Alternative Oyster Culture (AOC)
2021-2023 Grants Program
Status of Fishery in Louisiana

Submitted by

Louisiana Sea Grant College Program

Louisiana State University

LSU Contract Award # AWD-003725
LSU Grant # GR-00008764

&

Iberia Development Foundation

New Iberia, La.

LSU Subcontract
 # PO-0000180270

Submitted to

Louisiana Department of Wildlife & Fisheries

Office of Fisheries

April 2024

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Suggested Citation:

From: Melancon, Earl, Ralph (Wood) Oglesby, Thomas Hymel, Albert (Rusty) Gaude′, Anne Dugas, Kevin Savoie, Elizabeth Robinson, Brian Callan, Evelyn Ducote, Michael Tarantino. 2023. Alternative Oyster Culture (AOC) 2021-2023 Grants Program and Status of Fishery in Louisiana. Louisiana Sea Grant Report to Louisiana Department of Wildlife & Fisheries, Office of Fisheries. Full Report: www.lafisheriesforward.org. 51pp.

Dedication

This project is dedicated to Jules Melancon, a multigeneration traditional Louisiana oyster harvester from Bayou Lafourche who was the first to enter the AOC fishery in 2012. Throughout his time in the traditional and AOC fisheries he was a source of knowledge and guidance. He never hesitated to engage with us when we needed his advice. He was a friend and colleague. He was instrumental in the success of this project.

Jules C. Melancon, 65, March 22, 1958 - August 31, 2023.

Acknowledgements

The Alternative Oyster Culture (AOC) Grants Program was a team effort. The team included Louisiana Sea Grant (LASG), LSU AgCenter, and Iberia Development Foundation members. Several members hold joint appointments with Sea Grant and the LSU AgCenter, and they are denoted with an asterisk (*). LASG team members included Ralph (Wood) Oglesby, Thomas Hymel*, Anne Dugas, Leslie Davis, Albert (Rusty) Gaude′*, Kevin Savoie*, Brian Callam, Elizabeth Robinson, and Earl Melancon. From the Iberia Development Foundation (IDF), the team members included Evelyn Ducote, Michael Tarantino, and Elizabeth (Liz) Mauney. The IDF could not have participated in the grants program without the approval of its Foundation Board members, and we acknowledge and thank them for having the confidence to approve involvement with us. Two Sea Grant/AgCenter Extension Agents helped the team many times and they need to be singled out for recognition, Dominique Seibert, Marine Extension Agent for Plaquemine and St. Bernard Parishes, and Haley Gambill Marine Extension Agent for Lafourche and Terrebonne Parishes.

The grants program began through the efforts of former LASG Executive Director, Robert Twilley, but when he transitioned to another LSU position a few months into the grants program contract, leadership of LASG changed to Julie Lively, our present Executive Director. Julie's advice and support was not only welcomed but foundational in helping to guide us during the three-year grants program.

Louisiana Sea Grant has never in its 50+ years of existence taken on the task of having principal oversight responsibilities and administration of grant funds disbursed directly to commercial fishers. But Sea Grant has been involved in AOC since its introduction to Louisiana in the late 1980s and was a logical choice to help this fishery develop. We thank the Louisiana Department of Wildlife and Fisheries (LDWF) and former Assistant Secretary of Fisheries, Patrick Banks, and Brian Lazina, Coastal Resources Administrator for the Louisiana Coastal Protection and Restoration Authority (CPRA), for funding support to LASG and LSU. We also thank the Louisiana Oyster Task Force members, and Mitch Jurisch chairman, for their vote of support for our efforts at their May 2021 meeting.

At the core of the AOC applicant selection process for a grant was the work of the program's selection committee members. Selection committee members included two voting and an alternate representing the Louisiana Oyster Task Force, Peter Vujnovich, Faye Mathews, and Brandi Shelley; two voting members and an alternate representing LASG, Melissa Daigle, Greg Lutz, and Niki Pace; one voting member and an alternate representing IDF, Wendel Verret and Janet Faulk-Gonzales; and an at-large member, Kerry St. Pe′, retired Executive Director of the Barataria Terrebonne National Estuary Program (BTNEP). We are indebted to them for their time and efforts in this essential task and for doing it pro bono.

A very special thank you to the attorneys that gave the team insight and direction as we developed grant contracts, dealt with inevitable situations that required legal counsel, and who was always willing to assist in whatever else "popped up." Those individuals were James (Jim) Wilkins, Director of the Law and Policy Program for LASG, Porteus R. (PR) Burke, attorney for the Iberia Development Foundation, and Cole Garrett, General Counsel for the LDWF. Having these three individuals available to us was an invaluable treasure to the team. Additionally, Jim has been part of LASG's AOC effort since the 1990s and his knowledge was a great help in documenting the historical progression of AOC in Louisiana.

The supply and equipment requests of commercial fishers can be very different from those of the academic community. Therefore, understanding and developing the proper protocols to assure that state and federal regulatory compliance was properly followed for reimbursements, payments to vendors, and development of the LSU subcontract to IDF, required cooperation and understanding by the LASG's Sponsored Research Manager, Judy Johnson, by the LSU Office of Sponsored Programs, Tracy Wang, Emily Richards, and Jennifer Donaldson, and from LDWF, Jason Froebe and his staff. Two individuals that we contacted for advice almost daily were LASG's Business Managers, Lindsay Rushing, initially, and later, Conner Lenore; Lindsay and Conner were our business compass to keep us moving in the proper direction.

There were many LDWF personnel that helped guide the team: Richard Williams, Danica Williams, Carolina Bourque, George Melancon, Denise Kinsey, Robert Caballero, and Sharon Cilano. Brian Hardcastle and his team at the LDWF's Marine Laboratory located on Grand Isle, La., was a great partner whenever we needed accommodations for meetings and workshops. Two members of the marine lab staff even went looking for a boat trailer license plate we lost on the highway during a workshop, and they found it!

Our LASG's state oyster hatchery staff, under the supervision of Hatchery Director, Elizabeth Robinson, assisted at our meetings and workshops held on Grand Isle. The staff was always willing to give tours of the hatchery facilities, even during times when they were very busy with other responsibilities. Thank you for your professionalism and dedication to the hatchery: Sarah Gieseler, Sarah Bodenstein, Rissa Inselman, Jacquelynn Tran, Matias Carballo, Lesley Schneider, Stephanie Browning, Caleb Cavness, and Simone Muir.

Throughout the project there were media needs that required interaction not only with the farmers but also with the public. From LASG's Communication Department, Roy Kron, Melisa Castleberry, Hannah Bellone, and Robert Ray aided us with media releases, web assistance, and photo ops; we are especially indebted to Roy for his editing skills. Consulting with us and aiding in developing web sites, instructional and informational factsheets, whiteboards, and videos were Blackberry Productions (dba eBellDesign), HypnoVID Media Productions, Inc., and Composite Design, LLC. LDWF communications staff also assisted with public release announcements.

A central piece of the evaluation process of each applicant applying for a grant was the location of the proposed AOC farm within an estuary's salinity habitat. This required development of coastal maps that could be used by the applicant and by the evaluation team during evaluation. Fortunately, as the program was developing, Lauren Swam, an M.S. student working in Megan LaPeyre's United State Geological Survey (USGS) lab located on the LSU campus within the School of Renewable Natural Resources had developed a series of seasonal salinity (isohaline) maps of Louisiana's coast. Lauren was able to slightly modify those maps and allowed us to post them on the web for applicants to view and for the evaluation team to use in the assessment process.

Coastal maps were also needed to assess how seasonal pollution closures could potentially influence a farm's location. Chris Lamaire, Molluscan Shellfish Program Manager with the Louisiana Department of Health (LDH) was able to supply seasonal pollution closure data to the program team. That data was then developed into a series of seasonal coastal maps by DeWitt Braud with the LSU Coastal Studies Institute; DeWitt has since retired and is now a LASG scholar.

With expansion of AOC comes the need to review AOC state regulatory rules and laws to accommodate the needs of state agencies and to assure the public is provided with a safe market product. The efforts of two individuals at LDH were instrumental in working with LDWF and LASG in addressing regulatory needs and developing information to share with the AOC farmers: Jennifer Armentor, Molluscan Shellfish Program Administrator and a non-voting member of the Louisiana Oyster Task Force, and Justin Gremillion, former Chief of Specialty Operations.

During the program there were many AOC workshops that were presented by the program team, but two need to be singled out: (1) Evelyn Gutierrez Watts, LASG Seafood Extension Specialist and Assistant Professor in the LSU School of Nutrition and Food Science, who directed the Hazard Analysis and Critical Control Point (HACCP) training workshops for the AOC farmers, and her assistant, Julie Falgout, LASG Seafood Industry Liaison, and (2) Dani DiIullo, LASG Director of Education & Engagement, and her assistants, Ali McMillan and Vanessa van Heerden, who taught a two-day teacher workshop at the LDWF's Grand Isle Marine Laboratory instructing teachers on how to incorporate the AOC fishery and the traditional oyster fishery into their classroom.

Most of the AOC farms that are presently operating in the state are in AOC aquaculture parks. We worked with the park administrators regularly to coordinate grants and general AOC needs: Weldon Danos,

Executive Director of the Grand Isle Port Commission (GIPC), Kim Monte, Executive Director of the Cameron Port, Harbor, and Terminal Authority (CPHTA), and Marcos and Boris Gerraro, administrators of the privately held Southern Belle Park. Assisting Weldon was Misty Bradberry, Administrative Assistant for GIPC, and assisting Kim were the former and present Assistant Port Directors for CPHTA, Tunie Dunaway and Tianna Dunaway, respectively. They were always available to help us, and we thank them for their service. We also acknowledge the cooperation of the Cameron Port Authority Commissioners and the Grand Isle Port Commissioners for their support of AOC in their respective communities.

The Cameron AOC aquaculture park could not have been established during the 2021-2023 grants program without the efforts of Ryan Bourriaque, State Representative District 47, and Mark Abraham, State Senator District 25, who sponsored the legislation to create the park. At the Cameron local level, we acknowledge the efforts of Cameron District Attorney and Port Authority attorney, Tom Barrett, and Cameron Police Jury staff member, Wendy Walker Harrington. We must also acknowledge the efforts of Claire Marceaux, former Executive Director of the Cameron Port Authority, who had a vision for AOC in her parish many years before the grants program was ever conceived and established.

Off-bottom oyster cage culture is found throughout the Gulf and Atlantic states, and we were helped with advice and guidance by several individuals from other states. We acknowledge some of those individuals who helped us: Rusty Grice, Oyster Aquaculture Business Specialist with the Mississippi-Alabama Sea Grant Consortium (MASGC), LaDon Swann, Executive Director of MASGC, and Steve Sempier, Outreach and Deputy Director of MASGC; Scott Rickard, manager of the Auburn University Shellfish Laboratory (AUSL), and Andrea Tarnecki, Assistant Extension Professor at AUSL; from the University of Florida Leslie Sturmer, Florida Sea Grant Extension Shellfish Specialist, and Angela Collins, Florida Sea Grant Assistant Professor and Extension Scientist; and from Mississippi Department of Marine Resources, Shellfish Bureau Director Jason Rider, and Ellen Coffin, Shellfish Program coordinator. We also thank John Supan, retired Oyster Aquaculture Specialist with LASG, and now an AOC farmer in Alabama, for helping us with historical information on AOC development in Louisiana.

