Marine aquaculture policies and regulations in Puerto Rico

May 2026

The Nature Conservancy

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Recommended citation

The Nature Conservancy. (2026). *Marine aquaculture policies and regulations in Puerto Rico*. San Juan, Puerto Rico.

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Cover photo: The Puerto Rican coast (© Pichón Duarte).

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Acronyms

CARICOOS	Caribbean Coastal Ocean Observing System
CFMC	Caribbean Fisheries Management Council
CINVESTAV	Centro de Investigación y de Estudios Avanzados
CPS	Conservation Practice Standard
CRIM	Puerto Rico Municipal Revenue Collection Center
CZMA	U.S. Coastal Zone Management Act
DECA	Puerto Rico Environmental Compliance Assessment Division
DEDC	Puerto Rico Department of Economic Development and Commerce
DNER	Puerto Rico Department of Natural and Environmental Resources
EFH	Essential Fish Habitat
EPA	U.S. Environmental Protection Agency
ESA	U.S. Endangered Species Act
FAO	Food and Agriculture Organization of the United Nations
FDA	U.S. Food and Drug Administration
GP	General Permit
HACCP	Hazard Analysis Critical Control Point
IP	Individual Permit
ISER	Institute for Socio-Ecological Research
JPA	Joint Permit Application
MSA	U.S. Magnuson–Stevens Fishery Conservation and Management Act
MSP	marine spatial planning
NIMBY	not in my backyard
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollution Discharge Elimination System
NRCS	Natural Resources Conservation Service
NSSP	National Shellfish Sanitation Program
NWP	Nationwide Permit
OGPe	Puerto Rico Permits Management Office
PATON	Private Aids to Navigation
PBA	Programmatic Biological Assessment
PGP	Programmatic General Permit
PRDA	Puerto Rico Department of Agriculture
PRPB	Puerto Rico Planning Board
PRSHPO	Puerto Rico State Historic Preservation Office
SK	Saltonstall Kennedy
SSF	small-scale fisheries
TNC	The Nature Conservancy
UPR	University of Puerto Rico
U.S.	United States
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
VI DPNR	U.S. Virgin Islands Department of Planning and Natural Resources
WOTUS	waters of the United States

Introduction

Marine aquaculture in Puerto Rico is at a small experimental stage, but the industry could provide alternative or supplemental livelihoods and positive environmental impacts if it implements a regenerative aquaculture approach (see the definitions and Figure 2 on the next page). The commercial cultivation of non-fed species, such as seaweeds or bivalves, has the potential to provide a range of ecosystem benefits, including stock enhancement, habitat provision, increased abundance and biodiversity, improved water quality and clarity, buffering against ocean acidification, and climate benefits from seaweed-based products (Gentry et al., 2020; The Nature Conservancy [TNC], 2021). These benefits result from several driving factors, including the intensity and scale of culture, type of gear, farm management practices, species cultivated, and local environmental conditions (TNC, 2021).

While several studies have identified potential species and cultivation feasibility in Puerto Rico's marine environment, the development of a marine aquaculture industry has yet to be fully realized (Alston et al., 1999; Kite-Powell et al., 2022; Van Wyk & Davis, 2006a). The industry may be slow to develop due to the lack of a regulatory framework and enabling policies, insufficient upstream (e.g., hatchery, nursery) and downstream (e.g., processing facility) infrastructure, risk of hurricane impacts, and limited accessible shallow-water areas for farming. Marketing challenges and high transportation costs for imports and exports also pose challenges for development (Davies et al., 2019).

The complexity of aquaculture policies and regulations can vary depending on species, in-water versus land-based cultivation, and development in U.S. federal waters versus territorial or state waters. There can also be distinct and overlapping jurisdictions of federal, state, or territorial agencies—even municipal. **The goals of this report are to review marine aquaculture efforts in Puerto Rico, provide a roadmap of the current permitting processes for cultivation of non-fed species such as molluscan shellfish (referred to herein as shellfish) and seaweed, and identify a framework that may assist with the sustainable and inclusive growth of marine aquaculture in Puerto Rico.**

A well-governed aquaculture industry is needed to secure the socioeconomic and environmental benefits of the sector. Policy interventions can consider both catalyzing and sustaining an aquaculture industry through systems-based approaches that account for cross-sectoral links such as supportive infrastructure development and small-scale fisheries (SSF) synergies (Partelow et al., 2023; Ruff et al., 2020). Global sustainability agendas, such as the United Nations Food and Agriculture Organization (FAO) *Guidelines for Sustainable Aquaculture*, can provide a framework for balancing social and ecological benefits with increased productivity (FAO, 2025).

Figure 1: Inland waters along the coast of Puerto Rico (© Pichón Duarte).

Fed aquaculture refers to the cultivation of aquatic organisms such as finfish or crustaceans (e.g., shrimp, salmon, or cobia) that require feed inputs.

Non-fed aquaculture refers to the cultivation of aquatic organisms such as shellfish or macroalgae (e.g., oysters or seaweed) that rely on natural food sources in their surrounding environment without the need for feed inputs.

Restorative or regenerative aquaculture occurs when commercial or subsistence aquaculture provides direct ecological benefits to the environment with the potential to generate net-positive environmental outcomes.

Ecologically sustainable development of aquaculture focuses on balancing food production with the conservation of surrounding ecosystems and mitigating negative environmental impacts.

Conservation aquaculture has been defined as "the use of human cultivation of aquatic organisms for the planned management and protection of a natural resource" (Froehlich et al., 2017). Conservation aquaculture typically does not involve the commercial sale of cultured organisms.

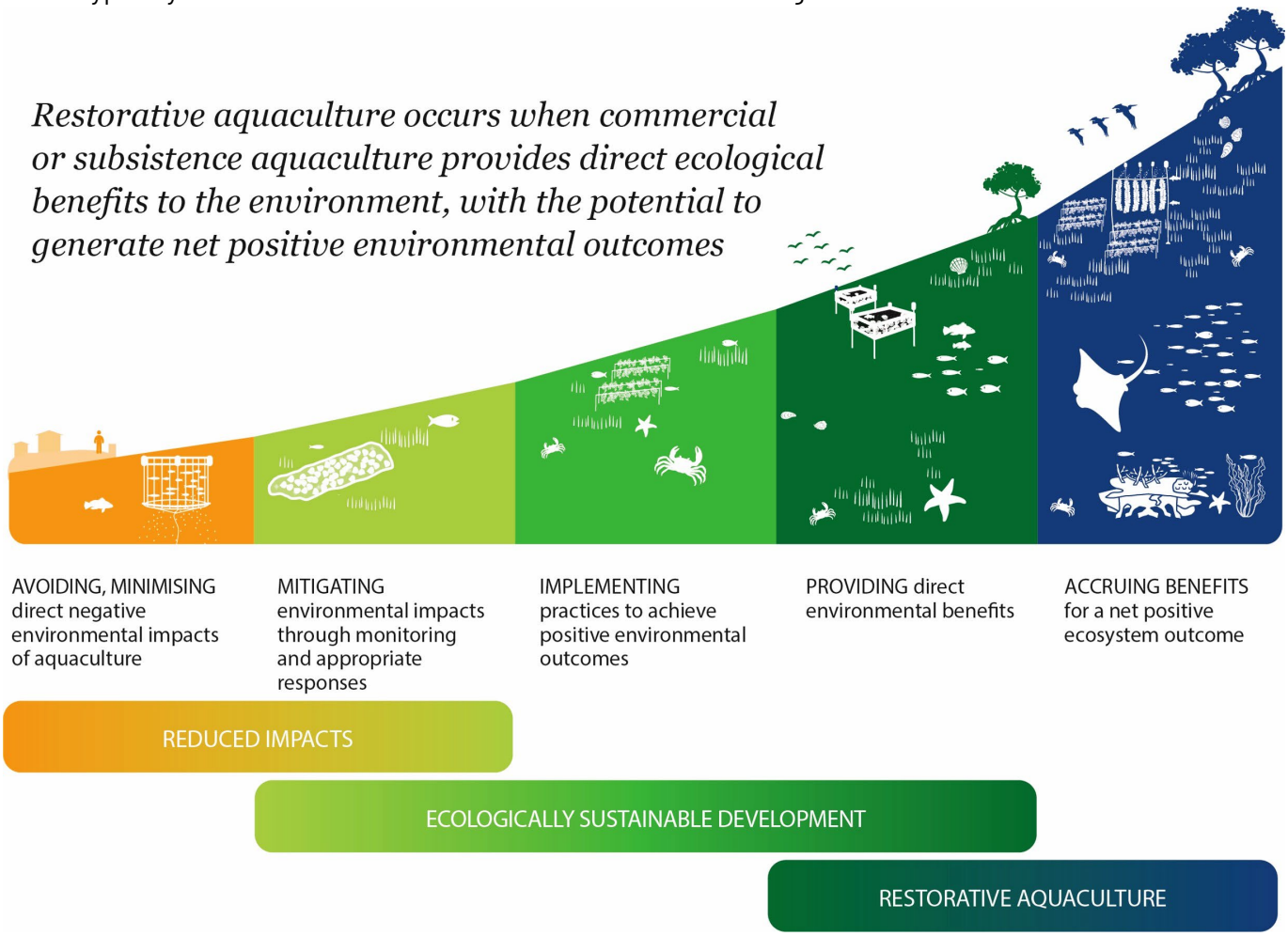

Figure 2: The restorative aquaculture pathway.

