● NMFS ● Councils: MAFMC ● Commissions/FINs: ACCSP ● States: FL, AL, MS, LA 	<ul style="list-style-type: none"> ● This recommendation is being implemented by: <ul style="list-style-type: none"> ○ GARFO, ACCSP, and MAFMC, which coordinate closely on the tilefish permit and reporting. ○ The Atlantic HMS RIT, ACCSP, and NMFS OST, which coordinate closely to implement the LPS. ○ Gulf States, which developed supplemental surveys in the Gulf of Mexico in coordination with OST and MRIP statistical consultants. This coordination is continuing through the MRIP Gulf Transition Team Subgroup.²³
West Coast: NMFS Commissions/FINs: RecFIN, PSMFC States: CA, OR, WA	<ul style="list-style-type: none"> ● RecFIN, West Coast States and NMFS have conducted pilot studies and investigated potential surveys in close coordination.
Pacific Islands: Councils: WPFMC Territories: American Samoa Department of Marine and Wildlife Resources, Guam Division of Aquatic and Wildlife Resources, CNMI Division of Fish and Wildlife	<ul style="list-style-type: none"> ● WPFMC relayed that supplemental survey development was considered, but not implemented, in Pacific Island territories due to resource limitations. The specific programs attempted were the Guam Naval Base adjustment factor project, a survey for rare events, and a non-commercial spearfishing project.

Evaluation of Recommendation 9

NMFS and partners indicate this recommendation is being implemented in the Atlantic, Gulf, and West Coast regions. While some partners suggest coordination could be strengthened (e.g., FL FWC citing communication between NMFS and states could be improved; ASMFC citing supplemental surveys and/or changes to core surveys should be compatible across jurisdictional lines, both inshore and offshore, and across states) there is broad consensus that coordination of survey development and implementation is important. NMFS put forward the following considerations in developing and implementing supplemental surveys in any region: angler reporting burden, integration or comparability with existing programs, calibration with existing programs, and the possible value in enhancing existing programs before using resources on supplemental efforts. On the West Coast, however, NMFS and the PSMFC noted that supplemental surveys have limited utility for many of the region’s multi-species fisheries.

NMFS further felt the management needs of regional or Council-managed species would best be met by ensuring new supplemental surveys truly supplement MRIP, meaning that they are designed to be statistically comparable and compatible with existing MRIP estimates, and they are identified as priorities in the MRIP Regional Implementation

²³ www.fisheries.noaa.gov/event/gulf-state-recreational-catch-and-effort-surveys-transition-workshop?utm_medium=email&utm_source=govdelivery

Plans. For example, survey modules could be collaboratively developed with the MRIP RITs as add-ons to the MRIP general surveys during certain times of year and/or certain locations to meet specialized management needs.

NASEM Study Committee Conclusions Associated with Recommendation 9

No additional conclusions were provided by the NASEM study committee on Recommendation 9.

Evaluation of Associated Conclusions

Not Applicable.

Proposed Course of Action

NMFS has long operated cooperative fisheries monitoring and management programs in a manner consistent with this recommendation and will continue to do so. The agency strongly recommends the same course of action for Fisheries Commissions, Councils, states, and other members of the MRIP RITs. The MRIP Regional Implementation Planning process²⁴ provides an existing means of communicating and prioritizing unmet needs. Supplemental surveys that can meet unmet needs, such as specialized modules added-on to MRIP general surveys, can be identified in these plans to facilitate coordination and collaboration. NMFS also strongly recommends all recreational fisheries monitoring programs adhere to NMFS Policy Directive 04-114.²⁵

J. NASEM Study Committee Recommendation 10: Evaluating Carry-Over Provisions for Management

“NMFS and the Councils should further evaluate approaches to establishing criteria for the use of carry-over provisions, as well as limits on the amount of unused ACL or acceptable biological catch that could be carried forward. Implementation of such carry-over approaches could allow the recreational sector to achieve a high level of ACL utilization in a way that would be both practical and cost-effective while reducing risks of extreme overages and subsequent payback.”