From the beginning of the grants program, the team had a focus not only on AOC farm development but also on understanding farm economic sustainability. The small AOC farmer with a footprint of 0.5-2.0 acres is the norm in the state today and will always have an important presence and role in the AOC fishery. However, we needed economic information on how to potentially grow the fishery. With that need for economic information, Rex Caffey, LASG Director of Marine Extension and Professor and Director of the LSU AgCenter's Center for Natural Resource Economics & Policy was able to secure funds through the John P. Laborde Endowed Chair for Sea Grant Research and Technology Transfer. Those funds allowed him to secure a six-month visiting professorship appointment for Dan Petrolia, Professor in the Department of Agricultural Economics at Mississippi State University. Dan was able to develop economic information that will be important for future AOC economic growth.

Finally, a very important group of AOC farmers and individuals associated with AOC need to be recognized for their cooperation during this three-year grant process. They were an invaluable resource for information to the LASG team during the past three years, and their cooperation and knowledge were foundational to the program's success: Jules Melancon, Tony Tesvich, Steve Pollock, Marcos Guerrero, Boris Guerrero, Mike Roberts, Albert Beson, Kirk Curole, Kim Galjour, Scott Maurer, David Sorrels, Angela Kay Doxey, Hubern Doxey, Brandi Shelley, Terry Shelley, Sarah Gieseler, George Waguespack, Percy M. Dardar, Nathan Herring, Jason Pitre, Joshua Pitre, Chad Guidry, Khai Dong, Lane Fontenot, Ryan Anderson, Zach Lea, Anthony Theriot, and Kirk Daigle.

Executive Summary

The Louisiana Department of Wildlife and Fisheries (LDWF) developed the "*Louisiana Oyster Management and Rehabilitation Strategic Plan*." The fourth initiative (of 12) within the Plan is the "*Expansion of Alternative Oyster Aquaculture."* Within Initiative #4 are goals to sustain, enhance, and expand the AOC fishery through oyster seed production grants, implementation of AOC farm startup grants, development of AOC aquaculture parks, and education and outreach opportunities to the industry and public. Louisiana Sea Grant (LASG) was awarded a three-year, 2021-2023, contract from LDWF to implement those goals through a grants program. The Iberia Development Foundation (IDF) disbursed the funds as a subcontractor to LASG through Louisiana State University (LSU).

Alternative Oyster Culture (AOC) began in 2005 as an experimental fishery and grew slowly within the state to nine permitted grow-out farms, one AOC aquaculture park, and one private oyster hatchery by the end of 2020. After the passage of Hurricane Ida in August 2021, all nine grow-out farms were lost due to the storm's destructive forces (Fig. 1). Three rounds of grant funding opportunities were publicly advertised and a total of $1,380,000 in grant funds were disbursed by LASG and IDF through the program by its end in December 2023. By December 2023 after the three rounds of funding, the

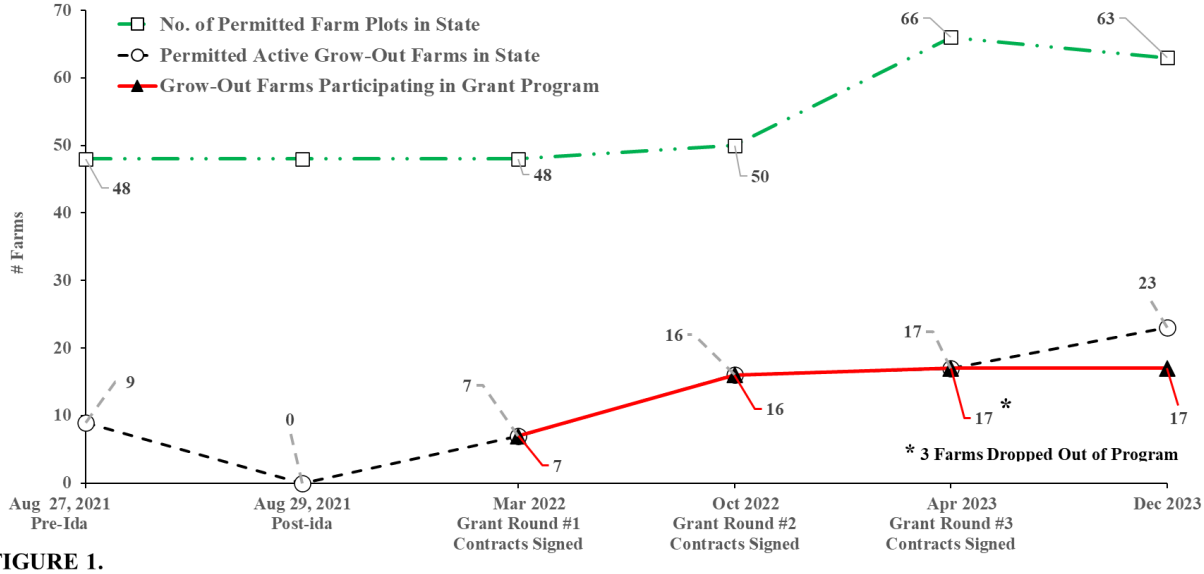


FIGURE 1.

disbursed funds supported 17 permitted AOC grow-out farms in Louisiana with five of them also having small self-contained seed nurseries, $840,000 (61% of funds; $45K/farm, $15K/nursery), one inland recirculating aquaculture system (RAS) private hatchery with a nursery in Baton Rouge, La., $240,000 (22% of funds; $225K/hatchery = $15K nursery)), and three aquaculture parks, $300,000 (17% of funds; $100K/park). Farms located in aquaculture parks work under its Coastal Use Permit (CUP) and this is an incentive for them to locate there. The three aquaculture parks account for 58 grow-out farm plots, 92% of the 63 permitted in the state (Fig. 1). The three parks also account for 135 acres, 73%, of the state's total permitted 185 acres of grow-out farms. The three parks are located near Grand Isle, lower Calcasieu Lake near the town of Cameron, and in the Dos Gris area between Grand Isle and Port Fourchon. Farm plots range in size from 0.5 acres to 2.0 acres. Grand Isle and Cameron are administered by their respective Port Commission, and the Dos Gris (Southern Belle Park) is privately owned by the Marcos Guerrero family. The remaining farm acreage within the state is located on traditional oyster leases and private water bottoms.

The grant program's highest funding priority was to help re-establish the farms lost to Hurricane Ida, followed by traditional oyster harvesters who wanted to get into AOC. The number of traditional

oyster harvesters that applied was 10 and nine were funded. The median age of all AOC farmers in the state (grantees + non-grantees) by the end of 2023 was 49 yrs. (range 29-78 yrs.) and six individuals were considered full-time in AOC (Fig. 2). Two of the full-timers are retired individuals from other professions. Two of the seven younger farmers in the 21-40 yrs. old groups started part-time and have now become full-time. Prior AOC experience was also a high priority and 74% of farmers possessed at least one year (Fig. 2), but the pool of experience dwindled significantly by the third round. The lack of any AOC experience and formal educational opportunities for training are a potential hindrance for anyone wanting to enter the fishery due to the technical nature of it, which is different from a wild-harvest fishery.

Individuals in Louisiana Active in AOC by end of 2023 = 21 + 2 known farm-working partners = 23 = N

- Median Age within the AOC Industry = 49 yrs. (range 29 – 78 yrs.)

Traditional Oyster Fishers in the AOC Industry = 9 (39%)

- *excludes two who left the AOC fishery in 2023; one for medical and one for other priority business reasons*
- Median # Yrs. with Traditional Oyster Experience = 21 yrs. (range 5 – 36 yrs.)
- Median Age Traditional Oyster Fishers in AOC = 49 yrs. (range 31 – 71 yrs.)

with no Traditional Oyster Fishing Experience in AOC Industry = 14 (61%)

- Median Age with no Traditional Oyster Fishing Experience in AOC Industry = 45 yrs. (range 28 – 78 yrs.)

By Age Group*	#	%	# with AOC Experience	# Full -Time in AOC**
age 21-30	3	13%	3	1
age 31-40	4	17%	3	1
age 41-50	8	35%	5	1
age 51-60	2	09%	2	1
age > 60	6	26%	5 (3 are retired)	2
N =	23		N = 74%	N = 26%

* Excludes the two traditional oyster farmers who left the AOC fishery in 2023.

* * Full-Time means not working in any other business than related to the AOC fishery.

Figure 2.

There are **challenges** for any start-up business and AOC is no exception. The five challenges listed here are not exclusive but highlight needs that are foundational in nature for potential success:

Hurricanes - Hurricanes are an issue for all Gulf and South Atlantic states. From 2005, the beginning of AOC in coastal Louisiana, to 2023 there were 26 storms consisting of 16 hurricanes, eight of which were category three or higher, nine tropical storms, and one tropical depression. In Louisiana, as in other states, AOC rebounded slowly after each storm. But the challenges will not diminish as ocean water temperatures in the Gulf of Mexico and Atlantic Ocean become warmer creating the potential for stronger and more frequent storms. The ability to cope with hurricanes to protect AOC infrastructure is at the forefront of commercial need.

Coastal Restoration - Most present AOC farms are located within the Barataria estuary in the Mid-Barataria Sediment Diversion freshwater outfall; those farms were present prior to the grants program and prior to federal (USACE) approval of the Mid-Barataria Project. No coastal restoration effort is more influential on the oyster industry than existing and proposed coastal restoration projects with hydrological modifications that influence salinity habitat. Future farm locations will need to consider present and future planned coastal restoration efforts by the state.

- **Farm Economics** - Most Louisiana AOC farmers are working at a "sweat equity farming" level, meaning that they are a labor force of one (the owner) or two. To increase the potential for profit, small farms are receiving a premium price per oyster through direct-sales efforts. Small farms will likely continue to be an important part of the fishery. However, small farms may have less resilience from market price fluctuations and environmental uncertainties such as natural mortality events. A recent economy-of-scale study for Louisiana AOC recommends 4-acre and larger farms to increase resilience. But to increase farm size requires more upfront investment, with labor as a significant cost. In other states there is a recent trend towards larger farms. Larger farms may require wholesale distribution to move products in bulk. There are no known wholesale outlets presently associated with AOC farmers for efficient shipments of large orders. Working with wholesalers may require a reduction in price per oyster for the farmer. This could potentially reduce opportunities for small-farm profit that relies on bypassing the wholesaler.
- **Oyster Seed Availability** - The lack of a consistent supply of oyster seed for farmers is an issue not only in Louisiana but throughout the Gulf of Mexico states. Oyster seed in AOC cages are a product of hatchery spawns. Louisiana has one private hatchery, and it may have the potential to supply the needs of the state's present number of farmers. However, Louisiana does allow restricted importation of out of state seed. The timing of seed availability and quantity throughout the year remains a potential bottleneck to the farmer. Hatcheries can hold oyster seed for only a short period of time and may require oyster seed nursery outlets to hold it until seasonally needed by a farmer. There are a few nurseries in the Gulf states and one inland experimental nursery in Louisiana associated with the private hatchery. Commercial nurseries may have their own challenges including having a critical number of farmers to purchase seed at an optimum size for nursery profit. The economic challenges of an AOC nursery farm in Louisiana are presently unknown.
- **Legislative and Regulatory Requirements** – There is a 150-year history of traditional oyster fishery governance in Louisiana. But AOC is new and dates to 2005 with the establishment of the first experimental aquaculture park. Couple the Louisiana Department of Health (LDH) and the LDWF enforcement regulations with a "new" fishery and you have a recipe for confusion by all parties.