Overview of marine aquaculture activities in Puerto Rico

While marine aquaculture is nascent in Puerto Rico, a history of research activities has looked at the feasibility of cultivating different fed and non-fed species. For example, several studies have sought to determine the viability of farming native mangrove oysters, *Crassostrea rhizophorae*, and indeed, an artisanal commercial oyster fishery presently exists in several locations, such as Boquerón and Loíza (Hertler et al., 2019; Mattox, 1949; Watters & Martinez, 1976; Watters & Prinslow, 1975). There have also been spiny lobster, *Panulirus argus*, ranching experiments whereby postlarvae are collected from the wild and grown to commercial size following practices similar to those used in Southeast Asia (Alston et al., 1999; Davis et al., 2006). Additionally, several different shrimp and finfish mariculture companies were established in Puerto Rico for periods of time (Rivera, 2022). For example, in the early 2000s, Snapperfarm Inc. had a research and commercial project for cultivating cobia, *Rachycentron canadum*, off Culebra Island. The cobia farm was sited in an appropriate location and showed no significant environmental impact, though due to permitting delays for commercial-scale expansion and investor priorities, the company moved to Panama (Barnaby, 2006; Benetti et al., 2007).

Recent in-water marine aquaculture farms

Several permitted in-water coral nurseries focusing on conservation aquaculture exist throughout the archipelago and are led by local organizations such as Sociedad Ambiente Marino and the Institute for Socio-Ecological Research (ISER). While not for food, the skills applied to these coral projects could be transferable to commercial aquaculture. In Puerto Rico, at the time of writing this report, only two known projects targeting research for commercial shellfish and seaweed aquaculture have gone through the permitting process for in-water farms, and those experiences have informed this report.

In 2020, the Marine Biological Laboratory was awarded U.S. Department of Energy funding for a seaweed aquaculture project: Techniques for Tropical Seaweed Cultivation and Harvesting. The project utilized an offshore array design (Figure 3) with an innovative storm-avoidance system to cultivate

Figure 3: Left: Marine Biological Laboratory catenary array seaweed farm. Right: *Eucheuma isiforme* example. © Luis R. Rodríguez Matos and Dr. Loretta Roberson.

Gracilaria and *Eucheuma* species located in La Parguera. The team also conducted a preliminary evaluation with fishers from Boquerón, and completed a techno-economic assessment model to determine the economic viability of seaweed farming in Puerto Rico. The project was conducted in collaboration with the University of Puerto Rico (UPR) Department of Marine Sciences, the UPR Materials Characterization Center, Puerto Rico Sea Grant, TNC, the Caribbean Coastal Ocean Observing System (CARICOOS), the Woods Hole Oceanographic Institution, C.A. Goudey and Associates, the University of Connecticut, Centro de Investigación y de Estudios Avanzados (CINVESTAV), Makai Ocean Engineering, Pacific Northwest National Laboratory, Rutgers University, the University of California at Irvine, and the University of Washington.

In Culebra, the local organization Mujeres de Islas (Figure 4)—in collaboration with Asociación Pesquera de Culebra, Puerto Rico Sea Grant, Sociedad Ambiente Marino, and Conservación ConCiencia—was awarded funding from the National Oceanic and Atmospheric Administration (NOAA) FY23 Saltonstall Kennedy (SK) Competition for a community-based native oyster aquaculture project (NOAA, 2023). Several Culebra sites are permitted for experimental spat collection and grow-out. The project has several components across the supply chain that assess the viability of a native oyster aquaculture industry in Puerto Rico, including (1) determining spatiotemporal differences in spat collection, growth, and the survival of native pearl oysters, *Pinctada imbricata*, and mangrove oysters; (2) mapping the supply chain and determining the willingness to pay for farmed oysters; and (3) co-evaluating the project with local fishers and determining the potential for collective action regarding future enterprises.

Upstream & downstream infrastructure development

In addition to the in-water projects just described, it is important to highlight several land-based marine aquaculture projects that contribute to the development of infrastructure and capacity. In Naguabo, Conservación ConCiencia—in collaboration with Florida Atlantic University's Harbor Branch Oceanographic Institute Queen Conch Laboratory, as well as Villa Pesquera de Naguabo—has developed the first queen conch hatchery and nursery for restoration purposes in Puerto Rico. This community-led hatchery was initially funded by NOAA SK and is now in the process of establishing two mobile queen conch labs in other fishing communities on the main island. While currently focused on queen conch, *Aliger gigas*, the infrastructure and hatchery equipment may be applicable to other shellfish.

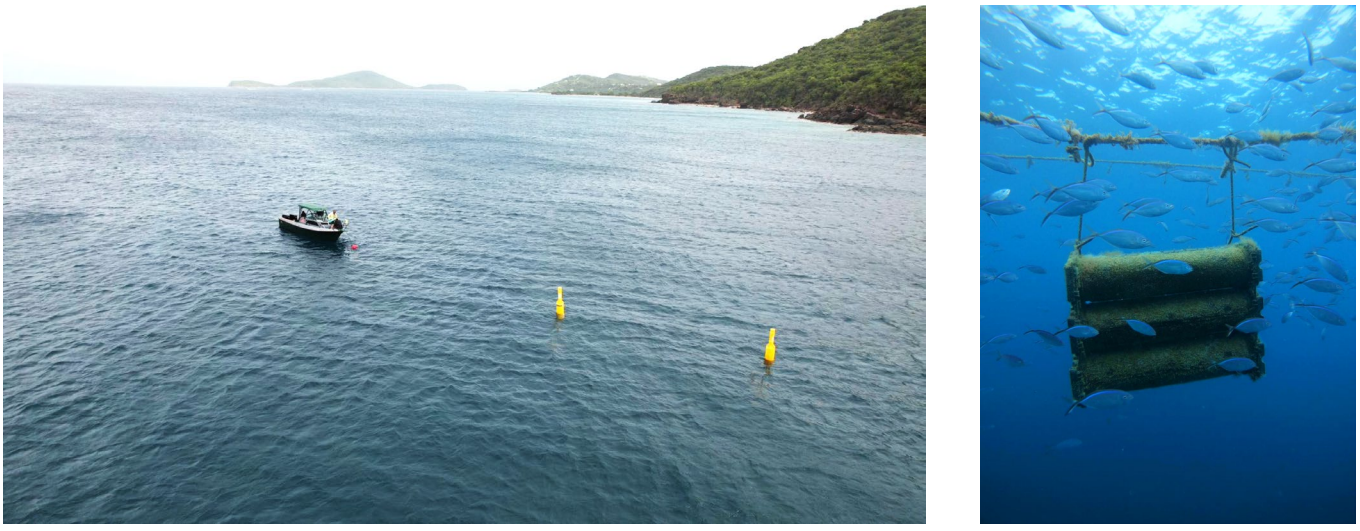

Figure 4: The Mujeres de Islas oyster farm's double line array (left) with oyster baskets (right). © Emmanuel Maldonado and Nicolás Gómez Andújar.

Figure 5: Institute for Socio-Ecological Research hatchery infrastructure (left) and microalgae lab (right). © ISER.

Researchers from Ana G. Méndez University and UPR, funded by Puerto Rico Sea Grant, are exploring hatchery techniques for mangrove oysters. The research team is also analyzing microbial and heavy metal contaminants of oyster samples from several locations and testing oyster depuration for safe human consumption. Additionally, the UPR Department of Marine Sciences at Mayagüez has aquaculture infrastructure available through research laboratories and teaching facilities.

