Resources Legacy Fund Key Partner Report
Decadal Management Review of California's MPA Network
January 2022

Introduction

This report is submitted by Resources Legacy Fund (RLF), an independent non-profit organization that builds alliances that advance bold solutions to secure a just and resilient world for people and nature. RLF partners with leaders in philanthropy, communities, government, science, and business to promote smart policies and secure equitable public funding for the environment, climate change resilience, and healthy communities. Across the American West and internationally, RLF manages large, multi-year grantmaking programs and fiscally sponsors projects that advance enduring outcomes. RLF has developed and administered many strategic charitable programs in partnership with the State of California over the past 20 years, including those focused on marine protected area (MPA) design and management.

From 2004-2012, RLF partnered with the California Natural Resources Agency to administer the Marine Life Protection Act (MLPA) Initiative, the public private partnership that supported design and adoption of California's MPA network. RLF currently serves as a member of the Marine Protected Area Statewide Leadership Team and is a signatory of the Memorandum of Understanding to support the implementation of the MLPA. Since 2012, RLF has managed approximately $2 million annually in philanthropic funds to support MPA monitoring, outreach and education, and compliance related projects; RLF made over 475 MPA related grants and contracts totaling $23 million in investments during that time. From 2019-2022, RLF also administered a $2.5 million Once-Through Cooling (OTC) Interim Mitigation Program grant from the Ocean Protection Council to support a range of MPA compliance related efforts including a small grants program. RLF grantees and contractors include academic, government, civic, fishing, conservation, and Tribal entities. RLF has also supported presentations related to California's MPA network at national and international conferences and publication of journal articles and a book about the California MLPA experience.

RLF also serves as fiscal sponsor to the MPA Collaborative Network and is the core funder for MPA Watch programs statewide, using both philanthropic and OTC funding. Historically, RLF has provided early funding that helped launch many of the programs and institutions that remain important to MPA management including Reef Check California, the California Collaborative Fisheries Research Program, the California Ocean Science Trust, the MPA Collaborative Network, MPA Watch, the Tribal Marine Steward Network, and the recently launched District Attorney Statewide MPA Task Force. Many of these programs and additional RLF partners will submit their own reports for the California Department of Fish and Game's Decadal Management Review (DMR) to share insights from the past 10 years of MPA implementation, providing valuable context for the significant body of work accomplished by non-governmental and Tribal partners.

This submission is focused primarily on one aspect of RLF engagement: support for development and application of technology to support MPA compliance (pages 2-8). Additional information on these enforcement technologies can be referenced in the DMR submissions from Channel Islands National Marine Sanctuary (CINMS), California Marine Sanctuary Foundation (CMSF), and Protected Seas. We have also included background information regarding the scientific publications and presentations featuring California's MPA network (page 8-10).

Origin of eFINS: Supporting Enforcement Data Collection, Analysis, and Tracking

In 2013, RLF supported the Office of National Marine Sanctuaries to research and release a report titled: "Cooperative Enforcement of the Channel Islands National Marine Sanctuary and Marine Protected Areas: An Analysis of Patrol Data from 2002-2010." The report integrated enforcement recommendations from agencies including California Department of Fish and Wildlife (CDFW), NOAA's Office of Law Enforcement, Channel Islands National Park Service (NPS), United States Coast Guard (USCG), and CINMS.

The report identified the need for a digital, geospatially-based, mobile data collection platform for enforcement officers to effectively carry out their mission. In 2015, RLF supported CMSF and CINMS to work with the McClintock Lab at the Marine Science Institute at the University of California Santa Barbara to develop and trial a customized mobile application (app) that would allow CDFW officers and NPS rangers to electronically record enforcement encounters in the Santa Barbara Channel region. CMSF and CINMS iteratively improved the pilot app throughout the first two years of the pilot effort based on officer input, and moved the app to the cloud-based Fulcrum data platform, allowing for increased accessibility, affordability, and confidentially, which were identified as priorities by participating enforcement agencies.