Observations that may Assist AOC Development for Potential Success in Louisiana:

- **Solutions are needed to reduce the destructive forces of hurricanes on AOC farms.**
- **Importance of documenting economic information to assist in business decisions and success.**
- **Outreach and formal training opportunities will help to understand the technical aspects of AOC and better ensure that informed decisions are made prior to entering the fishery.**
- **The direct-sale market generates a premium price and is the economic driver for small farms.**
- **Large-scale farms may need the development of wholesale distribution for growth of AOC.**
- **Commercial-scale oyster seed nursery farms may have the potential to support growth of AOC.**
- **Traditional oyster fishery laws and regulations may need tweaking for AOC development.**

Off-Bottom oyster cage culture is not unique to Louisiana and has become established within the last two decades by all the northern Gulf and South Atlantic states. Louisiana has a rich fisheries culture and many of the AOC farmers who, if not themselves traditional commercial fishers, have generational heritage within their family. There is also an entrepreneurial spirit within the small AOC farmers, such as using social media as a direct-sale method, ecotourism, and selling AOC merchandise; example, Bayou Rosa Oysters (https://bayourosaoysters.com). This generational heritage and entrepreneurial attitude are strengths for small AOC farmers without precluding the importance of developing larger farms; starting small and growing the business may be a good strategy for learning such a technical fishery. AOC produces a boutique-type half-shell oyster for the market and presently is a small part of Louisiana's total oyster production but does offer an opportunity to diversify the industry. More information on AOC can be accessed at the Louisiana Fisheries Forward web site (www.lafisheriesforward.org), the LDWF web site (www.wlf.louisiana.gov/subhome/commercial-oyster), the LASG (www.laseagrant.org/outreach/aquaculture/), and from your local Louisiana Sea Grant/LSU AgCenter Marine Fisheries Extension agent.

Introduction

The Louisiana Department of Wildlife and Fisheries (LDWF) developed the "Louisiana Oyster Management and Rehabilitation Strategic Plan" (LDWF 2020). The plan states, "*These initiatives require implementation and funding in order to promote and maintain a thriving oyster resource and industry in Louisiana, and to allow for the most efficient utilization of coastal areas*." The plan is a response by the state as mitigation measures for habitat changes due to natural and human-induced processes such as coastal restoration activities.

The fourth initiative (of 12) within the LDWF Plan is the Expansion of Alternative Oyster Aquaculture (AOC). The term AOC refers to farming oysters in cages, mostly off-bottom. Elsewhere in the Gulf of Mexico (GoM) and United States, "off-bottom oyster culture" is often referred to by that name or similar, but not as AOC. However, in Louisiana with its historical and productive traditional oyster fishery, it is known as AOC. The inclusion of the term "Alternative" implies, and rightly so, that this cage method is not a replacement for the traditional fishery, but a supplement for those fishers and entrepreneurs who have an interest in developing a "new" method of bringing this valuable Louisiana product to market.

Within the LDWF's initiative #4 are the goals to enhance, expand and sustain the AOC fishery by (1) *implementing oyster seed production grants*, (2) *sustaining and increasing hatchery diploid and triploid production*, (3) *implementing industry AOC startup grants*, (4) *developing and implementing education and outreach opportunities to the industry and general public*, and (5) *developing designated (special) management use areas, hereafter referred to as AOC Parks*, in coastal waters which have the necessary oyster habitat parameters adequate growth and survival. Louisiana Sea Grant (LASG) College Program has a decades-long history in working on many of those same goals, while also having the desire and infrastructure of faculty and staff expertise to address the others.

LASG was awarded a three-year contract from LDWF to help implement strategic initiative #4. The goal was to supply the Louisiana AOC fishery with the necessary financial assistance, education and outreach, and marketing and business tools to increase the opportunity for business success. That goal had two objectives: (1) supply and administer grant opportunities to enhance existing and develop new AOC Designated Management Use Areas (Aquaculture Parks), develop oyster seed nurseries and grow-out farms, and to develop private oyster hatcheries, and (2) develop and coordinate outreach and education meetings, workshops, and media materials for the AOC farmer and public. The following information is a report on those efforts and accomplishments.

Methods

The AOC team consisted of LASG personnel, Earl Melancon, Ralph (Wood) Oglesby, Anne Dugas, Elizabeth Robinson, Brian Callam, Leslie Davis, and the Iberia Development Foundation (IDF) personnel, Michael Tarantino, Evelen Ducote, and Elizabeth Mauney. Three on the LASG team have dual employment status with the LSUAg Center, Thomas Hymel, Kevin Savoie, and Albert (Rusty) Gaudet. IDF was a subcontractor and administered grant contracts on behalf of LASG and LSU, kept the ledger on grant-awarded funds, and distributed payment checks.

Funds available for the grants equaled $1.8 million dollars (US). Funds were divided into four categories for distribution based on a competitive process: two private hatcheries, for a total of $450,000 at $225,000 each, three aquaculture parks, for a total of $300,000 at $100,000 each, 20 grow-out (to market) farms for primarily capital cost associated with developing a 1-acre sized farm, for a total of $900,000 at $45,000 each, and 10 small farm-scale nurseries (for seed oyster cultivation), at $15,000 each for a total of $150,000. The grant program's highest funding priority was to help re-establish the farms lost to Hurricane Ida, followed by traditional oyster harvesters who wanted to get into AOC. A high priority during the selection process was also given to applicants who had a permitted lease ready for AOC development. All applications were also dependent on a farm location habitat assessment based on historical seasonal salinity and on seasonal state health pollution closures.

At the initiation of the grant process, an AOC aquaculture park administered by the Grand Isle Port Commission existed in the Barataria estuary near Grand Isle, La., and was given a park grant without going through the competitive process. Also, prior to the grants program another aquaculture park had been under consideration for several years by the Cameron Port, Harbor, and Terminal District Authority (CPHTA). Cameron Park was also conditionally approved into the program if the park was successfully established. Therefore, the grant solicitation process had funds remaining for one new AOC aquaculture park.

All grants were for the purchase of supplies and equipment associated with capital costs. Excluded uses of the funds included salaries and owner's draw, and the purchase of boats, outboard motors, vehicles, or land. Electronic equipment purchases, such as security cameras or laptops for business documentation, were on a case-by-case basis with sufficient justification. Originally, the lease, purchase, or construction, of a storage building was also excluded but that policy changed when it became evident that grantees needed storage space for their purchased supplies and equipment. Aquaculture parks were given greater latitude to construct any facilities that collectively benefited the AOC park tenants. All purchases before being submitted to IDF needed the approval of the Program's AOC Outreach Coordinator and Lead Scientist. The Rules and Regulations for use and expenditures of grant funds are found in Appendix 1.

Grantee activity was assessed on a quarterly basis by the AOC program outreach coordinator and others on the AOC program team. The metric used for success of a grantee was the adherence to a quarterly timeline showing progress on purchases and eventual deployment of those purchases on the farm, park, or hatchery. The timeline was cooperatively developed by the grantee and LASG staff. The quantity of sales and profitability of a farm were not metrics used to document success on a farm. Park success was evaluated on use of funds to improve infrastructure to benefit the farms within the park, for example security improvements and increase in navigational aids for safety. Hatchery success was measured on the quantity of eyed larvae and post-set seed produced.

Ownership of the equipment was the grantee's unless defaulted on the contract, at which time ownership defaulted back to the state. The determination if a grantee was defaulting on a contract would be through quarterly progress reports or if the farm or business was abandoned.

AOC Grant Selection Process

Selection of all grant awards, other than the two grandfathered aquaculture parks, was by a selection committee separate and independent from the AOC team staff. It consisted of two representatives of the Louisiana Oyster Task Force (OTF) with an alternate, two representatives from LASG with an alternate, one representative from IDF with an alternate, and one at-large representative selected by the others on the committee. The Co-PI, Earl Melancon, and lead scientist on the AOC grant program team was chair of the selection committee but non-voting. An advisory group of scientists with extensive oyster knowledge and experience was established to assist the committee with information as needed.

All selection committee and advisory members were required to sign a confidentiality agreement to not discuss a candidate outside of the group. Committee meetings were webinar and closed to the public. There were three rounds of grant opportunities during the program, each announced to the public at an OTF meeting, on the Louisiana Seafood Future (LSF) web site (www.laseafoodfuture.com), and also distributed to the news media by LDWF and LASG communication staff. One month was allocated for farm application submittal, and two months for aquaculture parks and private hatcheries. Submittal could be either by mail or by email to IDF.

Application documents included a formal one-page application (see Appendix #2), a recorded phone interview with the LASG team that lasted up to an hour, and any supplemental documents provided at the discretion of the applicant. The list of questions to be asked during the interview (Appendix #3), and explanation of the evaluation metrics used by the Selection Committee in the scoring process (Appendix #4) were all published on the LSF website prior to the application process. During the interview the LASG staff attempted to engage in a more conversational type of interaction to put the applicant at ease, and

which often led to unscripted questions and conversation. After the interview, the LASG staff distributed all applicant documents to the selection committee and advisory group via a secure private website. The evaluation process (Appendix #4) was partly a habitat algorithm evaluation to reduce subjectivity in scoring. We were sensitive to the needs of applicants, and the mathematical process was explained in a public-access webinar, at an applicants' workshops, and on a one-on-one basis as needed.

The habitat evaluation algorithm for nursery and grow-out farms consisted of the applicant's farm location relative to seasonal salinity and the LDH seasonal pollution closures (Table 1). The habitat algorithm was developed by working with Megan La Peyre's United States Geological Survey (USGS) lab located on the LSU main campus. La Peyre's team developed a series of isohaline salinity maps for all of Louisiana's coastal estuaries. The salinity maps were a modification of the graduate work of Lauren Swam (Swam 2021). An example of the salinity maps for the Barataria estuary can be seen in Appendix #5. Additionally, working with Chris Lemaire and Jennifer Armentor with the Oyster Division of the Louisiana Department of Health (LDH) a series of historical seasonal pollution closure maps for Louisiana's coastal estuaries were established and used in the algorithm. An example of the pollution closure maps for the Barataria estuary can be seen in Appendix #6. All the maps were published on the LSF web site for applicant review.

The more subjective parts of the evaluation process considered an applicant's competitive qualifications compared to other applicants, their reasons for wanting to pursue AOC (as gleaned from the documents provided by the applicant and the recorded interview), and any efforts, whether successful or not, to pursue additional financial grants/opportunities for funds (Table 1). *What was not considered in the evaluation process of any applicant was their ability to provide personal funds as a match; this would have put those applicants without the same financial ability at a disadvantage.*

The application process for aquaculture parks and private hatcheries did not use the same assessment tools that were applied to nursery and grow-out farms. Park and hatchery grant evaluations required more documentation than farms because of the nature of the businesses. Park and hatchery applications required submittal of a formal application document that included the following: title page, names of business owners, statement of purpose, administrative structure and operating personnel, a proforma cash flow assessment of fund usage, proof of at least $1 million liability coverage, surety bonding for removal of any waterborne equipment if default on grant or if there is a natural event that produces a pubic hazard, an estimated timeline on progress if funded, a general idea of types of supplies and equipment that will be purchased, and any other general information about the business the applicant wished to provide.