In La Parguera and Ceiba, ISER—with funding and in collaboration with NOAA, the Puerto Rico Department of Natural and Environmental Resources (DNER), UPR at Mayagüez, U.S. Fish and Wildlife Service (USFWS), and National Fish and Wildlife Foundation—has developed the first land-based coral, sea urchin, and crab nurseries in Puerto Rico for ecosystem restoration efforts around the archipelago (Figure 5). The nurseries also cultivate seaweed. In 2024, ISER received funding from Puerto Rico Sea Grant to optimize the cultivation of *Ulva* species at land-based nurseries and to determine if the production of *Ulva* is economically viable to produce and assess various pathways to integrate this undervalued crop into the Puerto Rico Blue Economy.

TNC, with funding from the U.S. Department of Agriculture Natural Resources Conservation Service (USDA-NRCS), is supporting the development of oyster aquaculture infrastructure. Sub-awardee ISER installed oyster depuration facilities at the Culebra fishing association and is utilizing larval production equipment to conduct proof-of-concept hatchery techniques for native oysters for both commercial and conservation efforts.

Additionally, Cultimar Technologies, with support from several investors, is developing an Atlantic red snapper hatchery in Arecibo, with the goal of supplying fingerlings to farms across Latin America and the Caribbean (Cultimar, 2026). Sea Grant also recently funded Innovasea to explore the potential for offshore fish farming in Puerto Rico, with red snapper as a target species and potentially sourcing fingerlings from Cultimar (Innovasea, 2026).

Territorial & federal marine aquaculture activities

Several federal and territorial government projects and activities are setting precedents for aquaculture development in Puerto Rico. For example, the Pacific Northwest National Laboratory conducted a co-location study that assessed the potential of integrating the siting of wave energy devices and marine aquaculture. The team partnered with Manna Fish Farms and the University of New Hampshire on the requirements for aquaculture (Freeman et al., n.d.).

In August 2023, NOAA hosted the U.S. Caribbean Marine Spatial Planning (MSP) Workshop in San Juan. Its goals were to share information about NOAA's

MSP work, inventory available data, identify data gaps, and increase local capacity and resources for regional ocean planning (Morris & Wright, 2023). Such efforts aim to assist coastal managers, environmental organizations, and industries with planning for future Blue Economy development opportunities like renewable energy and aquaculture. They may also help inform aquaculture planning efforts like NOAA's effort to identify Aquaculture Opportunity Areas, which are geographic areas evaluated to determine their potential suitability for commercial aquaculture development.

The Caribbean Regional Ocean Partnership receives NOAA funds through CARICOOS for a Data Sharing Initiative (crop.caricoos.org) that contributes to MSP efforts, including aquaculture. The data portal integrates different data products, information, and visualization tools from different sources, making them available to the public.

The USDA-NRCS Mid-Atlantic and Caribbean Region is conducting Coastal Zone Soil Surveys in Puerto Rico that could aid in evaluating and assessing the suitability of sites for different aquaculture species. Once completed, the survey will provide detailed spatial soil maps, a rich database of soil chemical and physical properties, and interpretations for MSP for aquaculture and restoration projects.

DNER's most recent Coastal Zone Management Act (CZMA) report, *Final Section 309 Assessment and Strategy 2026 to 2030* (DNER, 2026), indicated that while aquaculture is an important enhancement area, its development is a low priority for the Puerto Rico Coastal Zone Management Program. The report listed concerns regarding negative impacts from traditional aquaculture activities. Limited CZMA Section 309 funding may be a reason for the low priority score, and identified aquaculture management needs could still be addressed with CZMA Section 306 or other funding sources. Additionally, Special Area Management Plans could potentially be used as a planning and management mechanism for aquaculture.

The U.S. Virgin Islands Department of Planning and Natural Resources (VI DPNR) recently went through a multiyear process to advance marine aquaculture, which could be informative for any future efforts in Puerto Rico. Specifically, the Virgin Islands Commission on Aquaculture and Mariculture was formed, and the commission developed a 5-year strategic plan. Additionally, VI DPNR updated aquaculture rules and regulations, which were recently transmitted to the U.S. Virgin Islands Legislature (VI DPNR, 2026).

Marine aquaculture permitting process in Puerto Rico's territorial waters

Shellfish and seaweed aquaculture farms in territorial waters of Puerto Rico (i.e., 9 nautical miles from the coastline) require several permits that cover the siting of farms; leasing of the seabed; use of specific infrastructure or farm gear; use of farm inputs such as feed and nutrients; and capture, importation, and exportation of marine organisms (Table 1). Many of these permits and authorizations have associated fees (Table 2).

Department of the Army General Permits (GPs), including Nationwide Permits (NWPs), or Individual Permits (IPs)

In Puerto Rico, the DNER, the Puerto Rico Planning Board (PRPB), and the U.S. Army Corps of Engineers (USACE) have Joint Permit Application (JPA) procedures. The JPA for aquaculture activities is submitted online in the Regulatory Request System (rrs.usace.army.mil/rrs). USACE submits the application to the agencies and departments specified in Table 1 under the USACE permit nexus.

As shown in Table 1, the USACE permit and JPA procedures are the nexus for many regulatory requirements (Figure 6). Depending on the type, magnitude, and potential impact of the aquaculture activities, a permit application is processed by USACE for authorization as a GP or IP. GPs include several NWPs pertaining to aquaculture activities, such as NWP 48 – Commercial Shellfish Mariculture Activities and NWP 55 – Seaweed Mariculture Activities. NWPs 55 and 56 were developed in response to Executive Order 13921 for more effective and streamlined permitting.

Table 1: Permits and regulatory requirements of federal and local agencies for marine aquaculture of non-fed species, such as shellfish and seaweed, in Puerto Rico's territorial waters.

Permit or authorization (as needed, category noted in bold at left)		**Federal or territorial agency**	**Facility and/or activity requiring coverage**	**Statute or authority**
Department of the Army General Permit (GP) or Individual Permit (IP). Applied through the Joint Permit Application (JPA) process.		Issued by the U.S. Army Corps of Engineers (USACE)	Aquaculture activities affecting navigable waters and/or resulting in discharges of dredged or fill material into U.S. waters	Section 10 of the Rivers and Harbors Act; Section 404 of the Clean Water Act
USACE permit nexus for other requirements	Endangered Species Act (ESA) consultation. Conducted by the lead federal agency (e.g., USACE during the permit application review process).	USFWS and NOAA Fisheries	Direct or indirect impacts associated with proposed aquaculture activity on all species federally listed as threatened or endangered, as well as their critical habitat	Section 7 of the ESA
	Marine Mammal Protection Act consultations. Conducted by the lead federal agency (e.g., USACE during the permit application review process).	USFWS and NOAA Fisheries	Direct or indirect impacts associated with proposed activity on marine mammal species	Marine Mammal Protection Act
	Essential Fish Habitat (EFH) Consultation. Conducted by the lead federal agency (e.g., USACE during the permit application review process).	NOAA Fisheries Habitat Conservation Division	Direct or indirect impacts associated with proposed action/activity on all EFH	Magnuson–Stevens Fishery Conservation and Management Act (MSA; 2007)
	National Historic Preservation Act Consultation. Conducted by the lead federal agency (e.g., USACE during the permit application review process).	Puerto Rico State Historic Preservation Office (PRSHPO)	Required for any federal funding, license, or permit that has the potential to affect historic properties	Section 106 of the National Historic Preservation Act
	Water Quality Certificate (will receive a copy of the JPA).	Puerto Rico Department of Natural and Environmental Resources (DNER), Point Sources Permit Division	Certification or waiver required for any federal license or permit that authorizes any activity that may result in any discharge from a point source into waters of the United States (WOTUS)	Clean Water Act Section 401 Water Quality Certification Improvement; Regulation 9677

Permit or authorization (as needed, category noted in bold at left)	Federal or territorial agency	Facility and/or activity requiring coverage	Statute or authority
Coastal Zone Management Act (CZMA) Federal Consistency Certification (will receive a copy of the JPA).	Puerto Rico Planning Board (PRPB)	Requires that federal actions within and outside the coastal zone—that have reasonably foreseeable effects on any coastal use (land or water) or natural resource of the coastal zone—be consistent with the enforceable policies of a state's federally approved coastal management program	CZMA
Authorization of a concession. Applied through the JPA process.	DNER	Leasing of submerged lands for "water-dependent uses," including aquaculture	Regulation 4860 – Regulation for the Use, Surveillance, Conservation, and Management of the Territorial Waters, Submerged Lands Thereunder, and the Maritime Zone; Amendment 5207; Amendment 7828; Administrative Order 95-17
Environmental Compliance Determination	Puerto Rico Department of Economic Development and Commerce (DEDC), Environmental Compliance Assessment Division (DECA)	Determines if the proposed activity will have potentially significant environmental impact; this determination is required for the authorization of a concession and is applied for separately	Regulation 8858; Regulation 9473; Law for Permit Process Reform (161); Environmental Public Policy Act (416)
Private Aids to Navigation (PATON).	U.S. Coast Guard (USCG)	Lighted structures, day beacons, and lighted and unlighted buoys for marking structures in navigable waters; noncommercial buoys normally do not require a permit	PATON
National Pollution Discharge Elimination System (NPDES) permit.	U.S. Environmental Protection Agency (EPA)	Required for the discharge of pollutants to WOTUS, which includes the addition of feed, nutrients, pharmaceuticals, or other substances	Clean Water Act Sections 402 and 403