²⁴ www.fisheries.noaa.gov/recreational-fishing-data/marine-recreational-information-program-teams#regional-implementation-teams

²⁵ National Marine Fisheries Service (2021) Policy 04-114: Implementing Recreational Fisheries Catch and Effort Survey Design Changes, https://media.fisheries.noaa.gov/2021-06/04-114_2021.6.9_final%20for%20Doreumus%20Signature_signed.pdf?null

Summary of Input Received from NMFS and External Partners

Entities that Have Considered this Recommendation	Status
<p>Atlantic and Gulf:</p> <ul style="list-style-type: none"> ● NMFS ● Councils: GMFMC, NEFMC, MAFMC ● Commissions/FINs: ASMFC 	<ul style="list-style-type: none"> ● OSF issued guidance on implementing carry-over provisions in a 2020-published Technical Memorandum.²⁶ ● Regarding implementation of carry-over provisions: <ul style="list-style-type: none"> ○ Carry-over is being implemented partially for Atlantic bluefin tuna, and Amendment 14 to the Consolidated Atlantic HMS fishery management plan is currently considering carry-over provisions in the Atlantic shark fishery. ○ NMFS Regional Offices reported that carry-over is not yet being implemented for recreational species in their regions, but some are exploring possible carryover approaches comparable to what is done for the commercial sector. ○ Carry-over was considered in the Gulf of Mexico (GMFMC 2019²⁷), but was rejected due to observed problems with the approach (e.g., unpopularity with stakeholders, reduced overall harvest in the long-term). ○ ASMFC and MAFMC are planning to consider this in the future through their Recreational Reform Initiative.²⁸ Currently, MAFMC evaluates recreational ACLs by comparing the 3-year average catch to the 3-year average recreational ACL to determine whether an overage has occurred; this method has the same intended effect as some carry-over provisions.
<p>Pacific Islands: NMFS Councils: WPFMC</p>	<ul style="list-style-type: none"> ● Carry-over provisions have been considered, but are not being implemented because the Pacific Islands do not currently have ACLs for non-commercial species.

Evaluation of Recommendation 10

At the national level, NMFS has developed detailed guidance on implementing carry-over provisions through the 2020 Technical Memorandum, cited above. The implementation of carry-over provisions must be done on a fishery-by-fishery basis, and regionally, NMFS and partners indicated the use of carry-over provisions have only been successful in specific cases (e.g., for Atlantic highly migratory species). In the Atlantic, West Coast and Pacific Islands, NMFS and partners expressed interest in exploring the implementation of carry-over provisions for select stocks. LDWF suggested that

²⁶ D. Holland, D. Lambert, E. Schnettler, R. Methot, M. Karp, K. Brewster-Geisz, J. Brodziak, S. Crosson, N. Farmer, K. Frens, J. Gasper, J. Hastie, P. Lynch, S. Matson, and E. Thunberg (2020). National Standard 1 Technical Guidance for Designing, Evaluating, and Implementing Carryover and Phase-in Provisions. NOAA Tech. Memo. NMFS-F/SPO-203, 41 p., <https://spo.nmfs.noaa.gov/sites/default/files/TMSPO203.pdf>

²⁷ Gulf of Mexico Fishery Management Council (2019) Carryover Provisions and Framework Modifications: Draft Generic Amendment to the Fishery Management Plans for Reef Fish, Coastal Migratory Pelagics, Coral and Coral Reefs, and Spiny Lobster in the Gulf of Mexico. 184 p., <https://gulfcouncil.org/wp-content/uploads/E-6a-Draft-Generic-Amendment-for-Quota-Carryover-and-Framework-Modification.pdf>

²⁸ www.mafmc.org/actions/recreational-reform-initiative

thorough testing and assessment of public acceptability of the consequences of carry-over provisions should be fully evaluated before implementing them in the Gulf of Mexico. ASMFC suggested that flexibility for carry-over provisions could be helpful for rare event species, short season species, and/or species managed jointly by ASMFC and Councils.