Table 1. Evaluation Scoring Process for Nursery and Grow-Out Farms.

Applicant Weighted Final Score = $0.25(A) + 0.40(B) + 0.20(C) + 0.10(D) + 0.05(E)$

A = Applicant's competitive qualifications against others applying
Value $_A$ (points):1=Poor; 2=Below Avg.; 3=Avg.; 4=Above Avg.; 5=Excellent.

B = Salinity isohaline within a basin where AOC farm located (data yrs. 2015-2019)
Value $_B = 0.10(S_1) + 0.25S(_2) + 0.50(S_3) + 0.15(S_4)$
S_1 = avg. salinity
S_2 = avg. salinity in winter, December-February
S_3 = avg, salinity in summer, June-September
S_4 = salinity variability

C = LDH pollution closures within a basin where AOC farm located (data yrs. 2016-2021)
Value $_C = 0.17(S_5) + 0.33(S_6) + 0.17(S_7) + 0.33(S_8)$
S_5 = Value for Number of March-April closures during period
S_6 = Value for Number of May-August closures during period
S_7 = Value for Number of September-October closures during period
S_8 = Value for Number of November-February closures during period
Value: 6 closures=1 point; 4-5 closures= 2; 2-3 closures=3; 1 closure= 4; 0 closures = 5

D = Applicant's Reason for wanting to pursue AOC
Value $_D$ (points):1=Poor; 2=Below Avg.; 3=Avg.; 4=Above Avg.; 5=Excellent

E = Applicant's efforts to pursue additional financial grants/opportunities.
Value $_E$ = any amount $\geq$ \$1,000 = 5

NOTE: A high score does not necessarily mean funding since there is also a telephone interview and ability to submit more information on your application. The selection team will evaluate all evidence brought before them before making a final decision

AOC Grant Award Process

Once all applicants within a round were chosen, each was contacted by email, phone text, and registered letter. IDF coordinated times for each awardee to appear at their office in New Iberia, La., and sign a notarized contract. At least one LASG team member was present at contract signings, and all rules and regulations explained. Soon after all had signed contracts, the LASG team convened a group meeting to again explain all rules and regulations as well as purchasing procedures. This group meeting also gave grantees the ability to hear others and have a group Q&A session with the LASG team.

The administering of grants through a competitive process created the need to develop a procedural avenue for an applicant or grantee to express any grievances that could arise. The grievance process included an initial review by the program lead scientist in collaboration with other team members. If the grievance could not be resolved, the complainant had the opportunity to express their grievance in public to the OTF board members at one of their regular meetings. The OTF could dismiss the complaint or make a recommendation to the AOC selection committee, who had final decision authority. Since all information used in the selection process was confidential, the program lead scientist had limitations in explaining the program team's position on the grievance unless the complainant permitted private information to be shared. The OTF had the ability to go into executive session to hear the grievance if they chose. The entire grant process is outlined in Figure 1 below.

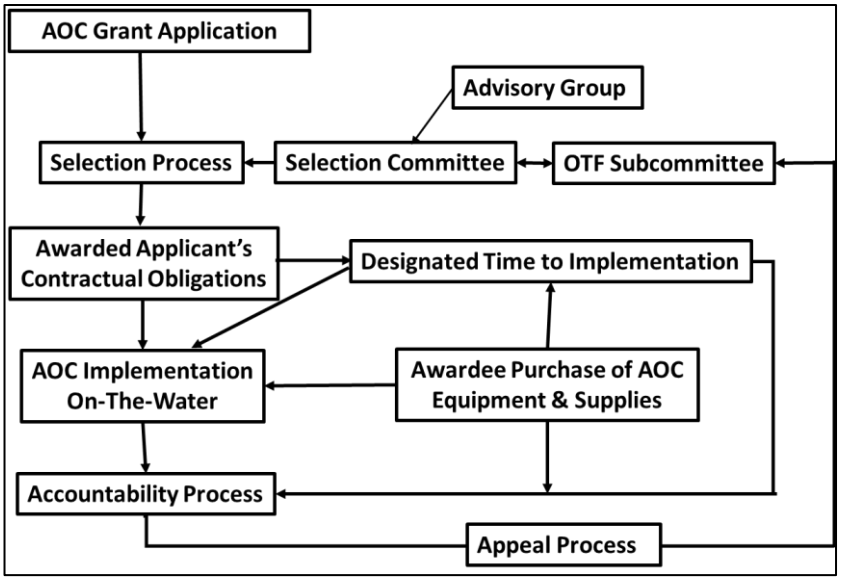


Figure 1. Flow Chart of Application, Selection, Implementation, and Grievance Procedures.

AOC Grants Outreach and Education Process

The grant program was officially announced to the public on May 11, 2021, at the OTF meeting held in New Orleans, La. The next day, LASG and LDWF posted the grant announcement on their respective web site and sent the announcement to the state's news media for publication. On May 19, 2021, a webinar presentation of the grants program with a Q&A opportunity afterward was presented to the public. On June 9, 2021, an in-person and webinar three-hour afternoon meeting/workshop was held at the LDWF Marine Biology Laboratory on Grand Isle, La., to explain the program to existing AOC farmers and any interested public with a Q&A afterward.

Many excellent AOC-type outreach and education materials exist on the web through federal, state, university, and private efforts. The AOC grants program team linked much of that information to the Louisiana Fisheries Forward website with a dedicated AOC page (www.lafisheriesforward.org). Besides the AOC information found at those web links, the grants program team in cooperation with the LASG communications staff, with LDWF staff, with private consultants, and with AOC farmers developed and placed on the LFF website Louisiana-specific AOC fact sheets, videos, and white boards to assist and inform. All newly created AOC information was vetted by the LDWF and LASG administrations before public access. Additionally, the AOC team conducted workshops and meetings to engage AOC farmers and inform the public (Appendix #7). At the end of 2023 the LSF site was no longer maintained, and all pertinent AOC information was moved to the Louisiana Fisheries Forward (LFF) website.

History of AOC in Louisiana 1990-2023

Off-bottom oyster culture has been around for over a half century on the west and east coasts of the United States, but in comparison is a new venture for the northern Gulf of Mexico states (Walton et al. 2013). In Louisiana with its nationally prominent traditional oyster fishery, AOC experienced a slow growth period in its early days but is now gaining momentum. The Louisiana Oyster Industry continues to evolve.

Off-bottom cage culture typically begins at a hatchery with rearing of spawning oysters and larvae. The concept of rearing oysters in the United States dates to the nineteenth century but did not develop with advanced hatchery-rearing technology in this country until the mid-twentieth century (Dupy et al. 1977). There was little interest in hatchery technology by the traditional commercial oyster industry until natural populations on the west and east coasts began to decline (MacKenzie 1996). Similar interest did not occur in Louisiana until there was a temporary oyster spat recruitment crisis during the late 1980s (Supan 2005).

Marino et al (2019) documents the current four-step permitting procedures in Louisiana to develop an AOC farm : (1) Joint application to the Louisiana Department of Natural Resources (LDNR) for a Louisiana coastal use permit (CUP) and to the Corps for a Department of the Army permit (DA Permit); 2) Application to the Coast Guard for determination and approval of marking and lighting requirements (PATON Approval); (3) In some parishes, it is also necessary to apply to the local government for a "Coastal Zone Activity Certification" or similar permit; and (4) Application to LDWF for the AOC Permit itself. During or after the four-step process the farmer must also obtain all necessary commercial fishing licenses from LDWF and comply with all LDH health and safety requirements. If a farm is located within an AOC aquaculture park it is the responsibility of the park owner to obtain all documents required in the four-step process, but LDWF commercial fishing licenses and LDH health permits are the responsibility of a farmer within the park.

Louisiana has had a steep downward trend on the public oyster grounds starting in 2007 and continues to this day as the worst in recorded history (LDWF 2023). This decline is primarily due to freshwater from the Mississippi River dwindling oyster populations on the public oyster grounds east of the Mississippi River. Historical production shifted from the public grounds providing 24,000 pounds of oyster meat, 0.4%, to private oyster leases providing 6,600,00 pounds, 99.6%, of state landings in 2021 (LDWF 2023). Although the state's public grounds rebounded slightly in 2022 with supplying 3.3% of state production, lack of oyster seed remains a critical issue (Cabellero 2023). This decline helped to spark a resurgence in state government's interest in establishing AOC methods to help diversify the traditional industry and helped to establish the AOC 2021-2023 grants program administered by LASG.

The below history of the AOC fishery is a summary of chronological events, but it is not meant to be a complete account of the many individuals that worked to develop the fishery. It is meant to give understanding to the complexity and challenges faced in developing a new type of fishery for the state that is in multi-used coastal waters with private property and state legal rights to consider. It is also a new type of state fishery competing for a market share with a traditional oyster fishery that annually contributes 33-40% of the nation's oysters (NMFS 2022).

State Oyster Hatchery Development

From 1988 to 1990 there were consecutive years of very low natural spat recruitment in Louisiana (LDWF 2001) which sparked interest from the traditional oyster industry in using hatchery-reared larvae for remote setting onto oyster shell to augment natural reef production. Interest in a hatchery to address the issue began in 1990 with private investors, Jordan Bradford of Oyster Farms Inc., Hopedale, La., Tony Venterella, of Amite Oyster Company, Amite, La., and Lee Hansen of Whiskey Creek Oyster Hatchery, Netarts, Oregon (John Supan, personal communication). Hansen wished to diversity his oyster business operations into the Gulf of Mexico. The three men established their private company, Gulf Shellfish Farms of Louisiana (GSFL) and financed a small hatchery beneath an existing boat shed located on Grand Isle, Louisiana, near Caminada Pass.

John "Sup" Supan, LSUAg Center Area Fisheries Agent for Orleans, St. Tammany, and Tangipahoa Parishes from 1984-1989, became LASG's oyster specialist in 1990 to foster the hatchery's development (Supan 1995). Supan was loaned to GSFL by LASG to help supervise hatchery operations, to produce eyed oyster larvae, to evaluate setting and planting survival, and to help train other oystermen in remote setting techniques to produce their own seed oysters for their traditional private oyster leases. The hatchery was designed to produce 500 million eyed larvae per year: producing 150 million eyed larvae in 1991 and 385 million in 1992 (John Supan, personal communication). On the 20-year anniversary of the hatchery, Supan reflected on his early efforts to establish the first commercial oyster hatchery in Louisiana and some of the challenges he faced (LASG 2013).

By 1992 oyster recruitment began to rebound on the state's public reefs and continued to improve throughout the decade (LDWF 2001), and the traditional oyster industry's interest in remote setting began to wane. GSFL dissolved in 1993, leaving its assets to LASG (tanks, equipment, and supplies) and Supan became the hatchery director/manager/biologist. LASG's efforts to support the hatchery continued for the

following 17 years with R&D efforts funded through competitive grants, such as NOAA Sea Grant's Gulf Oyster Industry Program (GOIP), NOAA Sea Grant's Oyster Disease Research Program, and from NOAA Sea Grant's National Aquaculture Initiative. The early effort to find LASG the financial means to continue the hatchery was due to a strong partnership between Supan and the late Ron Becker, LASG Associate Director.