Since 2017—in partnership with CDFW Law Enforcement Division—RLF, CMSF, and CINMS have constructed, tested, and maintained a mobile data collection and sharing app now known as the electronic Fisheries Information Network System (eFINS). eFINS allows CDFW marine officers and other California marine enforcement partners—such as the Channel Islands National Park and City of San Diego Lifeguards—to electronically record, store, and reference geospatial data collected during their marine patrols. The pilot effort initially focused on enforcement of MPAs within the Channel Islands region to test the feasibility of the app. Through positive referrals by participating officers, in 2022, the project has expanded to include additional CDFW patrol vessels and units throughout the state.

Highlights– eFINS

Statistics related to eFINS pilot project since inception:
- Total number of patrol officers using eFINS: 115
- Marine patrol records entered through January 20, 2022: 4,525
- Number of records entered inside MPAs: 743
- Number of records entered outside MPAs: 3,782
- Number of warnings and citation records entered inside MPAs: 552
- Number of warnings and citation records entered outside MPAs: 1,307

- Number of CDFW marine patrol vessels collecting eFINS data: 13

eFINS Technical Attributes Support Enforcement

As of January 2022, participating officers from CDFW and partner enforcement agencies use the eFINS app to create geospatial records associated with contacts made out on the water during their marine patrols. Via their mobile phones, officers can quickly (with two clicks) create a record within the system that captures GPS location, date, time, and the type of record, e.g. compliant contact, warning, or citation (See Fig 1). As time and field conditions allow, they can also include additional information associated with the contact, such as vessel information, the marine species targeted, or the type of violation associated with a warning or citation being documented in the system.

Officers also have the option of adding photos or videos to eFINS records. In addition, officers using the eFINS app can use the system as a reference tool to allow for access to view their own or other officers' data while they're out on patrol in an offline marine environment (where they do not have access to the internet). The eFINS app also provides a map tool that allows officers to visualize their own location relative to important jurisdictional boundaries, like MPAs, fathom lines relevant for fishery regulations, and national marine sanctuaries.
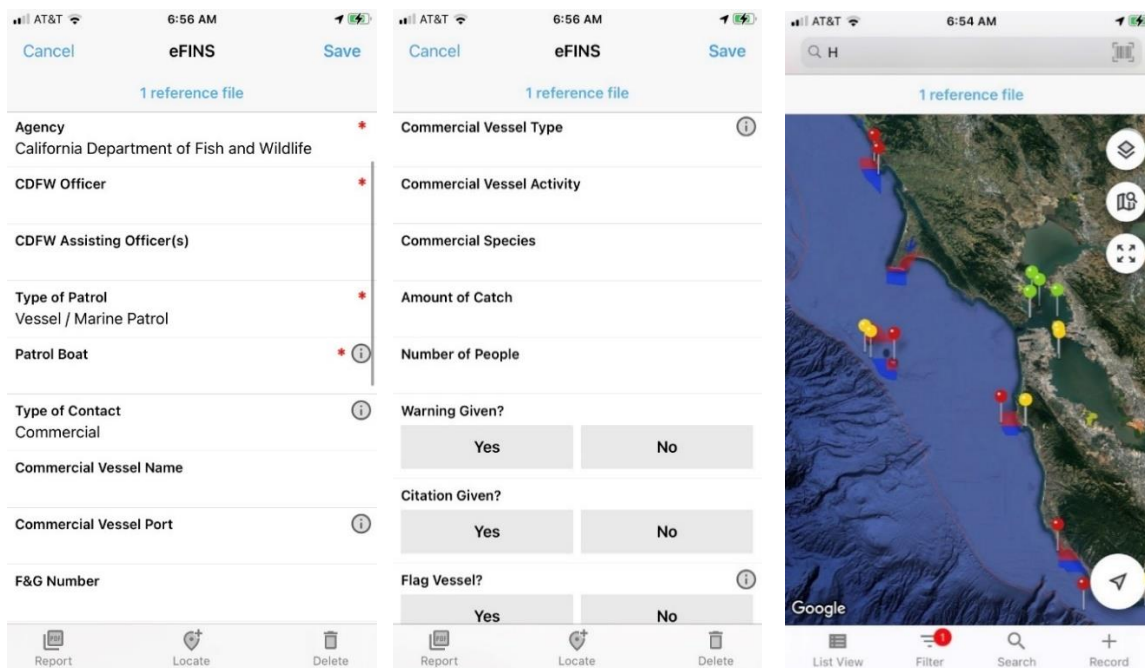