Permit or authorization (as needed, category noted in bold at left)	**Federal or territorial agency**	**Facility and/or activity requiring coverage**	**Statute or authority**
Special fishing permits: (1) Scientific Permit or (2) Mariculture/ Aquaculture Permit.	DNER (including PR Department of Agriculture approval if it is a mariculture/ aquaculture permit)	Capture, importation, exportation, and tenure of aquatic organisms for (1) scientific or (2) commercial purposes	Law Number 278 of November 29, 1998, as amended (known as the Puerto Rico Fisheries Law); Regulation 7949
Development, Land Use, and Business Operation Permit.	DEDC Permit Management Office	Commercial aquaculture businesses	Law Number 416 –Environmental Public Policy Act; Joint Regulation 9233
Water use permit.	DNER	Brackish or saline water use or intake for aquaculture land-based facilities, such as a hatchery, nursery, or depuration system	Law for the Conservation, Use, and Development of Water Resources of Puerto; Regulation 6213

Table 2: Associated costs for permits and regulatory requirements of federal and local agencies for marine aquaculture of non-fed species in Puerto Rico, with filing fees submitted each renewal period.

Permit, authorization, and/or requirement	**Fee and frequency**
Filing fee for concession, JPA process	$500 renewed every 1-5 years
Benthic survey and spatial analysis for ESA and MSA consultations	Estimates vary *
Appraisal certified and done by an expert appraiser	Estimates vary *
Public liability insurance	Estimates vary *
Annual fee for authorization of a concession	Equivalent to 8% of appraisal value annually
Public notice requirement for authorization of a concession	Estimated at $500
Filing fee for Environmental Compliance Determination	$100–$200
Filing fee for special fishing permits: (1) Scientific Permit or (2) Mariculture/Aquaculture Permit	$25–$400 renewed annually
Filing fee for Development, Land Use, and Business Operation Permit	$75
Filing fee for water use permit	$200

* Benthic surveys and spatial analysis costs vary greatly depending on the scale and level of detail required to inform the permitting and environmental review process. Applicants should work closely with permitting agencies to determine the appropriate level of detail necessary before developing plans to conduct benthic surveys or spatial analyses for aquaculture activities. Additionally, the public liability insurance cost and the cost to obtain the appraisal will vary depending on the size of the concession.

Acronyms appearing in this figure:
CRIM – Puerto Rico Municipal Revenue Collection Center. DECA – Puerto Rico Environmental Compliance Assessment Division. DEDC – Puerto Rico Department of Economic Development and Commerce. DNER – Puerto Rico Department of Natural and Environmental Resources. EPA – U.S. Environmental Protection Agency. GP – General Permit. IP – Individual Permit. JPA – Joint Permit Application. NOAA – National Oceanic and Atmospheric Administration. NPDES – National Pollution Discharge Elimination System. OGPe – Puerto Rico Permits Management Office. PATON – Private Aids to Navigation. PRPB – Puerto Rico Planning Board. PRSHPO – Puerto Rico State Historic Preservation Office. USACE – U.S. Army Corps of Engineers. USCG – U.S. Coast Guard. USFWS – U.S. Fish and Wildlife Service.

Figure 6: Flowchart indicating the general steps taken by the applicant (dark blue) and agencies (green) for the permitting process in Puerto Rico.

Although NWPs are more streamlined than IPs, both NWPs and IPs require USACE to satisfy consultation requirements, as applicable, in accordance with Section 7 of the U.S. Endangered Species Act (ESA), the Essential Fish Habitat (EFH) provisions of the U.S. Magnuson–Stevens Fishery Conservation and Management Act (MSA), and Section 106 of the U.S. National Historic Preservation Act. These consultations are designed to ensure actions do not negatively impact endangered species, EFH, other critical habitat, or any historic sites and cultural resources. Additionally, projects must obtain a Water Quality Certificate from DNER. Applicants may request pre-application meetings with USACE and other agencies to validate information and requirements before submitting the JPA application.

Authorization of a concession

DNER's authorization of a concession for the use of territorial waters and submerged lands is part of the JPA process (Figure 6). DNER's filing fee for the JPA is $500, paid at the time of application submission, though it can be waived at the DNER Secretary's discretion for nonprofits, associations, or unincorporated groups conducting activities for noncommercial use, or if a person demonstrates a lack of resources and the activity is their only source of income, such as bona fide fishers. The filing fee is also required when renewing permits, and renewals may occur every 1 to 5 years, depending on the concession.

The authorization of a concession requires publication of a notice in a general newspaper (~$500 fee) that indicates all documents are available for public scrutiny, though compliance with this requirement may be waived at the DNER Secretary's discretion. Additionally, the applicant must provide a copy of public liability insurance. Plus, an Environmental Compliance Determination must be made by the Puerto Rico Department of Economic Development and Commerce (DEDC), Environmental Compliance Assessment Division (DECA; $100–$200 fee). It is the applicant's responsibility to complete the public notice using the DNER template and the Environmental Compliance Determination.

Aquaculture is considered a "water-dependent use" and is treated the same as other marine industries (i.e., constructing marinas, dredging navigational channels, installing power lines, etc.), with the annual fee based on 8% of the appraisal value per square meter of the site. Exemptions to the annual fee may be made at the DNER Secretary's discretion for nonprofits, associations, or unincorporated groups conducting activities for noncommercial use, or if a person demonstrates a lack of resources

The permit application package should include, at a minimum, the fully completed Form 4345.* Instructions on correctly filling in each of the form's blocks can be found on the USACE website and include:

- A detailed description of the proposed activities in waters of the United States (WOTUS).
- The proposed methodology for carrying out the proposed construction activities in WOTUS.
- A breakdown of proposed permanent and temporary impacts in WOTUS.
- Drawings that clearly illustrate the footprint of the proposed project overlaid on WOTUS. The drawings must include a location map as well as plan and cross-sectional views of the proposed activity.
- A baseline habitat survey. A delineation of the benthic habitat in and adjacent to the marine aquaculture site(s) is required. Include, as applicable, any mangroves, seagrass, coral, or coral hardbottom habitat in or adjacent to the project area.

* Go to www.publications.usace.army.mil/USACE-Publications/Engineer-Forms/u43543q/34333435/

and the activity is their only source of income, such as bona fide fishers. It is the applicant's responsibility to obtain the appraisal value and submit it to DNER. Then, DNER submits it to the Puerto Rico Municipal Revenue Collection Center (CRIM) for approval.

Private Aids to Navigation (PATON)

Another authorization that may be required is the U.S. Coast Guard (USCG) PATON for the installation of day beacons, lights, buoys, etc. to mark privately owned marine obstructions or other similar hazards to navigation. This helps ensure that aquaculture operations are clearly visible to traveling vessels and do not pose a hazard to navigation. Noncommercial mooring buoys may not require this permit.

Development, Land Use, & Business Operation Permit

This permit is required, and applications are submitted through the DEDC Permit Management Office. This permit requires a $75 filing fee and covers all commercial aquaculture businesses, including in-water commercial farms, aquaculture centers, product processing and sales centers, and commercial hatcheries and nurseries.

Puerto Rico Department of Natural and Environmental Resources (DNER) special fishing permits

DNER may require special fishing permits. These include a Scientific Permit or Aquaculture/Mariculture Permit, which have a $25–$400 filing fee depending on the permit use and the applicant's status as a nonprofit or for-profit entity. Possible uses cover the capture, importation, exportation, and tenure of aquatic organisms. This would apply to the importation of oyster broodstock, seaweed, or spat/seed; the collection of wild oyster spat and broodstock or parental seaweed blades or masses for cultivation; and the exportation of cultivated organisms. Additionally, several vertebrate and invertebrate species are listed as authorized for importation, including several species of oysters, such as the nonnative Pacific oyster, *Crassostrea gigas*. The list of approved species for importation does not include any type of algae. A separate authorization would be required for species not listed. Health certificates from accredited veterinarians are also required for imported species.