Supan and LASG used those the GSFL-donated hatchery assets as in-kind match to develop triploid oysters for the Gulf of Mexico Region through a competitively funded three-year grant from the Louisiana Board of Regents' Industries Sub-Ties Program. Assisting Supan with those triploid efforts were Jerome LaPeyre of LSU's Animal Science Department and Stan Allen of Virginia's Institute of Marine Science. What resulted was a disease resistant (Dermo-resistant) diploid broodstock line named "OBOY" and used to eventually produce triploid seed oysters. Triploid oysters could potentially benefit Louisiana AOC as a fast-growing hatchery-produced resource (Supan 1995). This development of a triploid line of oysters was important because Louisiana had at that time no state guidelines or regulations for the commercial importation of seed oysters from another state. With the advancements of dermo-resistant triploid oysters, Vanessa Maxwell, a doctoral student under Supan, examined the concept of an aquaculture park within the framework of a demonstration project for industry (Maxwell 2007).

Hand in hand with development of an oyster hatchery is the possibility of establishing off-bottom oyster aquaculture farms. The concept of an oyster aquaculture park with multiple farm sites sparked interest from local government on Grand Isle as a possible economic incentive for their community (Wayne Keller, personal communication, retired Exec. Dir. Grand Isle Port Commission (GIPC)). With the legal assistance of Jim Wilkins, Professor and LASG Director of Law & Policy Program, this led to the establishment of a five-acre experimental AOC aquaculture park in 2005 as a cooperative agreement between LASG and GIPC, with Wayne Keller as administrator. This initial five-acre park allowed LASG, GIPC, LDWF, and oyster industry partners to begin conducting technical, economic, and legal evaluations of raising oysters using advanced oyster genetics and off-bottom culture methods in Louisiana. This first AOC park within the state, which was for experimental purposes and not for commercial use, was located near Grand Isle adjacent to Tern Island near Caminada Pass, all within the Barataria estuary.

As the experimental five-acre park developed, a traditional Grand Isle oysterman, Jules Melancon, became the first to work with Supan to develop appropriate methods that could potentially work in Louisiana (LASG 2013). Unfortunately, mother nature intervened with multiple hurricanes. Sea Grant's original hatchery was destroyed by Hurricane Katrina in 2005 and, after rebuilding a modest second hatchery, destroyed again by Hurricane Gustav in 2008. Fortunately, Jules Melancon continued to do experimental cage culture efforts on his own traditional leases in the Barataria estuary and continued his association with Supan.

LASG's oyster hatchery operation on Grand Isle was rebuilt for a third time in 2010 at a new location beneath LDWF's new Marine Fisheries Laboratory located at the end of Ludwig Lane on Grand Isle. In 2015, a new $3 million state-of-the-art LDWF/LASG 7,000 square-foot oyster hatchery became operational adjacent to the Ludwig Lane LDWF location and was dedicated to the late Michael C. Voisin, a traditional oysterman who as chair of the Louisiana Oyster Task Force for many years and supported many of LASG's AOC efforts. Much of the financing for the new hatchery came from Natural Resource Damage Assessment (NERDA) funds associated with the 2010 Deepwater Horizon tragedy.

The Michael C. Voisin hatchery facility is a cooperative agreement between LASG and LDWF with the hatchery suppling at least half of its eyed larvae production to the state for traditional fishery enhancement and coastal restoration activities, and in return the hatchery receives funds for LASG operation and to hire staff. Along with its larvae commitment to the LDWF agreement, the state hatchery's academic mission is to develop disease resistant oyster strains, to test potential oyster cultch materials, and to produce triploid oysters to the commercial AOC fishery when the private hatchery sector cannot meet the farmers' needs. After Supan's retirement, Brian Callam was Hatchery Director from 2019-2022, and now Elizabeth Robinson is the LASG Director.

The Legislative Challenge

The first AOC aquaculture park established on unleased public water bottom in 2005 was in Grand Isle, La., as an experimental research operation. In 2005, the four-step permitting process (Marino et al. 2019) for an AOC farm or park was nonexistent. This was a new type of venture for the state and many local, state, and federal governments, as well as nearby landowners and public estuarine-based industries expressed concerns. Louisiana Sea Grant was instrumental in helping to address those concerns and help draft AOC park legislation for the Grand Isle Port Commission. The below information chronicles the development of the first commercial AOC park on unleased public water bottoms.

Official efforts to establish a Grand Isle AOC Park began in 2002 when Louisiana Sea Grant, working with the Grand Isle Port Commission, helped to draft AOC legislation, but the effort failed to generate a sponsor that year (Jim Wilkins, LASG, personal communication). But later, in 2005, Representative Lulan Pitre from Lafourche Parish introduced a bill to, "*Authorizes the Grand Isle Port Commission to use certain state water bottom, water column, and water surface for research purposes*." This eventually led to passage of legislation creating an AOC 5-acre experimental park under the direction of John Supan with LASG and administrated by Wayne Keller, Executive Director of the Grand Isle Port Commission.

The development and passage of legislation creating the 5-acre experimental park was a cooperative effort with Representative Pitre by LASG and the Port Commission. This cooperative effort started in 2003 when John Supan, Wayne Keller, and Jim Wilkins, Director of LASG Legal Program, conducted a series of meetings with government and local businesses to assess the feasibility of an AOC park. The park was originally proposed to be 100 acres in area but then reduced to 91 acres after concerns by a local marina owner, and eventually reduced to five acres. In September 2003, Supan, Keller, and Wilkins met with representatives from the Louisiana Department of Natural Resources (LDNR), Louisiana Office of State Lands (OSL), Army Corps of Engineers (USACE), and LDWF to discuss the proposed AOC park.

After the September 2003 meeting, a list of ten concerns was prepared by LDWF on behalf of all agencies and presented to the Port Commission (listed here from unpublished notes by Supan): (1) proposed action will require a mariculture permit from LDWF as per LA. RS. 56:579.1.B., (2) a mariculture permit is prohibited from being issued under La. RS 56:579.1.C as proposed. Specifically, the act requires maricultural projects to occur within the coastal zone on privately owned property and water bottoms. The proposal is within the coastal zone but not on privately owned property or water bottom, (3) legal authorization for the Port Commission does not include provisions for such a project, (4) Port Commission's geographic jurisdiction is limited by La. RS 34:3253 to the boundary of the Town of Grand Isle and Ward 11, (5) Tern Island, which is adjacent to the proposed action, contains a wading bird rookery, which is protected by state and federal law, (6) Port Commission does not have the authority to lease water surface, column, or bottom for oyster production, (7) OSL has the authority to issue a permit for using the water column while LDWF has the authority to issue a lease for water bottoms, but neither has the authority to grant the right to the Port Commission or any other entity the exclusive rights to the water column, (8) the proposed AOC park site is a highly used recreational area and restriction of vessels from the project site is currently not authorized under any state statute, (9) The liability of any property and/or person injury or death is an issue that needs addressing in this matter, and (10) legal opinion from the State Attorney General's Office (AGO) is necessary to clarify the above items 3, 4,6,7,8, & 9.

The appropriate way to describe how those 10 concerns were addressed is to provide the verbatim summary of John Supan's unpublished notes to the Louisiana Sea Grant Administration: *"Some of the issues have been addressed by subsequent negotiations with LDWF by relocating the project to a smaller island just east of Tern Island, reducing the park to a 5-acre test site, and agreeing to make the site non-commercial. The port commission subsequently amended their coastal use permit application in November 2003. Meanwhile, the PI* [Supan] *and the Sea Grant Legal Program* [Wilkins] *assisted the Port Commission* [Keller] *in drafting a resolution requesting an opinion from the AGO* [Attorney General's Office] *to address the other issues. The commission submitted the resolution to the AGO in November*

2003. In March 2004, the AGO verbally contacted the commission with a favorable discussion on the resolution. During a May 2004 telephone conversation, the AGO promised a written opinion to the commission within two weeks. As of October 2004, the opinion has still not been issued.

The Sea Grant Legal Program has been negotiating with [Name Removed]*, OSL, to identify for the Port Commission the necessary requirements to gain a letter of no objection to the coastal use permit application and for a special permit for use of the water column and bottom. These requirements include: (1) Landowner approval, (2) AGO approval, (3) LDWF approval, LDNR and Corps permits, and (5) A letter of no objection from the parish (Jefferson) governing authority.*

The PI [Supan] *and Jim Wilkins, Director-Sea Grant Legal, conducted a title search for the Port Commission at the Jefferson Parish Assessor's Office in March 2004 to identify the owner of Tern Island. A letter was drafted for the commission to approach the landowner, describing the project; its significance to the island's economic development, and requesting a letter of no objection. After subsequent telephone discussions between the landowner and the commission, the letter was received by the commission on May 14, 2004.*

All these issues are being addressed by the Port Commission, Sea Grant Legal, and the PI. These policy issues were the basis for a successful proposal for Yr.-2 funding by the GOIP [Gulf Oyster Industry Program] *entitled "Inshore Molluscan Aquaculture Parks: Identifying Gulf State Policies to Facilitate Sustainable Community Development." The project expands the policy investigation to the other Gulf States and includes collaboration with Stephanie Showalter, Director-National Sea Grant Law Center, Granvil Treece, Aquaculture Specialist-Texas Sea Grant College Program, and Jay Clement, CoE-Maine District Office. Mr. Clement, identified by the PI's relationships with aquaculturists in the Northeast region of the U.S., has vast experience permitting aquaculture operations in Maine and has begun assisting the PI and Wilkins in their dialog with* [Name Removed]*, CoE New Orleans District Office, who has been vocally adamant against the project.*

The permit application was amended in August 2004 in response to the Attorney General's Office (AGO) recommendation that tasks be clarified in the permit application to help it render its opinion on the project. The Louisiana Sea Grant College Program became a co-applicant with the GIPC, and the PI became an agent of the application to become an official facilitator of the permitting process.

The location was moved back to near Tern Island in response to local parish government review. The wading bird rookery was addressed by identifying that LDWF has been issuing oyster leases in lagoons on the island since 1960 and that there have not been any active nests reported on the island since 1998. LDWF then required an opinion from the US Fish and Wildlife Service (USFWS) regarding federal protection of the rookery site. USFWS stated reiterated that there have not been any active nests reported on the island in over five years and that they did not have any objection to the project, although they would like to survey the island for active nests during Spring, 2005.