Figure 1-3. Example screenshots of data entry forms and the map tool available through the eFINS app.

While CDFW has recently developed its own Records Management System (RMS) to digitize its records management, eFINS provides valuable supplemental features such as geospatial mapping (see Figure 2 below showing example density analysis of warning and citation records), real-time enforcement data collection, ability to rapidly assess repeat offenders while in the field, and streamlined reporting to agencies and the public about enforcement in MPAs and in the marine environment.
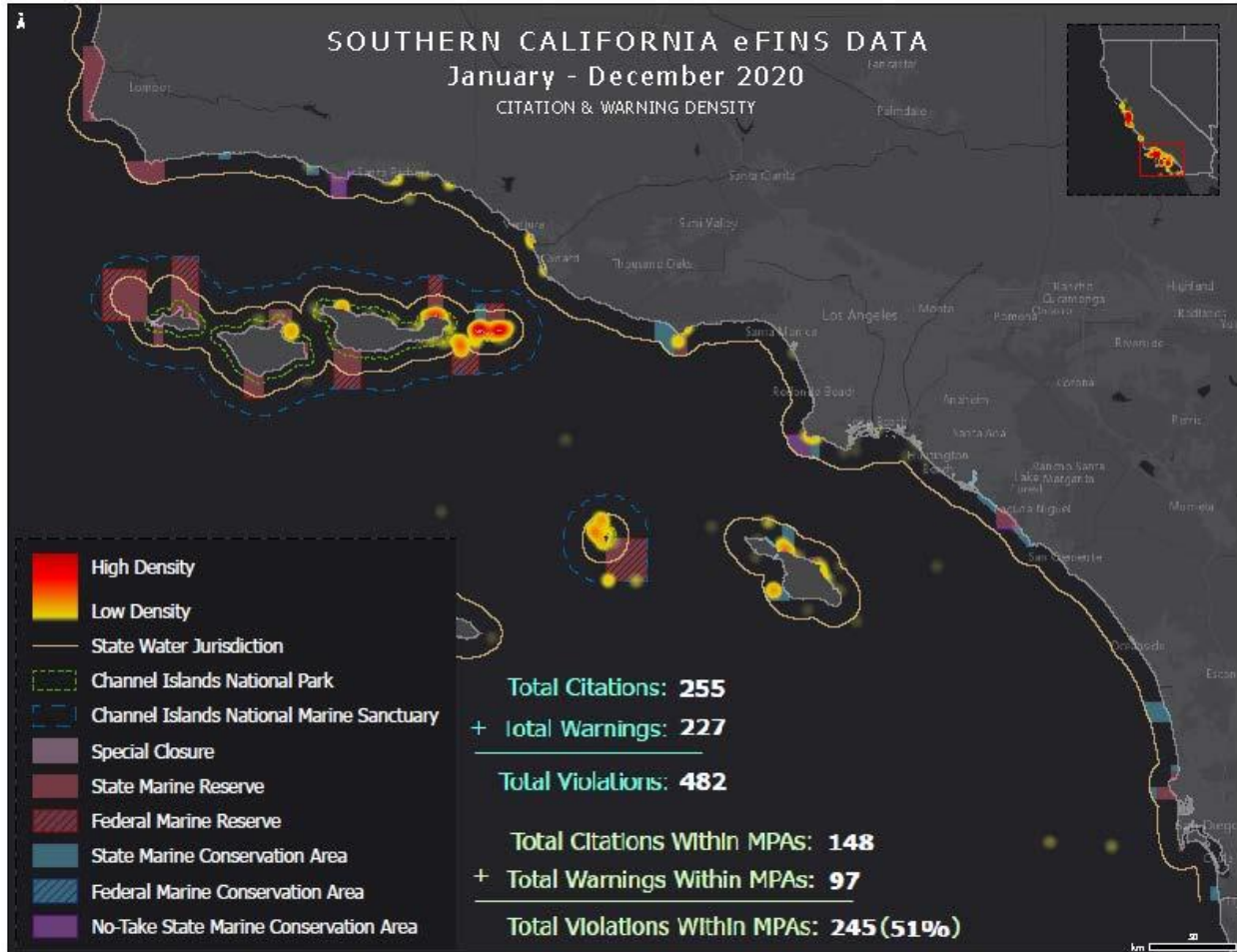
Figure 4: Example map product showing violation (citation and warning) density of eFINS data southern California from January to December 2020.