National Pollution Discharge Elimination System (NPDES)

This permit from the U.S. Environmental Protection Agency (EPA) may be required depending on production thresholds, types of culturing systems, and biological pollutants. Shellfish or macroalgae cultivation may not require this permit. Applicants should confirm this with the EPA. Proponents of projects in Puerto Rico must submit applications directly to EPA Region 2. While the NPDES permit is developed and issued by the EPA, DNER serves as the certifying authority.

Requirements for land-based infrastructure and postharvest processing

While this report largely focuses on requirements for in-water marine aquaculture, there are still several relevant requirements for land-based infrastructure and postharvest processing. For example, brackish or saline water use or intake for aquaculture land-based facilities, such as a hatchery, nursery, or depuration system, would require a water use permit from DNER.

If the project includes a product processing component, it will also need to comply with the Puerto Rico Department of Health. Such a case would require a permit to operate, compliance with Seafood Hazard Analysis Critical Control Point (HACCP) requirements, and food-handler training and certification.

Other applicable laws & requirements

Puerto Rico's Law for the Promotion and Development of the Fishing and Aquaculture Industry (Law 61) created the Fishing and Aquaculture Industry Council and the Program for Fisheries Promotion, Development, and Administration in the PR Department of Agriculture (PRDA). Law 61 also assigned duties to the Fishing and Aquaculture Industry Council,

such as the creation of a fisheries and aquaculture development plan. Additionally, an associated regulation (Regulation 6613) creates a framework for the PRDA to promote and develop the fisheries and aquaculture sector. This law and associated regulation have not been implemented historically.

Uniquely, in the municipality of Culebra, a farm would require additional approval from the local agency Autoridad de Conservación y Desarrollo de Culebra, which is dedicated to establishing public policies for conservation and development. Applicants should confirm if there are municipal permitting requirements where their farm will be located.

Marine aquaculture outside of territorial waters (i.e., beyond 9 nautical miles) would be under federal jurisdiction and may require a USACE GP or IP, EPA NPDES, and USCG PATON authorization. It is recommended that applicants connect with NOAA Fisheries Southeast Region's Aquaculture Coordinators regarding questions for offshore aquaculture permitting requirements. While Puerto Rico's local government would not have jurisdiction, federal consistency under CZMA Section 307 would give Puerto Rico a voice in federal agency decision-making.

Summary & key insights

In Puerto Rico, the JPA process serves as a nexus for several other requirements for the USACE GP or IP. While the authorization of a concession with DNER is part of the JPA process, it has several separate requirements that are the applicant's responsibility (Table 1 and Figure 6). The regulation for leasing submerged lands and territorial waters applies to all marine industries, including aquaculture, and annual fees vary based on appraisal values of specific sites. While Puerto Rico does have leasing regulations that apply to marine aquaculture, no aquaculture-specific leasing regulations, spatial zoning for aquaculture, or overarching aquaculture development acts are actively implemented.

Exemptions to JPA requirements for a concession, such as the filing fee, annual fee, and public notice, can be made for scientific research projects or for people lacking economic resources. Bona fide fishers are listed as people who can apply for exemption in the regulation for leasing of submerged lands and territorial waters.

In addition to the JPA, several other authorizations or permits are required by different federal and territorial agencies to operate a marine aquaculture facility; they are applied for separately (Table 1). Some of these authorizations or permits may or may not be required depending on the type of aquaculture operation.

A list of approved species is specified in the Puerto Rico Fisheries Law, which applies to aquaculture businesses. Otherwise, local governments have not clarified expectations for sustainable aquaculture development or officially endorsed best management practices that address environmental concerns.

Additionally, at the time of writing this report, comprehensive guidance and general information on the permitting process were not available on local government websites.

Policy & regulatory considerations & recommendations for sustainable & inclusive growth

Enabling aquaculture policies and environmental regulations are necessary for the sustainable growth of a marine aquaculture industry in Puerto Rico. While proper regulatory standards are needed to limit the risk and consequence of negative environmental impacts, unnecessarily stringent environmental regulations have been associated with low growth or development of aquaculture industries in different locations globally (Abate et al., 2016). Additionally, regulatory burdens can be disproportionately high for small-scale producers, as they may have less access to resources needed to navigate complex permitting processes (van Senten et al., 2020). There have also been instances of large-scale aquaculture contributing to gentrification, marginalization, and reduced access to shared resources with small-scale farmers and fishers (Genschick et al., 2017; Kaminski et al., 2020; Khiem et al., 2010; Partelow et al., 2021). Preliminary results from sur-

veys conducted by Mujeres de Islas across Puerto Rico indicate general concerns of nonresidents entering the aquaculture industry and reducing access for local people (Gómez-Andujar & Considine, 2025). Ensuring localized inequalities are not repeated in aquaculture business arrangements may be particularly important in Puerto Rico when considering the historical colonial context and present coastal gentrification (Kaminski et al., 2020; Klein, 2018; Wright et al., 2023).

An enabling regulatory and policy environment can contribute to effective, sustainable, and inclusive growth and may be particularly important for small-scale farmers who often lack access to farm inputs such as seed, technical assistance, and financial capital (Kaminski et al., 2020; Stevenson & Irz, 2009). Balancing environmental protections with the growth of the industry may be a key challenge for the crafting of future aquaculture regulations in Puerto Rico (Abate et al., 2016; Davies et al., 2019; Knapp & Rubino, 2016; Naylor et al., 2023), but it can be achieved by taking an evidence-based and systematic approach to the drafting, consultation, and consolidation of legislation and supporting policies.

Overall, a comprehensive regulatory framework and enabling policies are needed for aquaculture development in Puerto Rico. To grow the aquaculture industry in a sustainable and inclusive way, the following measures are recommended.

Clear, transparent, & streamlined permitting process

Tools that attempt to make licensing and permitting clear and transparent, such as websites and resources that outline the permitting process and specify identifiable contacts, may better enable growth. A central location for information on the permitting process in Puerto Rico is currently lacking, and comprehensive regulatory guidance is needed for prospective farmers to navigate these requirements. Resources could include a checklist or flowchart of permitting steps, a webpage with links to all permit applications, and a list of contacts for all relevant agencies. Additionally, permit applications and any resources should be translated into Spanish, given that it is the first language of the majority of Puerto Ricans (see the appendix as an example of a DNER resource for coral restoration). NOAA has supported the development of resources and website pages for aquaculture permitting processes in other states and territories, which may be an option for Puerto Rico.

It is also important to have government agency staff and resources dedicated to aquaculture management (Lester et al., 2022). A lead local agency for aquaculture is desirable for coordinating, planning, establishing, and integrating regulatory requirements for the industry. For example, it would be helpful for prospective farmers to have one local agency (e.g., DNER or PRDA) with designated personnel as a central contact that fully coordinates among all territorial and federal agencies for permits and helps convene all relevant agencies for pre-application meetings. Additionally, an online portal for submitting all permit applications could be beneficial. For example, the USACE GP or IP application is submitted through the Regulatory Request System, and while this is the nexus for several requirements, it does not include all permits or authorizations. Plus, DNER still recommends applicants submit hard copies in person for the JPA process.

Smart siting—using advanced remote sensing, satellite imagery, and data-driven modeling and forecasting—can help prevent aquaculture from negatively impacting the environment while also ensuring farms are likely to result in a viable and sustainable business. Currently, in Puerto Rico, prospective farmers must individually hire a qualified consultant to do benthic surveys and site suitability analysis for the permitting process, which can be a significant financial burden for small-scale producers. The development of siting tools could help ease this regulatory burden (Figure 7). An example is TNC's Baja California Mexico Aquaculture Suitability Tool (www.maps.tnc.org/acuaculturabaja), which takes into account a variety of factors, such as water quality, benthic habitat, social and cultural sites, navigation and shipping, and proximity of available upstream and downstream infrastructure. Another example is the NOAA OceanReports tool (coast.noaa.gov/digi-