A second coastal use permitting meeting was held on September 1, 2004. In response to the meeting, LDNR issued a letter requiring more documentation to process the permit application, namely: (1) Provide an alternative location analysis that addresses other sites considered, why they were eliminated from consideration, and the justification for the current site selection, (2) Address the issues raised by [Name Removed]of the CoE regarding hazards to navigation, (3) Provide a clear explanation of the purpose of the project, and it's goals, (4) Provide an official opinion from the AGO regarding the Grand Isle Port Commission's role in this project, (5) When prepared to do so, resubmit your application to the CoE with any design changes made since the application was returned by them; and, (6) Various plot sizes have been discussed during processing of this application (1, 5, 91, 100 acres). Please specify the size of the proposed demonstration plot. [Subsequently] *the PI and Wayne Keller, Executive Director, Grand Isle Port Commission (GIPC), conducted a field evaluation of alternative locations for the 5-acre park and are preparing a reply to the above requirements to the New Orleans Corp of Engineers District Office (CoE) and La. Dept. of Natural Resources.*"

Ten years after the first efforts to establish an AOC park, a CUP for the development of the 5-acre Grand Isle commercial AOC park was approved on January 19, 2012. Soon afterward, the CUP was amended on September 20, 2012, by legislative Representative Jerry Gisclair from Lafourche Parish, to allow expansion of the park to 25-acres that also gave authority for the Port Commission to manage it. Five years later in 2017, with many of the initial state and federal concerns now addressed, the Grand Isle Port Commission, again with Sea Grant assistance, worked with Representative Gisclair once again to expand the AOC park with another location near the first park in Bayou Rigaud behind Grand Isle. Once legislatively approved water bottoms had been established, the GIPC applied for a CUP for the 14-acre park expansion, and it was approved on February 27, 2020. Now the GIPC aquaculture park has a combined footprint of 39 acres. Both Grand Isle sites are administered by the present GIPC Executive Director, Weldon Danos.

The state's oyster hatchery played a vital role once the Grand Isle commercial AOC park was established. Through a cooperative effort between LASG and LDWF oyster seed from the hatchery was made available for purchase to the farmers. Initially, there was no mechanism for collecting revenue from the sale of seed, so an agreement was developed with the Louisiana Oyster Growers and Dealers Association, a long-standing 1950s-established organization that has a history of cooperation with the state and LASG. Oyster Seed revenue collection continued through the Association until the LDWF eventually took over the role once an administrative protocol had been developed. Over the last two years the state oyster hatchery has taken a diminished role in supplying oyster seed to not compete with the state's private hatchery.

Progression of Legislation and Farm Acreage

The historical progression of AOC acreage within Louisiana is documented below in Figure 2. Although estuary aquaculture farms on privately owned water bottoms had been legislatively permitted earlier, for example red drum fish farms (*Sciaenops oscillates*), the legal language did not fit well for AOC (Marino et. al. 2019). Part of the issue of AOC not fitting well into state laws was because no new water bottoms could be legally leased by traditional state means. In March 2002 the Louisiana Wildlife and Fisheries Commission enacted a moratorium prohibiting issuance of new private oyster leases on state-owned water bottoms (Banks et al. 2016). The moratorium was enacted because of private oyster leases potentially in conflict with the state's coastal restoration activities; there are approximately 400,000 acres of oyster water bottoms leased from the state. Not until 2016 with the passage of legislative ACTs 570 and 595 was the moratorium lifted. Although the moratorium was lifted, it has been a slow process to enact. There are six phases in the moratorium process and as of 2023 the state is still in the first phase.

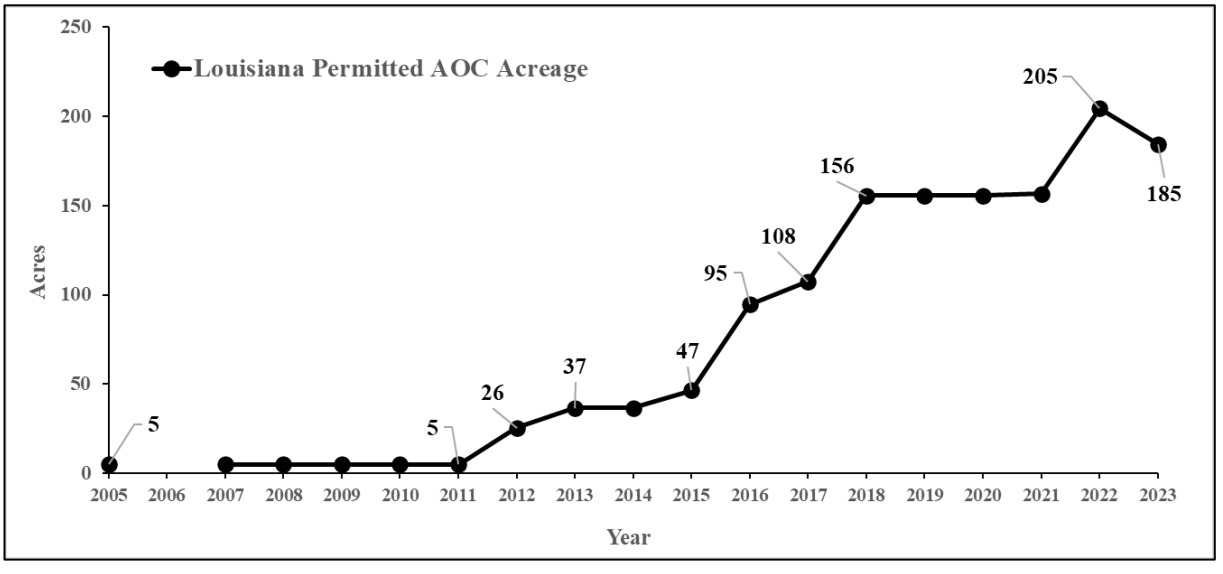


Figure 2. History of AOC acreage permitted within Louisiana from 2005 to 2023.

Official state-sanctioned AOC farming did not begin until 2005 with the passage of state legislative ACT 57 creating the five-acre experimental AOC aquaculture park in the Barataria estuary adjacent to Tern Island in Caminada Bay. But Legislative ACT 57 was paused in 2006 with the passage of House Concurrent Resolution No. 191 (Figure 2). The pause was due to many concerns, including if the GIPC had the legal authority to govern state-owned water bottoms, the potential navigation obstructions, and state liability issues, among others (Maxwell et al. 2008). Fortunately, most were resolved sufficiently to allow AOC to prevail the following year with ACT 79 of the 2007 state regular session that repealed Resolution No. 191 and reinstated the 5-acre research aquaculture park (Figure 2). Act 57 allowed the GIPC and LASG to operate the park strictly for research purposes.

This research park caught the attention of a local traditional oysterman, Jules Melancon. Jules began a cooperative effort with Supan to investigate the potential for commercial development. From 2007 to 2011, AOC acreage remained flat at five acres (Figure 2) since ACT 57 stated that the park was for research purposes only and not for commercial use. To legally administer a 25-acre park, in 2012 ACT 57 was amended by creating ACT 583 of the regular legislative session. ACT 583 increased the AOC acreage from the original five to 25 resulting in the establishment of eight two-acre commercial lease plots for tenants and administered by the GIPC. All eight plots were leased quickly but mostly remained fallow with little activity until the 2015-2018 period when the first commercially active tenants started farming. The first active park tenants in AOC were Scott Maurer, Mike Roberts, Steve Pollock, and father-son duo Marcos and Boris Guerrero. Jules Melancon decided to not take a lease in the park but to pursue a CUP on one of his own privately held state oyster leases.

In 2012, Legislative ACT 293 authorized LDWF to establish a permitting system for AOC activities on leased traditional oyster water bottoms and on privately owned water bottoms. Legislative ACT 293 codified the definition of AOC as, *"any on-bottom, off-bottom, or other means of cultivating or growing oysters other than directly on reefs or other water bottoms, including but not limited to the use of on-bottom cages or bags or floating, suspended, or otherwise off bottom cages or bags, and includes the harvesting of oysters so grown or cultivated."* Unlike privately owned water bottoms and traditionally leased oyster water bottoms that qualify for AOC state permitting under ACT 293, there is presently no permitting process for water bottoms that do not fall into one of those two categories because of the slow pace of the oyster lease moratorium lifting. Therefore, if there is interest in developing AOC other than on private and traditional oyster lease water bottoms legislative action is required. However, regardless of how an AOC lease or park is acquired all must have a CUP approved before starting.

Tenants within an aquaculture park do not require an LDWF permit since they work under the park's CUP. Aquaculture parks acquired through the legislative process pay no state fees, but an AOC farm or park on private property pays an application fee of $100, and an annual permit fee of $2 per acre or fraction of an acre thereafter (www.wlf.louisiana.gov/page/alternative-oyster-culture). A traditional oyster lease holder is already paying $3 per acre for that privilege, and the AOC $2 per acre is added on top.

In response to ACT 293, the first LDWF-permitted traditional oyster lease acreage was added within the state in 2013 by Jules Melancon on his six-acre oyster lease located in Bay Des Ilette in the Barataria estuary north of Grand Isle. By 2016, the active AOC state acreage had quadrupled from 26 acres in 2012 to 95 acres due mostly to other oystermen using their traditional oyster leases (Figure 2). The additional traditional acreage included Jules Melancon adding a second 15-acre AOC farm site on Independence Island in the Barataria estuary north of the barrier island Grand Terre; Jason Pitre and his brother Joshua, the first Native-Americans in AOC whose grandfather was a traditional oysterman, adding 8-acres in Little Lake located in the far eastern area of the Terrebonne-Timbalier estuary near Leeville, La.; and Terry Shelley, a traditional oystermen from Port Sulphur, La., along with his daughter, Brandi, adding 40-acres. The Shelley's AOC lease is in an area locally known as "No Man's Land" on Barataria estuary water bottoms created by eroding marshes close to the Gulf of Mexico behind a barrier beach. The Shelley's had arranged, for the first time in AOC history, a farming contractual agreement with a private landowner, but only two acres of the original 40-acres were ever used as a farm site.

In 2018, the first privately owned AOC park, Southern Belle, was created adding 48 acres through the LDWF permitting process. Southern Belle Park consists of 25 plots of 0.5-acres each with five now leased and active. Marcos Guerrero and his son Boris are owners and administrators of the Southern Belle AOC Park located between Grand Isle and Port Fourchon, La., adjacent Louisiana Highway 1 in an area known locally as "Dos Gris." The first tenant in 2018 was Kim Galjour, who had generational history within the traditional oyster industry. Later, in 2022, four other tenants joined the park.

In 2020, state Senate Concurrent Resolution No. 56 was passed to *"urge and request the Coastal Protection and Restoration Authority and the Department of Wildlife and Fisheries to cooperate in developing projects and programs to rehabilitate the productivity of the oyster resource, promote the viability of the oyster industry in Louisiana, assist the oyster industry with responding to a changing coast, and address competing uses for coastal water bottoms, including integrated coastal protection."* Subsequently, the LDWF published the "Louisiana Oyster Management and Rehabilitation Strategic Plan" (LDWF 2020). The Strategic Plan commits $132.3 million to the oyster industry divided into 12 initiatives. The fourth initiative within the plan, "Expansion of Alternative Oyster Aquaculture," has a projected funding commitment of $10.0 million. This led to the AOC Grants Program from 2021-2023 that was administered by LASG, and the results of those efforts are the basis of this report.