To ensure privacy, only CDFW, USGC, and the project lead at CINMS have access to the raw eFINS data. However, eFINS data can easily be converted to heat maps of enforcement hot spots, and to track contacts, warnings, and citations inside and outside of MPAs across officers or allied enforcement agency partners. Analysis of eFINS data can assist MPA managers and enforcement agencies to understand how the public is (and is not) complying with MPA regulations and where the State and its partners can focus resources to improve compliance.

Key Findings - eFINS

- The eFINS database continues to demonstrate the power and utility of quality geospatial data. Using an electronic enforcement database allows agencies to quickly and easily view trends in violations or activity, identify locations of key concern, and query data.
- eFINS provides officers, rangers and other marine patrol units with access to searchable historical data while on patrol that can enhance conservation and increase officer safety. Officers using eFINS can quickly search and confirm if a vessel they are contacting has had a previous interaction that resulted in an eFINS record even without internet access.

- Officer input has led to iterative eFINS upgrades to improve its functionality. Over the past five years of eFINS use, participating officers and rangers have demonstrated their capacity and desire to have access to a data collection and reference system like eFINS. The CDFW patrol vessel teams, P/V Swordfish and P/V Steelhead, have been consistently using the system to capture 90-100% of their enforcement contacts for 2+ years (Table 1).
- To facilitate wider agency coordination, beginning in 2018, eFINS data from southern California was shared with USCG Sector Los Angeles/Long Beach Intelligence staff to inform monthly regional inter-agency enforcement briefings and contribute to enhanced overall marine domain awareness.
- Linking eFINS data to data analysis and visualization tools like ArcGIS and R Shiny apps (https://shiny.rstudio.com/) can automate reporting products to reduce agency staff time spent manually compiling enforcement statistics (see Figures 4 and 5).

Table 1: eFINS data entry 2017-2021. Adoption has increased throughout the pilot effort, with the slightly decreased number of entries in 2020 attributed to shifting patrol availability due to the Covid-19 pandemic.