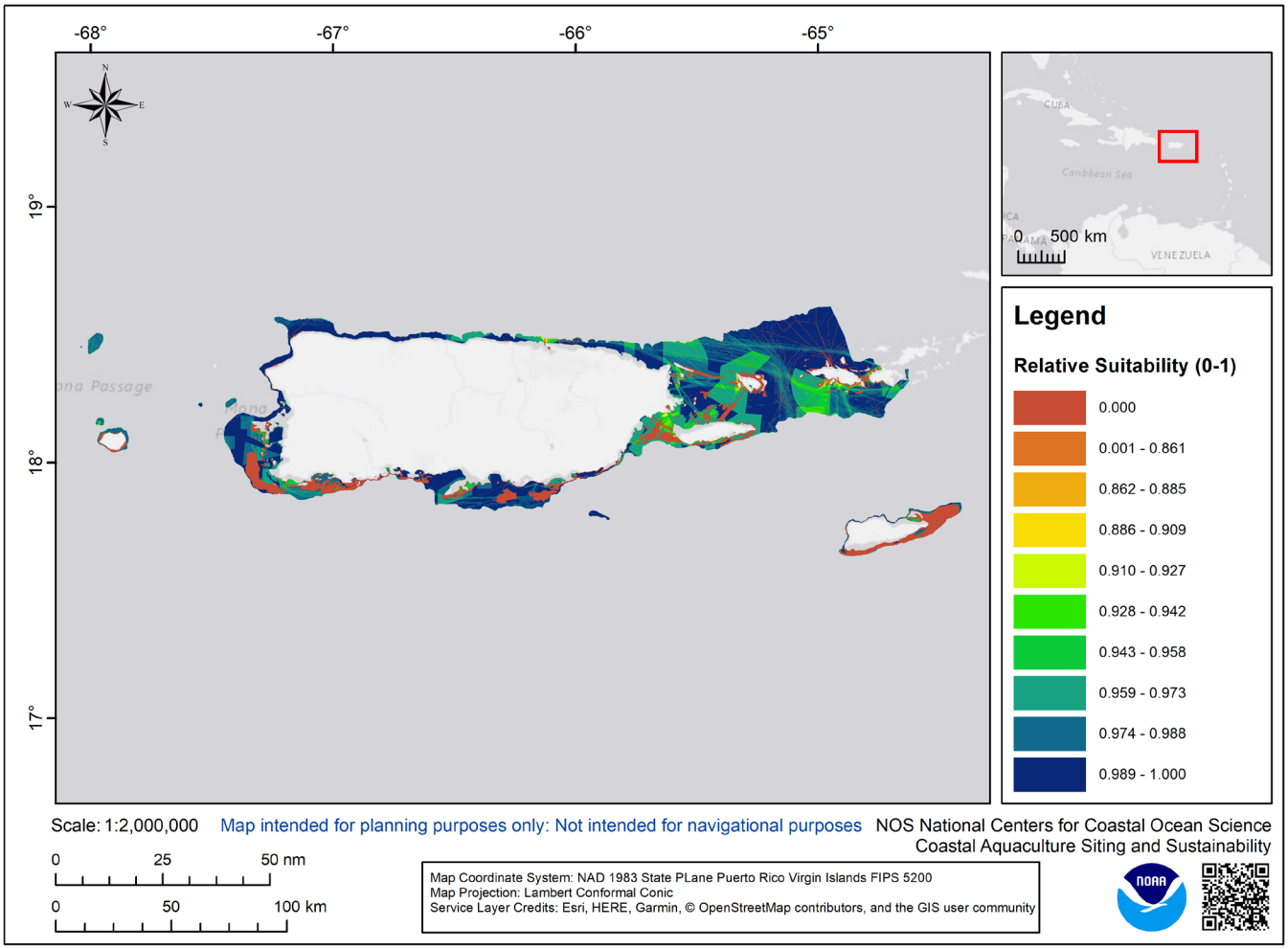

Figure 7: Example of siting analysis results completed by NOAA to assist with siting the Marine Biological Laboratory seaweed farm in Puerto Rico.

talcoast/tools/ort.html), which considers over 100 different ocean datasets in its analysis. Several existing resources could also aid in the evaluation of site suitability in Puerto Rico, such as results from the U.S. Caribbean MSP Workshop, USDA-NRCS Coastal Zone Soil Surveys, and the CARICOOS Data Sharing Initiative.

Streamlining the permitting process through pre-approved areas or zoning could also enable growth by reducing the costs of environmental surveys and siting assessments for prospective farmers and encouraging zoning plans for upstream and downstream infrastructure (Lauer et al., 2015; Lester et al., 2022). One mechanism could be a programmatic environmental assessment for suitable aquaculture sites, which could support the development of "pre-permitted" areas for interested farmers and reduce the need for individual benthic surveys and site suitability analyses. Another mechanism could be a holistic zoning process, such as High-Density Lease Areas or Aquaculture Use Zones developed in Florida, which meets pre-established criteria and consolidates multiple shellfish farms into a single location for farming and regulatory efficiency.

The development of a Programmatic Biological Assessment (PBA) or Programmatic General Permit (PGP) through USACE for shellfish and seaweed aquaculture in Puerto Rico could also streamline permitting processes, particularly for ESA and MSA consultations. An example of a PBA is in Washington State, which was developed in coordination with NOAA and USFWS and includes common shellfish

activities and common gear types as approved standard local operating procedures, allowing applicants who meet the PBA criteria to expedite permitting processes (USACE, 2015). An example of a PGP is Florida's General Permit SAJ-99, which allows for live rock, shellfish, and macroalgae leases. It bypasses the need to have each individual lease scrutinized through the NOAA Fisheries Section 7 consultation process if applicants meet PGP criteria.

Marine aquaculture leasing regulations

Specific regulations for aquaculture leasing of submerged lands provide tenure security for businesses that could foster industry development (Davies et al., 2019; Lester et al., 2022). Lester et al. (2022) found that including aquaculture in a state's right-to-farm law was positively associated with production. Right-to-farm laws provide farmers with some legal protections against NIMBY (not in my backyard) and similar attitudes, such as denying nuisance lawsuits against farmers who use sustainable and accepted practices. It is also important for aquaculture operators to foster trust and support from local stakeholders for early community buy-in, also known as social license to operate.

The current leasing structure in Puerto Rico treats aquaculture the same as other marine industries, and the DNER annual fee is based on an appraisal value that may consider all marine uses and adjacent land use. Appraisals for commercial spaces consider income potential and comparable sales; thus, considering all marine uses and adjacent land use may increase the appraisal value. It would be beneficial to have a separate leasing structure specific to marine aquaculture activities with a set annual fee per acre. Additionally, the filing fee and associated renewal frequency, as well as the annual fee, may not be affordable for small-scale producers, and it would be beneficial to have fee amounts and renewal frequency scalable to the size and type of activity.

Other U.S. states have separate leasing structures specific to aquaculture, with filing fees and annual fees varying but generally lower than those required in Puerto Rico (Beck et al., 2004). For example, the state of Maine has a tiered leasing system that considers scale of production, residency, and fed versus non-fed species, and each tier requires different costs, review levels, and renewal durations. The first lease type—limited purpose aquaculture license—allows growers to experiment before fully investing in new gear, species, or business (Table 3). DNER could utilize the National Sea Grant Law Center's Aquaculture Policy dashboard (nsglc.olemiss.edu/projects/state-marine-aquaculture-policies/) to evaluate multiple examples of leasing structures to determine appropriate fees that consider local economic conditions.

Table 3: Marine aquaculture tiered license and lease information for the state of Maine.

Lease type	Purpose	Size	Duration	Cost
Limited-purpose aquaculture license	Growers can try out different gear and species at different locations before applying for a lease	400 square feet	1 year	$100/year for residents $400/year for nonresidents
Experimental lease	For research and commercial pilot projects	Up to 4 acres	Up to 3 years	Application fee: $750 Rent: $100/acre/year
Standard lease	For shellfish, finfish, and/or marine algae	Up to 100 acres	Up to 20 years	Application fee: $2,000 (discharge), $1,500 (non-discharge) Rent: $100/acre/year

Interactions with coastal communities & local fishers

Puerto Rico's small-scale fisheries (SSF) provide critical nutrition, livelihoods, and cultural heritage to coastal communities throughout the archipelago (Garcia-Quijano, 2009; Griffith & Valdés-Pizzini, 2002). However, documented instances of aquaculture development have occurred in other parts of the world that have led to negative interactions with SSF. Mansfield et al. (2024) analyzed 46 diverse case studies and found that aquaculture development policies that do not explicitly consider the integration of SSF are likely to result in negative outcomes for SSF, coastal communities, and local markets. Common negative outcomes have included decreased access to fishing grounds and coastal infrastructure, a lack of economic benefits for local communities, and competition with local markets (Akyol & Ertosluk, 2010; Marshall, 2001; Nayak, 2017; Naylor et al., 2000). In contrast, policies that have considered integrating SSF and aquaculture have resulted in mixed outcomes with potential for positive interactions, such as supplemental income and livelihood diversification for fishers (Mansfield et al., 2024).