The LDWF's 2020 Oyster Strategic Plan was not without controversy. Many within the oyster industry did not totally agree with the 12 strategies developed by the state and argued that they, represented by the Louisiana Oyster Task Force (OTF), was not given sufficient ability to oppose controversial strategies before final state acceptance of the plan. The $10 million allocated for expansion of AOC was one of those controversial issues. The issue was not necessarily due to opposition to develop AOC which could potentially help diversify the industry, but due to the way the state had publicly released some of the reasoning behind the AOC strategic initiative. Some in government, as well as some state NGOs and others advocating for coastal restoration had proposed using AOC as a remedy, or partial remedy, for the Mid-Barataria Mississippi River Sediment Diversion Project to offset the traditional oyster fishery impacts within the Barataria estuary (https://mississippiriverdelta.org/project/mid-barataria-sediment-diversion/). This prompted LASG to issue a position statement on AOC relative to the traditional fishery to help explain its role in administering the AOC Grants Program (see Appendix 8). The AOC grants program and the LASG position statement were presented to the OTF at their May 2021 meeting, and both were approved by vote.

From 2018 to 2021 there was no additional AOC acreage development within the state (Figure 2). There were several reasons why AOC acreage may have remained flat during this period. The oyster industry was significantly impacted by low salinities in 2018-2019 when the Mississippi River had the longest lasting flood in recorded history and surpassing the great flood of 1927 in duration (LDWF 2019). Additionally, from August October 2018 to September 2021 coastal Louisiana experienced four tropical storms and eight hurricanes (NOAA 2023), and in January 2020 the COVID virus was officially recorded for the first time in the United States by the Centers for Disease Control and Prevention (CDC).

Cameron Parish's interest in developing an AOC aquaculture park predates the grants program by several years under then Executive Director, Claire Marceaux, with the Cameron, Port, Harbor and Terminal Authority (CPHTA) when she reached out to LDWF and LASG for information. But the process of developing an AOC park did not gain traction until January 2021 when the CPHTA, under the leadership of the present Executive Director, Kim Monte, applied for an AOC park grant through the LASG Grants Program. Subsequently, ACT 78 was passed in 2022 by the state legislature creating a second local government-administrated AOC aquaculture park located on public water bottoms in the lower area of Calcasieu Lake near the town of Cameron, La. The Cameron AOC Park is 48-acres in area with 15 plots of 2-acres each. ACT 78 had a dual purpose, establishing the location and boundaries of the AOC park, and giving CPHTA the authority to manage the Park. The Cameron aquaculture park is unique among the three parks in the state because it is an annexed area of the state's public oyster grounds in Calcasieu Lake.

Although the efforts of Supan, Wilkins, and Keller, in cooperation with local legislators paved the way for developing the infrastructure needed to acquire a park on public water bottoms, the process is still a significant effort since public lands and local governments are involved. Legislative ACT 78 was passed in 2022 through the efforts of local elected officials, Representative Ryan Bourriaque and Senator Mark Abraham, the Cameron Parish District Attorney representing the CPHTA, Tom Barrett, and an advisory committee composed of Kim Monte (CPHTA), George Melancon and Carolina Bourque (both with LDWF), and Ralph (Wood) Oglesby, Kiven Savoie, Jim Wilkins, and Earl Melancon (all with LASG).

Before ACT 78 of the 2022 legislative session could be proposed and eventually passed, the Cameron AOC Park efforts started in January 2021 with the advisory committee team meeting regularly. The AOC Park concept was first presented in June 2021 by the advisory committee to the CPHTA board members at three consecutive monthly public board meetings before they approved moving forward. Next, using some of the AOC grant program's funds allocated to CPHTA, three potential sites that had been approved by the LDWF administration were surveyed with a magnetometer for any above ground or buried obstructions and a side scan sonar for bathymetry was developed. The three sites also required a regulatory opinion from the Louisiana Department of Health (LDH) since Calcasieu Lake was traditionally closed annually to oyster harvest from late spring to early fall when the public oyster grounds harvest season ended, regardless of whether needed or not for water quality.

The Cameron AOC Park site that was finally selected had the proper water depths, no above and below ground obstructions, and was adjacent to an LDH monitoring station with historical data available. Once the site was selected, the advisory team presented it to the CPHTA board at their regular monthly board meeting for approval. The advisory team and CPHTA Executive Director also presented the park concept at two public meetings held at the CPHTA office in Cameron, and later to the Cameron Parish Police Jury for approval. The CPHTA Executive Director and advisory team then worked with the Parish District Attorney to assure that all Parish laws complied, and that CPHTA insurance liability coverage was in place. Only once all those conditions had been met did legislation get drafted. After passage of ACT 78, only then could the CPHTA apply for a CUP. The CUP was approved on February 9, 2023, a time span of two years from start to finish. The first tenants within Cameron Park in 2023 were Hubern Doxey, Anthony Theriot, David Sorells, and Kirk Daigle, each of whom applied to the grants program and was awarded $45,000 to develop an AOC grow-out farm.

As COVID subsided, with no tropical storms hitting Louisiana for two years, and with the infusion of grant money and the establishment of Cameron Park, by end of 2022 acreage had increased in the state to 205. But by the end of 2023, there was a small decline to 185 acres (Figure 2), when, on the death of Jules Melancon, his family heirs decided not to renew their LDWF AOC permits. By the end of 2023 there were three AOC parks with two administered by local governments and one privately. Across the state the three parks accounted for 135 AOC acres, 73% of the state's total, while 41 acres, 22% were located on privately owned water bottoms, and nine acres, 5%, located within traditional oyster leases (Figure 3).

Figure 3. Location of permitted AOC nursery and grow-out farms by the end of 2023.

There is one caveat with the acreage data defined in Figure 2 and Figure 3 below. A three-acre farm permitted by LDWF in 2016 on a traditional oyster lease located in the Biloxi Marsh is not shown in either figure. That permit was for a farm to supply oysters for coastal restoration purposes and not market sales and for our program purposes did not meet the criteria for inclusion.

Results and Discussion

Administration of Grants

LASG had never given grant money to commercial fishers, and we needed to develop the program and process from the ground up. It became clear early that the types of equipment and supplies potentially requested by grantees would be diverse and unusual, which could potentially cause unnecessary delays in the administrative process since LSU purchasing authorities were not used to working with commercial fishers. Additionally, Sea Grant did not have the staff to accommodate daily tracking of expenses and distributing reimbursement checks to farmers and vendors. Fortunately, Sea Grant had a history with IDF in an advisory capacity when they administered and distributed disaster funds to local shrimpers in August 2020 because of Hurricane Laura. With this prior relationship, the Foundation became the perfect partner for LASG and LSU to develop and administer the grant contracts. An additional advantage of this partnership was that both IDF and LSU used the same accounting firm as their external auditor.

Louisiana leads the nation in the domestic supply of oysters (NMFS 2023) and leads the nation in coastal wetlands restoration efforts (CPRA 2023). This dual national status has at times generated contentious situations between the state and the traditional oyster industry (Rogers 2003). Part of the state's efforts to reduce the tension is to use alternative oyster culture as a mitigation and stewardship measure for the Mid-Barataria Sediment Diversion (LATIG 2022). This prompted LASG to develop a position statement on AOC as it relates to the grants program and the traditional oyster fishery (APPENDIX 8). The position statement on AOC by LASG and the grants program team was presented to the OTF at its May 11, 2021, meeting, published on the LSF web site, and presented at the May 19, 2021, public rollout webinar of the grants program.

When the grants program started in 2021 limited documented economic knowledge about a Louisiana AOC farm existed. After program team observations and discussions with existing AOC farmers and with government and academic groups in the other Gulf states, we recommended to LDWF that LASG start small with the number of grant awards in the first round of funding followed by a larger second round. This allowed time for LASG and IDF to fine tune the program, give those interested in AOC time to learn more about the program, and time for LSU grant and purchasing administrators to better understand the types of supplies and equipment needs by farmers.

The award selection process was designed to be as independent from LASG as prudently possible while still adhering to institution accountability for the distribution of grant funds. The grant applicant selection committee that was developed allowed for that independence while also having traditional industry and Sea Grant representation. A challenge faced by many selection committee members was their limited knowledge of AOC and educating them was a challenge for the program team because of the lack of oyster farms for members to visit. Hurricane Ida had destroyed all Louisiana AOC farms in the first year of the grant program with the COVID pandemic occurring at the same time. The development of an advisory team for the selection committee members helped to bridge that AOC knowledge gap.

The selection committee was a diverse group of volunteers all of whom were very busy and scattered geographically across the state, with one living out of state. This required that the selection committee members and the advisory team meet virtually and to have all information, including audio of the phone interviews, available for review on a secure web site for independent access. The selection committee was requested to review all candidates' information. In the first evaluation meeting two selection committee members were assigned to lead discussions on a candidate, but in later application

rounds it was decided that better time management required that an advisory team member also be assigned to each candidate to assist with information as needed. Also, in the first round all members were required to generate salinity and LDH habitat site scores on their own but this proved challenging to some and very time consuming to all. In later rounds the objective habitat scores were generated by the LASG team with the option of committee members also scoring if they desired. However, the three remaining subjective parts of the overall scoring process were the sole responsibility of the selection committee.

For most applicants this was the first time they were introduced to a grant competitive process. Therefore, the first part of the application process was kept to a one-page formal document with only the essential information needed to start the selection process. The applicant was given the opportunity to include at their discretion more with the one-page document and many did add additional information. The second part of the application process, up to a one-hour phone interview that initially started with the prepared questions that had been given to them ahead of time, helped to reduce any anxiety that the applicant may have had. The team interviewers also noticed that the prepared questions helped the applicant generate spontaneous information during the interview. The one-page formal application document along with knowledge of the questions to be asked allowed for a better and more casual conversation during the interview process.

The LASG team interviewers stressed to the applicant that the selection process was by an independent committee and separate from us. During the phone interview the team interviewers stressed the importance of supplying as much documentation as possible to the selection committee and that they should not consider anything too trivial. We accepted additional applicant information up to a week before the selection committee was to meet, and in one circumstantial case information was accepted the night before the meeting.

The day-to-day purchasing needs and questions from grantees, as well as coordinating field assessment activities were performed by the team's AOC Outreach Coordinator, Wood Oglesby, while IDF staff coordinated and distributed grant funds by check. This program was originally designed to be a reimbursement-type grant, but quickly morphed into a direct-payment to vendors program as well. Many of the nursery and grow-out grantees did not have the financial resources for large purchases and wait for later reimbursement. This direct payment to vendors created an extra layer of work that was very time-consuming for all involved, but especially for Wood Oglesby.

Some of the grantees, despite all our efforts to hold group workshops, to explain one-on-one as needed, and to have all rules and regulations accessible on the web, still had difficulties interpreting how grant funds had to be approved based on government-mandated protocols that included bids for a costly purchase with a written justification. Even some of the small-cost unusual purchases needed written justification. Most grantees, to their credit, complied with these requirements with no hesitation and did not express negativity. But even with cooperation by grantees, this was a time-consuming process.

The grievance protocol developed to assist a grantee was used by only a very few individuals. Those few individuals did not necessarily agree with the grievance protocol and tried to circumvent it through other means. Fortunately, those efforts were thwarted since we had a protocol in place at the start of the program that had been approved by the Louisiana Oyster Task Force and the LDWF.