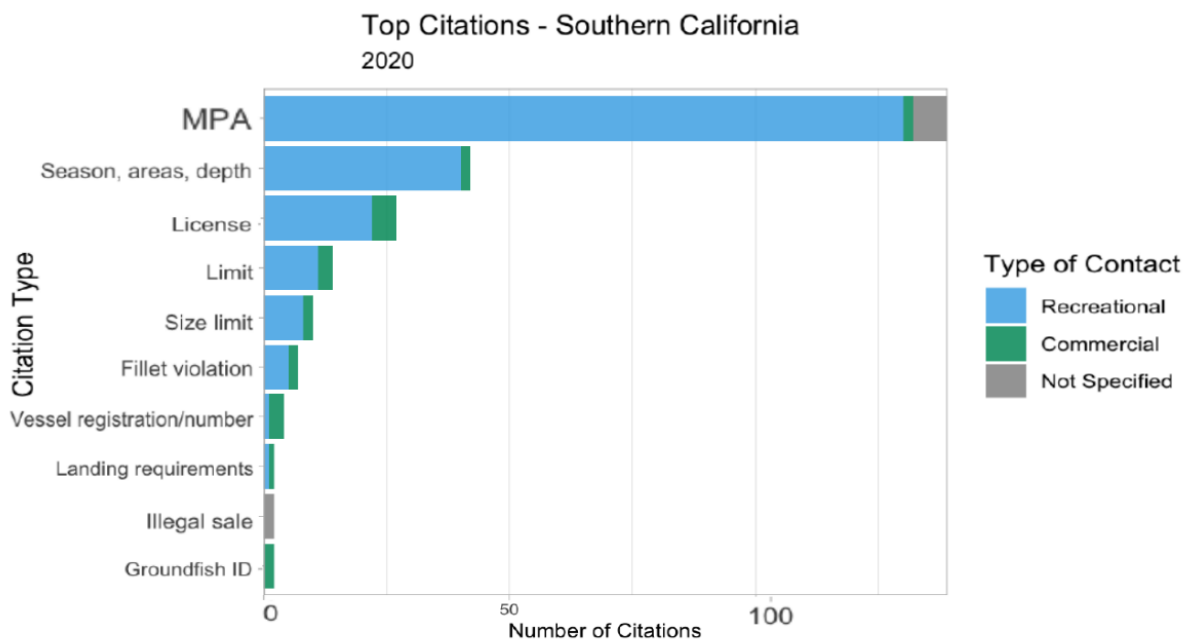| Year	2017	2018	2019	2020	2021
Total eFINS records	571	851	1,055	890	1,123

Figure 5: Example chart showing most frequently documented citations in southern California in 2020.

Challenges - eFINS

Integrating Data with Existing Enforcement Processes:
- eFINS is most useful when data collection is consistent and ideally, universal. Project staff have worked closely with CDFW to provide eFINS training to officers and use has increased significantly in the past two years, but uptake and data entry is not yet mandated across CDFW patrol vessels and regions.
- In 2019, CDFW focused on investment in a Records Management System (RMS) that was anticipated to offer some of the same functionalities as eFINS, such as tracking violations. In 2020, it was determined that while there are some areas of overlap, RMS and eFINS offer different and complementary functionality to CDFW. Identifying the most effective ways to merge and maximize the two database systems should be explored.
- Neither eFINS or RMS currently include a data field related to prosecution and final disposition of a case. However, tracking prosecution outcomes is critical to understand the effectiveness of enforcement efforts.
- Although eFINS can be utilized by officers to populate internal reporting that they do on a daily and monthly basis and significantly reduce time spent manually entering data, the system is not currently being used for this purpose.

Confidentiality and Data Use:
- Due to the sensitivity of the enforcement data being collected, CDFW and NPS have expressed confidentiality concerns over using a third-party cloud platform to host the data. These concerns were assessed and addressed by CDFW's Legal and IT departments in 2017 but remain a consideration for the database moving forward.
- Although the system has the functionality to do so, CDFW has not authorized eFINS to automatically capture GPS information representative of the officers' patrol movement and effort. Enabling this function, as USGC and other agencies do, would help CDFW better understand total patrol coverage.

Cost and Ongoing Maintenance:
- eFINS costs ~$50,000 annually, including user account fees, technical support, and analysis; to date, this is currently supported by RLF and other nonprofit partners.