It will be important for aquaculture development policies in Puerto Rico to incentivize the integration of SSF and explicitly consider coastal community outcomes to ensure an equitable distribution of benefits. Currently, bona fide fishers in Puerto Rico are eligible for exemptions from the filing fee and annual fee associated with the authorization of an aquaculture concession, which may increase access to this industry. Additional considerations to foster benefits for coastal communities in Puerto Rico may include promoting the development of local upstream and downstream infrastructure, supporting workforce development programs for employing local people across the supply chain, reducing concession fees for residents, and co-designing the sector with local communities (Mansfield et al., 2024; Sierra Castillo et al., 2025).

A workshop with the Caribbean Fisheries Management Council (CFMC) in March 2026 highlighted the importance of considering how aquaculture production levels may compare to annual catch limits for similar species (CFMC, 2026). These interactions are highly context-dependent, and further research exploring local conditions that implement participatory approaches could be beneficial to provide more targeted recommendations.

Promoting the integration of aquaculture with other marine industries could also be beneficial. For example, tourism is experiencing rapid growth within Puerto Rico's Blue Economy, and ecotourism has been promoted to increase conservation benefits and empower local communities (Puerto Rico Tourism Company, n.d.). Integrating ecotourism within aquaculture business strategies could help businesses diversify revenue and address negative perceptions of aquaculture by showcasing socioeconomic and environmental benefits (Mohammadi et al., 2024).

Environmental considerations & biosecurity concerns

Regulations that also address environmental concerns—such as biosecurity threats, impacts on wild stocks, and loss of genetic diversity—are vital for the sustainable development of aquaculture industries (Davies et al., 2019). The development and government adoption of aquaculture best management practices may also foster sustainable growth (Lester et al., 2022).

The approved species list for importation in Puerto Rico could be reconsidered or updated, as it currently does not approve or prohibit any algal species and allows for the farming of some nonnative species. For example, the nonnative Pacific oyster is included in the approved list, and while this species is the most commonly cultivated oyster globally due to its wide tolerance of environments and fast growth rates, it has also negatively impacted ecosystems worldwide as an invasive species and major vector for other invasive species (Molnar et al., 2008; Ruesink et al., 2005). Another example, elkhorn sea moss or cottonii, *Kappaphycus alvarezii*, is a common tropical seaweed species widely introduced and cultivated due to its high growth rates and source of carrageenan, though it has become an invader in

several locations, causing impacts to coral reefs and other ecosystems (Conklin & Smith, 2005; Sellers et al., 2015). The potential effects of cultivating nonnative species should be fully evaluated prior to their authorization.

Other seaweed and shellfish aquaculture regulations addressing environmental concerns may include:

- setting a maximum annual harvest of reproductive broodstock,
- establishing mandatory reporting requirements for mortalities above a certain percentage of stock to preempt any emergency response to disease,
- defining sanitary requirements for nursery and hatchery operations and maximum stocking densities for grow-out operations to limit the spread of pests and pathogens,
- developing bioregional seedstock guidelines where broodstock are obtained from the same bioregion as grow-out locations,
- developing guidelines for hurricane preparedness and response to minimize lost gear,
- setting a required minimum distance of farms from sensitive habitats, and
- recommending farm equipment designed to reduce potential marine mammal entanglements and benthic habitat impacts.

The formal adoption of aquaculture best management practices by local government may assist with addressing these environmental concerns.

Postharvest processing & food safety regulations

While this report has focused on the production side of aquaculture, it is important to note that with the development of seaweed and shellfish industries, the implementation of postharvest processing and food safety regulations will be vital. Currently, the Puerto Rico Department of Health requires permits to operate, compliance with Seafood HACCP requirements, and food safety training and certificates for an establishment that sells or processes seafood. While Seafood HACCP may be applicable for shellfish and seaweed, other federal frameworks may be more suitable or work in tandem.

At the federal level, seaweed is not classified by the U.S. Food and Drug Administration (FDA) as "produce" under the Produce Safety Rule or as a "fish or fishery product" under Seafood HACCP, creating regulatory gaps and uncertainty about which food safety standards apply (Engle et al., 2018; Janasie & Nichols, 2019). Nevertheless, seaweed processors may fall under the Food Safety Modernization Act's Preventive Controls for Human Food rule, which requires facilities to conduct a hazard analysis and implement written preventive controls—an approach similar to Seafood HACCP but distinct in its regulatory basis (Janasie & Nichols, 2019). Considerations for shellfish include territorial government participation in the FDA National Shellfish Sanitation Program (NSSP). FDA Seafood HACCP and NSSP apply to different parts of the supply chain and can work in tandem. Participation in NSSP includes classifying growing waters, monitoring water quality, setting and enforcing harvest controls, certifying shellfish dealers, and maintaining traceability systems.

A major control point for shellfish industries is the time temperature requirements after harvest, as *Vibrio* species grow exponentially at warm air temperatures and can cause severe human illnesses (Davis et al., 2021). For example, some states do not allow harvest during peak sun hours and require growers to use ice slurries for rapid cooling during summer months. Additionally, some states may require the depuration of shellfish harvested from certain locations to remove microbial contaminants. It will be important for Puerto Rico to establish an NSSP-compliant shellfish control authority for a safe, sustainable, and scalable oyster industry with interstate market access.

Training opportunities are essential for aquaculture farmers, seafood handlers, and processors to support a safe, resilient local seafood system. Current training programs in Puerto Rico are not reaching those who need them most, with 83% of fishers agreeing there should be more opportunities for training workshops, and many noting accessibility challenges (Rodríguez-Cruz, 2020). As Puerto Rico

expands into marine aquaculture, ensuring that training is affordable, geographically accessible, and tailored to local realities will be critical for both safety and industry growth. The Center for Innovation and Agroindustrial Technology of the UPR Mayagüez could be a potential resource for future trainings on food safety.

Funding, loan programs, & finance options

Funding, loan programs, and investment incentives may help reduce barriers to entry by offsetting farm equipment, start-up, and training costs. Government-supported research for aquaculture—on topics such as breeding programs for new species, farm technology, or novel markets—may also encourage advancements and industry growth (Lester et al., 2022; Van Wyk & Davis, 2006b). Finance options are particularly important for small-scale farmers with limited resources (Kaminski et al., 2020; Stevenson & Irz, 2009).

Several federal funding opportunities and financial assistance programs are available for aquaculture development. For example, NOAA and USDA have several competitive grant programs and financial assistance programs for small businesses, aquaculture research, and workforce development (NOAA, 2025; USDA, 2025). Several USDA agencies fall under mission areas to support a healthy, competitive, and sustainable aquaculture sector. Additionally, oyster farmers in some states can access crop insurance for hurricane impacts through the Risk Management Agency Shellfish Policy paired with Hurricane Insurance Protection – Wind Index Endorsement and Tropical Storm Option, although this program is not currently available in Puerto Rico. The Interagency Working Group on Aquaculture (n.d.) developed a *Guide to Federal Aquaculture Programs and Services*, which compiles financial resources for aquaculture producers.

Additionally, USDA-NRCS provides technical and financial support to oyster aquaculture farmers who comply with Best Management Practices or Conservation Practice Standards (CPSs) in some U.S. states, and a similar model could be implemented in Puerto Rico. For example, some NRCS programs provide technical and financial assistance for oyster restoration activities through CPS 643 – Restoration of Rare or Declining Natural Communities Practice Specification Oyster Bed Restoration, CPS 400 – Bivalve Aquaculture Gear and Biofouling Control, CPS 472 – Access Control, and CPS 595 - Pest Management. Only some of these CPS are currently available in Puerto Rico, and some may not be applicable locally. Additionally, one of the main challenges with implementing this type of financial support in

Figure 8: Juvenile mangrove oysters and pearl oysters from Culebra (© Megan Considine).

Puerto Rico is the requirement to document control of submerged lands (e.g., a concession), given the barriers presented in the "Marine Aquaculture Leasing Regulations" section of this report. Additionally, an evaluation of the assistance levels established for the U.S. Caribbean may be warranted to ensure they adequately reflect local conditions, including high shipping costs and import taxes for aquaculture equipment (TNC, 2025).

Local organizations, such as Puerto Rico Sea Grant, have funding cycles for competitive research (Puerto Rico Sea Grant, n.d.) that often feature priority and interest areas for aquaculture. Additionally, while not aquaculture-focused, Puerto Rico Science, Technology, & Research Trust (n.d.) has competitive funding opportunities for innovative research in a variety of adjacent topic areas, such as agriculture and environmental sciences.