NASEM Study Committee Conclusions Associated with Recommendation 10

- a. *“A generalized carry-over provision for recreational ACL underages and overages attributable to implementation error would reduce the need for precise catch management on an annual basis by allowing deviations to be corrected in the following year. Such carry-over approaches have been evaluated and found to be generally sustainable.”*

Evaluation of Associated Conclusions

In the context of the applicable Atlantic and Gulf recreational fisheries, NMFS and numerous partners agreed with this conclusion. For West Coast fisheries, however, NMFS and partners concluded a generalized carry-over provision would result in instability in bag limits and season length. NC DEQ suggested that this conclusion may need to be the fishery manager’s decision, and carry-overs of ACLs may change by stock. The SAFMC was uncertain about this conclusion, given that only 18 of the 56 Council-managed stocks in their region currently have an overfishing limit where carry-over provisions might apply; carry-over is not recommended for stocks that do not have an overfishing limit (*Holland et al., 2020*). The Council stated that it will be requesting additional terms of reference to be added to future stock assessments to evaluate if carry-over provisions might be allowed, but indicated that they may not be due to uncertainty and year-to-year variability in estimates.

Proposed Course of Action

NMFS has reviewed the topic of carry-over provisions and issued a NOAA Technical Memorandum²⁹ that provides guidance on evaluating and implementing carry-over provisions. If a Council expresses interest in developing a carry-over provision for a particular fishery, NMFS will support them in evaluating and implementing (if approved) such a provision.

Revisions to the National Standard 1 (NS1) guidelines published in 2016 included two provisions that added flexibility in the process of specifying ACLs. One provision allowed the unused portion of an ACL to be carried over to the following year. A second provision allowed changes in catch limits to be phased in over a period not to exceed 3 years. Both provisions required that overfishing is still prevented every year. This added

²⁹ Holland, D., D. Lambert, E. Schnettler, R. Methot, M. Karp, K. Brewster-Geisz, J. Brodziak, S. Crosson, N. Farmer, K. Frens, J. Gasper, J. Hastie, P. Lynch, S. Matson, and E. Thunberg. 2020. National Standard 1 Technical Guidance for Designing, Evaluating, and Implementing Carryover and Phase-in Provisions. NOAA Tech. Memo. NMFS-F/SPO-203, 41 p., <https://spo.nmfs.noaa.gov/sites/default/files/TMSPO203.pdf>

flexibility may have several benefits including increasing safety and economic performance and reducing social disruptions by creating stability in harvests over time. However, policies that allow acceptable biological catch (ABC) to be set closer to the overfishing limit (OFL) also have the potential to increase biological risk and should be properly analyzed and adopted with caution.

The technical memo is meant to support the implementation of the carry-over and phase-in provisions as described within the NS1 guidelines. It provides examples of how carry-over and phase-in provisions have been implemented in fisheries so we can learn from past experiences. The memo also describes some possible approaches to design and implement carry-over and phase-in provisions. Additionally, it identifies characteristics of fish stocks, fisheries, and management approaches that may impact the benefits and risks of applying carry-over and phase-in provisions.

K. NASEM Study Committee Recommendation 11: Review of National Standard 1 Guidelines

“NMFS should review the National Standard 1 guidelines to ensure that agency guidance with respect to recreational accountability measures aligns with the timeliness and precision of harvest estimates produced by MRIP.”

Summary of Input Received from NMFS and External Partners

Entities that Have Considered this Recommendation	Status
Nationally: NMFS	<ul style="list-style-type: none"> NMFS reviewed the National Standard 1 guidelines in 2016, and believes they provide managers with flexibility to design accountability measures that are appropriate given the information that is available for a particular fishery.