Knowledge Gaps and Recommendations - eFINS

To date, CDFW has lacked the ability to query real-time, on-the-water data or analyze geospatially-based enforcement records related to its marine enforcement encounters. Officer interactions were historically recorded on paper logbooks, and while the current digitized data tools used by the state ,such as its RMS, improve upon past systems, there is still no consistent way to provide geospatial information or a platform that allows for easy and quick visualization and analysis of data.

Without eFINS, officers have limited ability to access their own and other officers' historical data, such as violation history associated with vessels, during patrols. MPA managers have limited ability to analyze and learn from historical enforcement data captured by officers and allied enforcement partners because accessing such data is laborious or impossible to compare over

time or between and amongst geographies (such as accessing or comparing data from specific MPAs or regions).

We recommend:
1. Expanded use of eFINS to collect statewide enforcement statistics related to MPA management and broader enforcement priorities, starting with comprehensive use by CDFW marine patrols and regular eFINS trainings/refreshers for staff.
2. Integration of all historical eFINS data with data from the RMS and electronic Daily Activity Reports (eDAR) for submission of enforcement data for the DMR to share a more complete snapshot of MPA enforcement activity and violation trends.
3. eFINS data be included in regular, ongoing updates to the Fish and Game Commission and Marine Resources Committee, through its blog and other outreach, particularly through sharing place-based heat maps and anonymized data that can help public stakeholders and Fish and Game Commissioners better understand MPA compliance.
4. CDFW and other resource management agencies (like USCG and NPS) continue to meet regularly and utilize eFINS as a tool to support cross-agency coordination.
5. CDFW and partner agencies evaluate how historical eFINS data can support predictive MPA monitoring and highlight spatial and temporal trends in MPA contacts on the water.

Over the past five years, eFINS has proven to be an inexpensive, easy-to-use app that dramatically enhances MPA enforcement data collection, display, and analysis. The images shared here are a small sample of the capabilities of the eFINS program.

As CDFW and partner agencies look for ways to synergize their efforts, increase efficiencies, and demonstrate the significant investments of time and resources that have been committed to MPA enforcement, eFINS provides a simple way to track and analyze the vast number of MPA contacts made by officers every year. It also allows for coordination across agencies, and ensures that officers are aware of repeated contacts, warnings, and violations in real time. We look forward to working closely with CDFW on ensuring that eFINS information can be complementarily shared alongside other enforcement statistics during the DMR.

Highlights and Key Findings - Marine Monitor (M2) System

In addition to supporting CDFW and enforcement partner MPA patrols through the eFINS pilot project, RLF has partnered with several organizations to pilot autonomous monitoring of MPAs in California and provide additional context for vessel traffic along the coast. Marine Monitor (M2) is a shore-based radar, Automated Information System (AIS) and camera system that can function in off-the-grid environments and detects and records vessel activity offshore. By automatically scanning the waters surrounding a nearshore MPA for vessel activity, M2 can inform patrol officers and other resource managers about vessel activity historically and in real-time.

M2 data can support enforcement efforts by demonstrating vessel presence in MPAs, providing 24/7 tracking data that enhances on-water patrols by officers, and allowing for data analysis of vessel activity patterns over time and across seasons. A recent CDFW press release cited M2 as supporting evidence in the conviction of the commercial passenger fishing vessel *Electra*.

Further information about this effort can be found in the DMR reports submitted by Protected Seas, CINMS, and CMSF. RLF recommends consideration of future state adoption of shore-based radar, AIS, and camera technology to support long-term MPA monitoring and enforcement and promote compliance.

Highlights - Scientific Publications featuring California's MPA network

Since the passage of the Marine Life Protection Act in 1999, MPA managers and researchers have looked to California's MPA network as a natural laboratory and opportunity to better understand California's marine ecosystems and inform marine management generally. Goal 3 of the MLPA states that the MPA network shall "[i]mprove recreational, educational and study opportunities provided by marine ecosystems that are subject to minimal human disturbance, and to manage these uses in a manner consistent with protecting biodiversity." Advancing Goal 3 and the other goals of the MLPA, state and federal agencies, Tribes, public universities, private foundations and partners, and non-governmental organizations have supported a wide range of scientific research inside and outside of California's MPA network.