The UPR Agriculture Extension Service could be a beneficial resource for new entrants to receive assistance in developing aquaculture business plans. Other existing financial models can also be useful, such as GreenWave's Ocean Farm Basic Financial Model (GreenWave, n.d.), which supports early planning stages to estimate when new farms will break even and to determine which factors will impact revenue potential.

Conclusion

Marine aquaculture has not been fully realized in Puerto Rico, likely due to several factors, such as marketing challenges, limited farmer knowledge, and the need for enabling policies. As this report highlights, several steps lie ahead for a sustainable and accessible marine aquaculture industry. Partnerships between nongovernmental organizations, farmers, industry, researchers, and policymakers have made this report possible and will be required for the future success of this emerging industry.

Figure 9: Pearl oyster, *Pinctada imbricata*, from the Culebra oyster farm (© Megan Considine).

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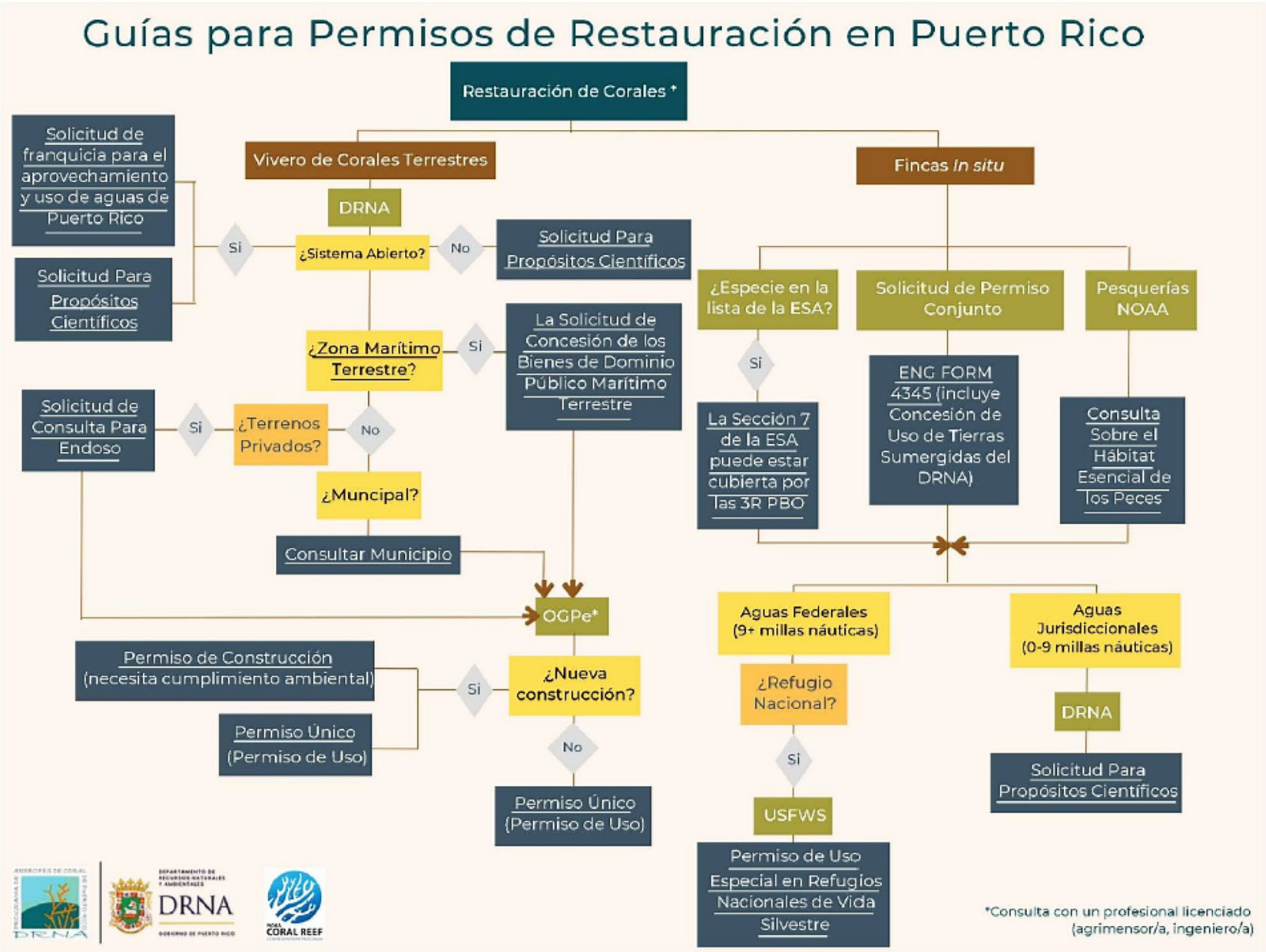
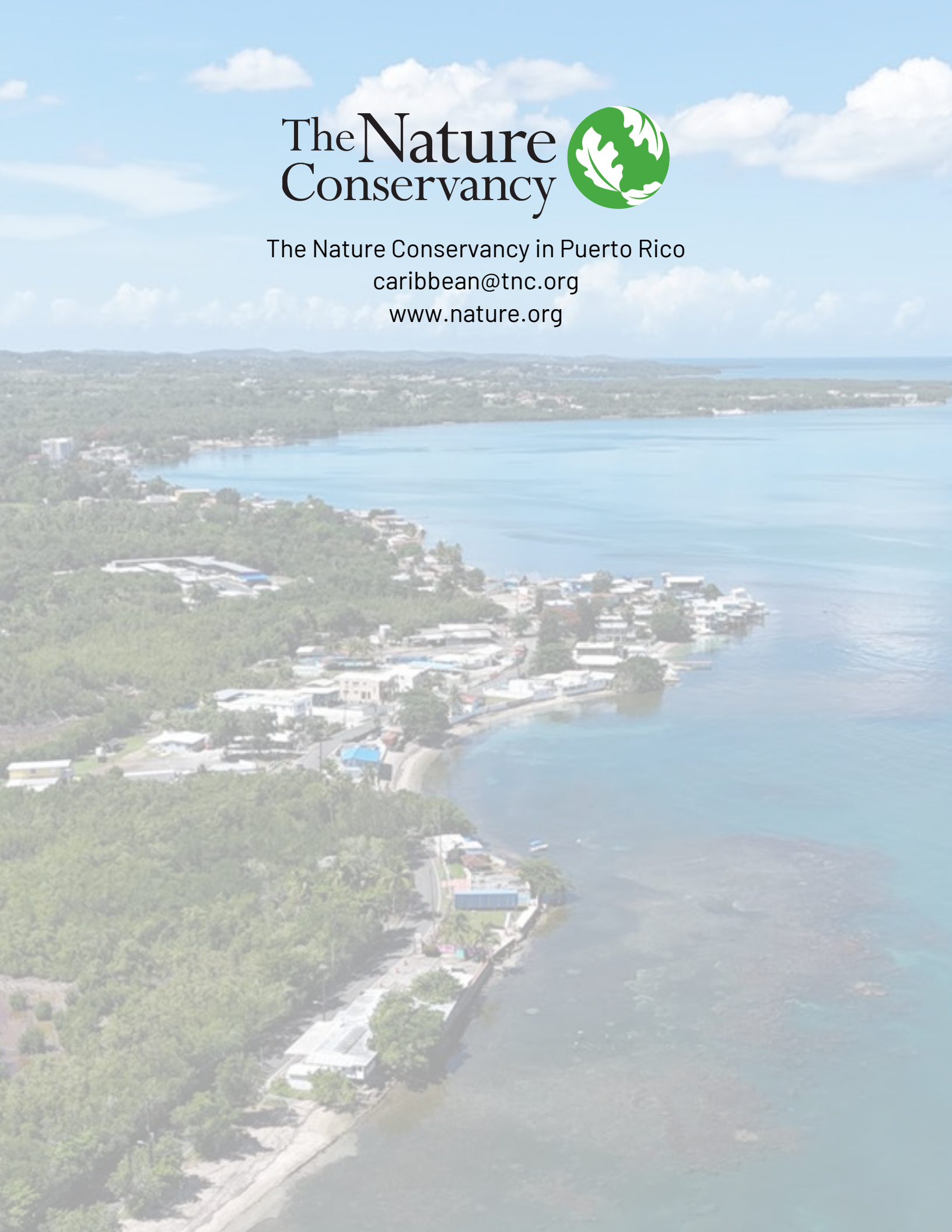
Appendix: Permitting guide for marine resources restoration activities in Puerto Rico





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