Evaluation of Recommendation 11

NMFS has reviewed the National Standard 1 guidelines and believes that they provide the flexibility to develop AMs that are appropriate, given the information available for a fishery.

NASEM Study Committee Conclusions Associated with Recommendation 11

“The committee acknowledges the challenges associated with the development and application of AMs in recreational fisheries given the precision and timing of MRIP estimates.”

Evaluation of Associated Conclusions

NMFS and partners generally agreed.

Proposed Course of Action

NMFS will continue to support the Councils' use and improvement of recreational accountability measures, so they align with the timeliness and precision of harvest estimates produced by MRIP and other available recreational fisheries monitoring programs.

The Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006 amended the Magnuson-Stevens Act (MSA) to include requirements for ACLs, AMs, and other provisions to prevent and end overfishing and rebuild fisheries. These mechanisms have helped several recreationally important stocks recover from "overfished" or "overfishing conditions." NMFS believes that the National Standard 1 guidelines provide the Councils with flexibility in developing AMs for all fisheries, including recreational. The amendments to the National Standard 1 Guidelines in 2016³⁰ added to those flexibilities. In 2018, the Modernizing Recreational Fisheries Management Act (Modern Fish Act) was signed into law. While the Modern Fish Act did not fundamentally change the MSA, it explicitly mentioned certain management approaches for recreational or mixed-use fisheries that some consider alternative approaches. Several Councils are currently considering these approaches.

NMFS believes that flexibility should continue to be afforded to Councils to develop measures that reflect the differences between the commercial and recreational sectors, consistent with the MSA's purposes and requirements, which include preventing overfishing. To reflect changing needs of fisheries over time, the National Standard guidelines (50 C.F.R. § 600.305(b)) provide that Councils should reassess fishery management plans' objectives on a regular basis. In addition, the National Standard 1 guidelines provide that, "[w]henver possible," fishery management plans should use in-season monitoring and management measures to prevent catch from exceeding ACLs (50 C.F.R. § 600.310(g)(2)). While supporting the use of in-season AMs, the National Standard 1 guidelines note at § 600.310(g)(3) that: "*The type of AM chosen by a Council will likely vary depending on the sector of the fishery, status of the stock, the degree of the overage, recruitment patterns of the stock, or other pertinent information.*" Consistent with requirements of the MSA, Councils have the flexibility to design AMs tailored to their management needs and the best scientific information available.

L. NASEM Study Committee Recommendation 12: Engagement of Stakeholders in Discussions about Optimum Yield

"NMFS and the Councils should develop a process for engaging recreational fisheries stakeholders in a more in-depth discussion of optimum yield and how it can be used to identify and prioritize management objectives that are better suited to the cultural, economic, and conservation goals of the angling community."

³⁰ www.fisheries.noaa.gov/national/laws-and-policies/2016-revisions-national-standard-1-guidelines

Summary of Input Received from NMFS and External Partners

Entities that Have Considered this Recommendation	Status
Atlantic and Gulf: <ul style="list-style-type: none"> ● NMFS ● Councils: MAFMC, NEFMC ● Commissions/FINs: ASMFC 	<ul style="list-style-type: none"> ● The agency and partners are actively engaging recreational fisheries stakeholders on this topic via roundtable discussions.
Pacific Islands: <ul style="list-style-type: none"> ● NMFS ● Councils: WPFMC 	<ul style="list-style-type: none"> ● The agency and partners are actively engaging recreational fisheries stakeholders on this topic via non-commercial engagement projects and advisory committees.
West Coast: <ul style="list-style-type: none"> ● NMFS ● States: CA, OR, WA 	<ul style="list-style-type: none"> ● The agency and partners are implementing this recommendation via recreational stakeholder workshops.
Nationally: <ul style="list-style-type: none"> ● NMFS 	<ul style="list-style-type: none"> ● The agency held a discussion on this topic at the 2022 National Saltwater Recreational Fisheries Summit.³¹