Key findings - Scientific Publications featuring California's MPA network

A survey of research conducted within California MPAs from 2000 to December 2021 reveals the following high-level findings:

- At least **101 published, peer-reviewed scientific papers** and **32 graduate-level research projects** have featured California's MPA network. Most of these publications have been published since completion of the MPA network in 2012.
- This research comes from **42 universities representing 13 US states and four countries**.
- These publications examine MPAs in every region of California, with the majority (83%) conducting studies across multiple MPAs or at the statewide level. Research focus included environmental science and ecology as well as economics, governance, policy, and human dimensions.
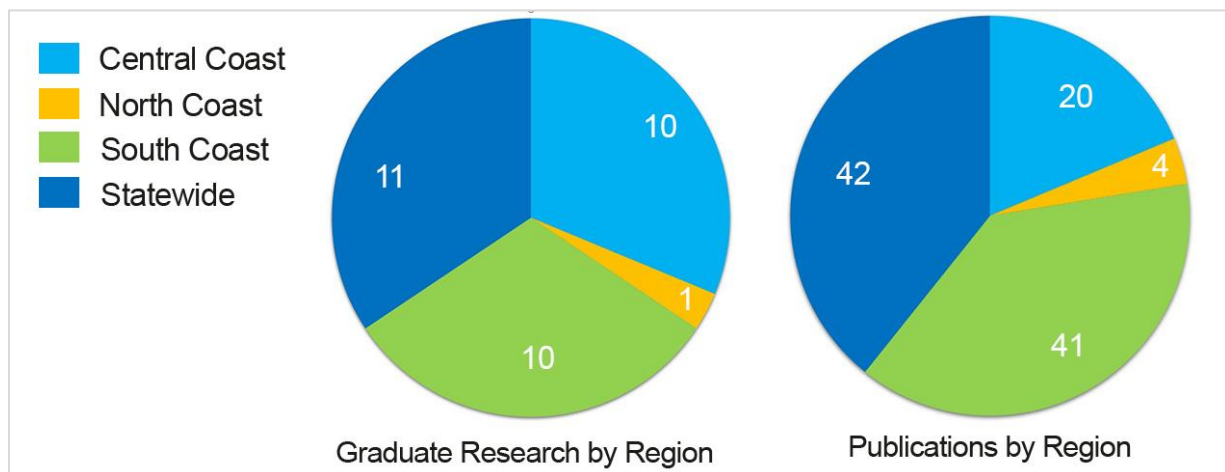

Figure 6: Distribution of MPA research and publications by geography

The number of MPA-focused papers has gradually increased over time and have appeared in 48 individual academic journals over the course of the last 20 years. The most popular journals for California MPA-related research include:
- Ocean and Coastal Management Journal (17)
- Ecological Applications (10)
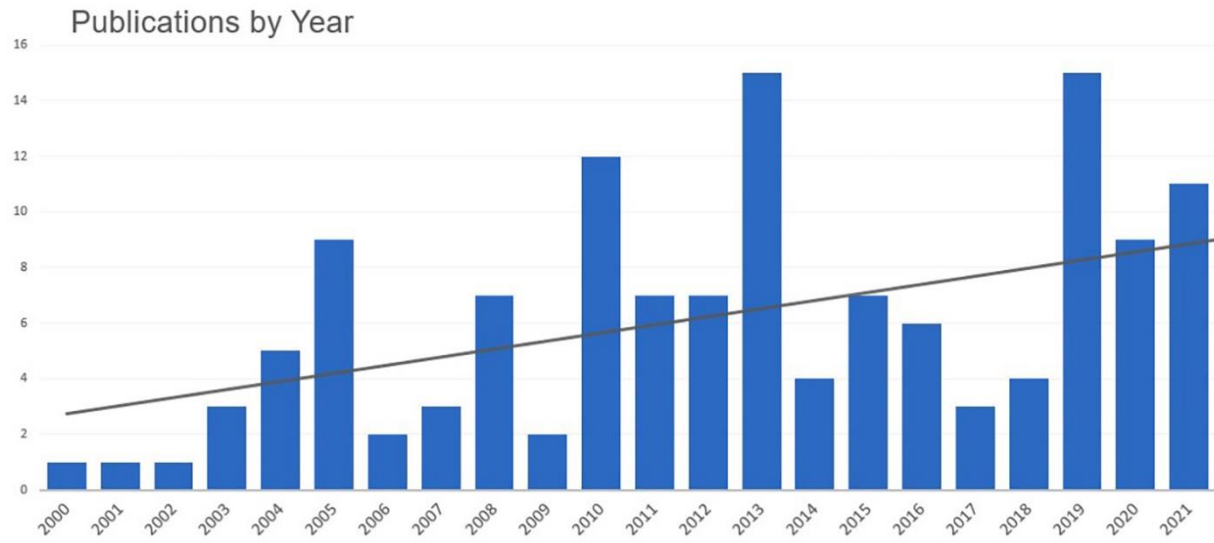- Marine Ecology Progress Series (9)

Figure 7: Volume of MPA publications over time

California's MPA network has also been featured at numerous science and management conferences throughout the US and globally. For example, California agency staff, RLF partners and grantees, and other MPA stakeholders have presented at international conferences such as:
- Symposium on Integrated Coastal Zone Management – Norway (2011)
- World Conference on Ecological Restoration – Mexico (2011)
- 2nd International Marine Conservation Congress – Canada (2011)
- 10th World Wilderness Congress – Spain (2013)
- 3rd International Marine Protected Area Congress – France (2013)
- IUCN World Parks Congress – Australia (2014)
- Oceans 20 - Canada's Oceans Act Conference – Canada (2017)
- 4th International Marine Protected Area Congress – Chile (2017)
- United Nations Convention on Biological Diversity COP 14 – Egypt (2018).

Knowledge Gaps and Recommendations - Scientific Publications featuring California's MPA network

This snapshot into California MPA research and international conferences is not comprehensive; many additional studies are ongoing as of the writing of this report, and there are likely many publications and instances of international conference participation that are not

included here. Nonetheless, California's MPA network has clearly provided significant opportunity for education, research, and study, and its management has been shared globally.

We recommend:
- Continued public investment in MPA research, particularly support for Tribal-led efforts, North Coast monitoring, human dimensions and socioeconomic research, and with an emphasis on inclusion of diverse scientists and perspectives.
- Continued emphasis on sharing MPA research results and management lessons learned.

Conclusion

By establishing the first statewide, scientifically based network of MPAs in the United States, California provides a globally relevant example of MPA management that can share significant lessons learned through the DMR and ongoing evaluation of MPA performance and adaptive management. Over the past two decades, RLF has worked closely alongside CDFW, members of the MPA Statewide Leadership Team, Tribal partners, nongovernmental organizations, academic institutions, the fishing community, and others to support effective implementation of the MLPA and to inform adaptive management that continues to ensure that California is a world MPA leader.

As research shows,[1] through the significant body of scientific publications referenced above, California's MPAs are advancing the goals of the MLPA in multiple ways. Looking ahead, continued partnerships, creativity, and investments are needed to maintain the significant momentum achieved to date. By supporting robust public engagement and partnership-based MPA management, California can ensure that its MPA Management Program continues to contribute to biodiversity protection and climate change resilience, to benefit all Californians.

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[1] Murray, Samantha and Tyler T. Hee. *A rising tide: California's ongoing commitment to monitoring, managing and enforcing its marine protected areas.* 182 Ocean & Coastal Management (2019).