Evaluation of Recommendation 12

NMFS and partners have broadly considered this recommendation in most regions, with discussions on this topic being held at both the national and regional levels. The written input provided by partners contributing to this report highlighted stakeholder engagement as a priority, although ASMFC felt *“Educating stakeholders is unlikely to solve the larger support of estimates that may not match the experience of fishermen on the water.”* The WPFMC and GMFMC expressed that they equate successful ACL management with optimum yield: WPFMC stated that in their region *“Optimum yield [OY] is equated with ACLs. Other conservation goals and consideration of cultural and economic objectives are done outside the realm of OY.”* GMFMC stated, *“This topic is complex and widely mischaracterized. The annual catch limits determine the harvest on an annual basis [from] which stakeholders derive benefits ... OY is a long-term management target that can only be achieved so long as ACLs are not being exceeded.”*

NASEM Study Committee Conclusions Associated with Recommendation 12

- a. *“The adoption of mandatory, electronic catch reporting schemes combined with intercept sampling for verification has the potential to bring recreational catch monitoring to a level of precision and timeliness comparable to that achieved in commercial catch monitoring programs. Implementing such mandatory reporting schemes could be considered for some recreational fisheries where precise monitoring and management are considered crucial.”*
- b. *Precise monitoring, such as that which may be achieved by using mandatory reporting, may also allow, and be further enhanced by, the adoption of rights-based management approaches in recreational fisheries.”*

³¹ www.fisheries.noaa.gov/event/2022-national-saltwater-recreational-fisheries-summit

Evaluation of Associated Conclusions

Conclusions 12a and b were not directly related to optimum yield, but raise additional, separate considerations. The input provided by NMFS and partners on conclusion 12a was context-specific: input reflected support for limited application of this approach (e.g., for rare event species with very small annual catch limits), but the consensus was that broad adoption of mandatory reporting programs for private anglers would not be feasible. In the Atlantic, NMFS has used this approach to supplement LPS estimates for monitoring recreational catch of bluefin tuna and billfish for over 20 years, although without an intercept sampling validation component. The SAFMC expressed interest in pursuing 12a for tilefish, snowy grouper, and wreckfish given the low recreational ACLs and high PSEs for those species in their region, and integrating that program with both MRIP and Florida SRFS sampling designs. NC DEQ also highlighted that they may need to pursue these methods in the near future to meet state-level in-season management needs. Outside of these specific Atlantic fisheries, NMFS and partners held a more generalized perspective. In the Atlantic, ASMFC stated that although progress has been made with mandatory reporting in the for-hire sector, it would be very difficult to implement for private anglers. In West Coast states and the Pacific Islands, NMFS similarly felt that mandatory reporting for private anglers was unrealistic and not a high priority to meet management needs. In the Gulf of Mexico, LDWF also viewed broad adoption of mandatory reporting as generally unrealistic for recreational fishing, highlighting how widespread and cryptic an activity it is and the amount of effort that would be required to develop, implement, and ensure compliance with such programs.

Conclusion 12b was acknowledged by the agency and partners, but NJ DEP suggested careful study and evaluation should be undertaken before considering the implementation of rights-based approaches.

Proposed Course of Action

NMFS continued the discussion of optimum yield at the National Saltwater Recreational Fisheries Summit in March 2022³² and will develop further courses of action related to this recommendation, as needed. NMFS will also participate as requested in ongoing discussions occurring at the state and regional level.

NMFS will recommend that partners who pursue the development of mandatory electronic reporting programs, such as those highlighted in Conclusions 12a and 12b, follow the proposed courses of action for Recommendations 8 and 9. The SEFHIER program, which is designed as 12a describes, may serve as a model for such programs provided that sufficient levels of compliance can be achieved for the considered fisheries.

³² www.fisheries.noaa.gov/event/2022-national-saltwater-recreational-fisheries-summit