Demographics

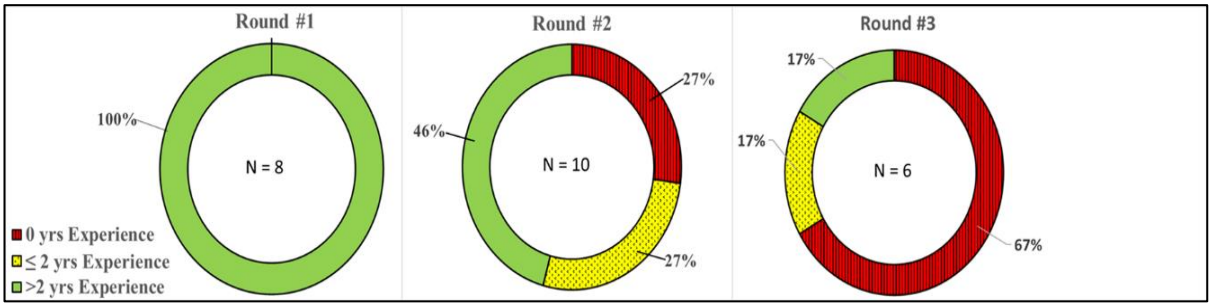


Figure 4. Experience within AOC by grant awardee at time of award.

One question that prevailed at the start of the program was what the experience of applicants would be, especially once the core group of known AOC farmers had applied (Figure 4). Applications were being accepted in the absence of any AOC state-required training program; in contrast, for traditional commercial oyster harvesters and commercial crab harvesters training is required by LDWF. Even within the applicants that had prior AOC experience there was much diversity in prior work backgrounds and most remained part-time in the AOC farming business (Table 2). Applicant work experience ranged from coming from an educational institution, an auto service repair industry, a hospitality industry, sales, healthcare, agriculture, retired individuals seeking a second career, to traditional oystermen. Some of the individuals who had not themselves worked in the fishing industry before AOC had prior generational roots in commercial fishing and had a desire to return to those roots.

Fortunately, the success of the grants program was influenced by the AOC knowledge that many of the applicants and grant awardees brought with them in the early round of funding (Figure 4). The program's outreach and education efforts relied heavily on their knowledge to support the program team's efforts. Many of the awardees knew each other and their collaborative efforts helped those individuals with a grant who were new to AOC farming. Many of the new grantees in the second round had been voluntarily working on AOC farms to gain experience and a few had deployed cages of their own. However, as the program progressed it became clear that we had captured those individuals within the state that had any prior AOC farming experience. It also became evident that to fully understand the complexities of an AOC farm business required at minimum two years of hands-on experience by an applicant.

The program team worked closely with all applicants, but by the third round they needed much more educational information as to how to set up an AOC business and work on a farm. This lack of knowledge became most evident to the program staff after a day-long workshop in Cameron, when a few days later, three of the awarded applicants decided to withdraw from the program before signing their contract. The reason two gave was that AOC may be too technical and labor-intensive for them with all their other obligations as traditional fishermen, while the third applicant left the state to be a commercial fisherman elsewhere. The program was able offer one of the returned grant awards to the only remaining Cameron applicant, but two remained unfilled. The goal was to have six grow-out farms in the Cameron aquaculture park but with the small pool of applicants and with three backing out, the program could not fulfill that goal. The Cameron Park presently has four farm tenants all filled by grantees with 11 plots remaining available.

By the end of 2023, there were 21 AOC business owners (grantees and non-grantees) active at some level within the AOC fishery (Table 2). Two of the 21 individuals had known partners working on the farm, thereby bringing the total number to 23 active individuals. Of the 23 individuals, 20 held grant awards by the end of 2023. The median age of an AOC grower within the state by the end of 2023 was 49 years old within a range that spanned an age from the youngest at 29 to the oldest at 78 (Table 2). Those within the AOC fishery that were also traditional oyster fishers made up 39% of the population with a median age of 49 years old within a range of 31 to 71 years old. The number of AOC fishers new to the oyster industry comprised 61% of the population at a median age of 45 years old within a range of 28 to 78

years old. It is interesting that when separated into age categories, all but one of the individuals in the AOC fishery over the age of 50 years old had prior AOC experience before the grant program started in 2021, and overall, 74% of state farmers had some experience before 2021 (Table 2). The fishery has only 6 of 23 that are exclusively AOC growers and not involved in any other business work. Three of the farmers, all above 60 years old, have retired from their prior vocation.

Table 2. Demographics of the AOC in Louisiana at the end of 2023.

Individuals in Louisiana Active in AOC by end of 2023 = 21 + 2 known farm-working partners = 23 = N

- Median Age within the AOC Industry = 49 yrs. (range 29 – 78 yrs.)

Traditional Oyster Fishers in the AOC Industry = 9 (39%)

- *excludes two who left the AOC fishery in 2023; one for medical and one for other priority business reasons*
- Median # Yrs. with Traditional Oyster Experience = 21 yrs. (range 5 – 36 yrs.)
- Median Age Traditional Oyster Fishers in AOC = 49 yrs. (range 31 – 71 yrs.)

with no Traditional Oyster Fishing Experience in AOC Industry = 14 (61%)

- Median Age with no Traditional Oyster Fishing Experience in AOC Industry = 45 yrs. (range 28 – 78 yrs.)

By Age Group*	#	%	# with AOC Experience	# Full -Time in AOC**
age 21-30	3	13%	3	1
age 31-40	4	17%	3	1
age 41-50	8	35%	5	1
age 51-60	2	09%	2	1
age > 60	6	26%	5 (3 are retired)	2
N =	23		N = 74%	N = 26%

* Excludes the two traditional oyster farmers who left the AOC fishery in 2023.

* * Full-Time means not working in any other business than related to the AOC fishery.

Farms, Parks, and Private Hatchery

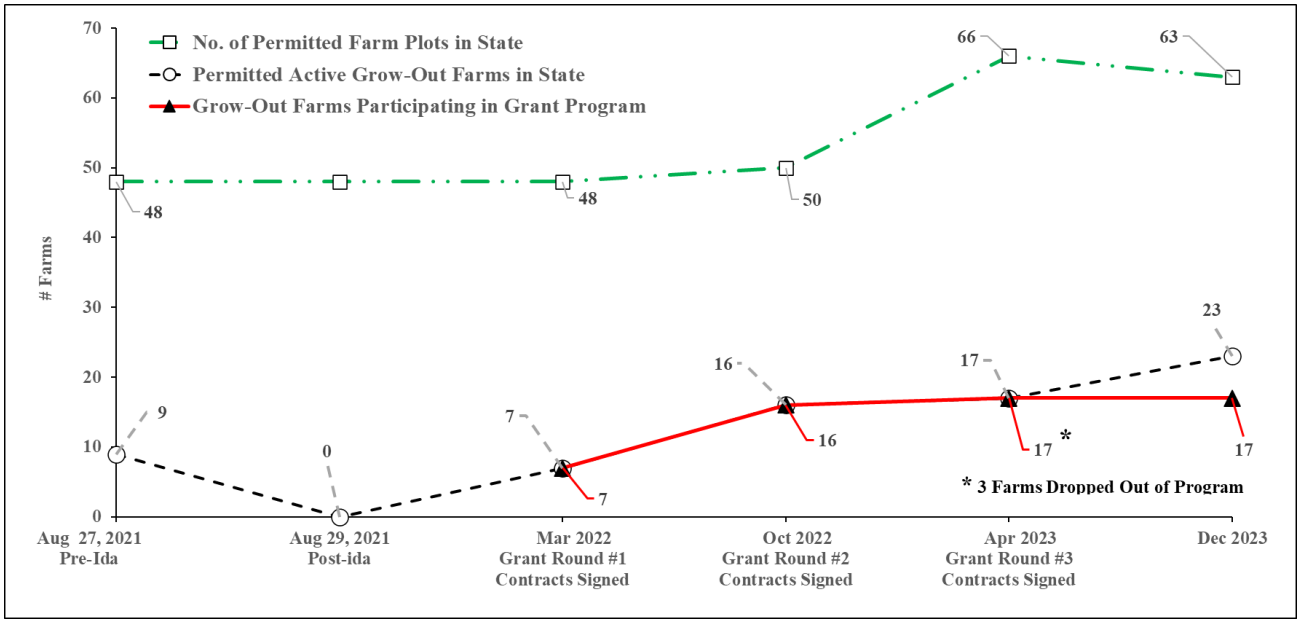


Figure 5. Number of Permitted* Grow-out Farms in Louisiana by 2023.

One of the program's foundational metrics used to define program success is the number of "active" AOC grow-out farms in the grant program relative to the number of permitted grow-out farms in the state (Figure 5 above). The term "active farm" is defined as a farm at any level of activity, from the first stages of ordering equipment and supplies to having cages deployed on the water and actively selling to market at a retail or wholesale level. By the end of the third round of funding in April 2023 there were

20 grow-out farms in the program, but three farms dropped out of the program soon after: one grantee with two farms due to medical reasons, and another grantee due to other business obligations with a higher priority. Near the end of 2023, the GO FISH Coalition, a non-profit foundation became active and added five farm plots in the Grand Isle Aquaculture Park to mentor commercial fishers in an AOC internship program (Mike Roberts, Chairman of GO FISH, personal communication), while one additional farmer did not receive a farm plot until the grant program had ended and was therefore not eligible. The Coalition was eligible during the three application rounds of the grant program but did not apply.

By the end of 2023, 23 of the 63 available permitted plots in the state were active. The three aquaculture parks account for 135 acres, 73%, of the state's total permitted 185 acres and for 58 farm plots, 92%, of the 63 permitted by the end of 2023 (Figure 5). Farm plots range in size from 0.5 acres to 2.0 acres. Farms located in aquaculture parks work under its Coastal Use Permit (CUP) and this is an incentive for them to locate there. The remaining farm acreage is located on traditional oyster leases and private water bottoms.

Grant funds awarded for a nursery farm could not be a stand-alone business but had to be associated with either a grow-out farm or hatchery. The grow-out farm or hatchery could be either in existence or funded through the program at the same time. At the beginning of the grant program, the target was to fund 10 nursery farms. By the end of the grant program six had been funded and two had opted out of the program and did not spend their funds. By the end of the second round no more nursery grants were awarded, and those funds reallocated to potential future grow-out farms and parks.

At the beginning of the grants process, the AOC nursery farmers had shown much interest in purchasing post-set larvae or eyed larvae to set on their own microcultch using the available nursery grants. But soon they realized that it was much less labor intensive, and perhaps more economical in the long run, to purchase oyster seed directly from a commercial nursery or hatchery as seed ready for cage deployment. This created an incentive for one of the awarded nursery farmers to take the initiative to begin developing an in-state commercial nursery business to supply such seed. Unfortunately, the commercial nursery did not last long for many reasons beyond the grant process. When this happened all nursery grantees were fortunate to have funds to develop their own bottle silos and upwellers themselves, although expending much labor to do so.

The target for private hatcheries was to fund two but only one applied and funds were allocated to that individual. The private hatchery funded is the only one within the state. To receive funds, the hatchery had to agree that Louisiana AOC farmers would have the highest priority for purchasing eyed-larvae and post-set seed. The hatchery is in Baton Rouge, La., at the LSU Innovation Park as a startup business. Since the hatchery is the only one in Louisiana, the program was sensitive to publicizing production information and therefore kept all information private except to LDWF, the program's funding agency. The hatchery had to set a goal for eyed-larvae and seed for the year as the metrics used to monitor for success or failure.

Expenditures

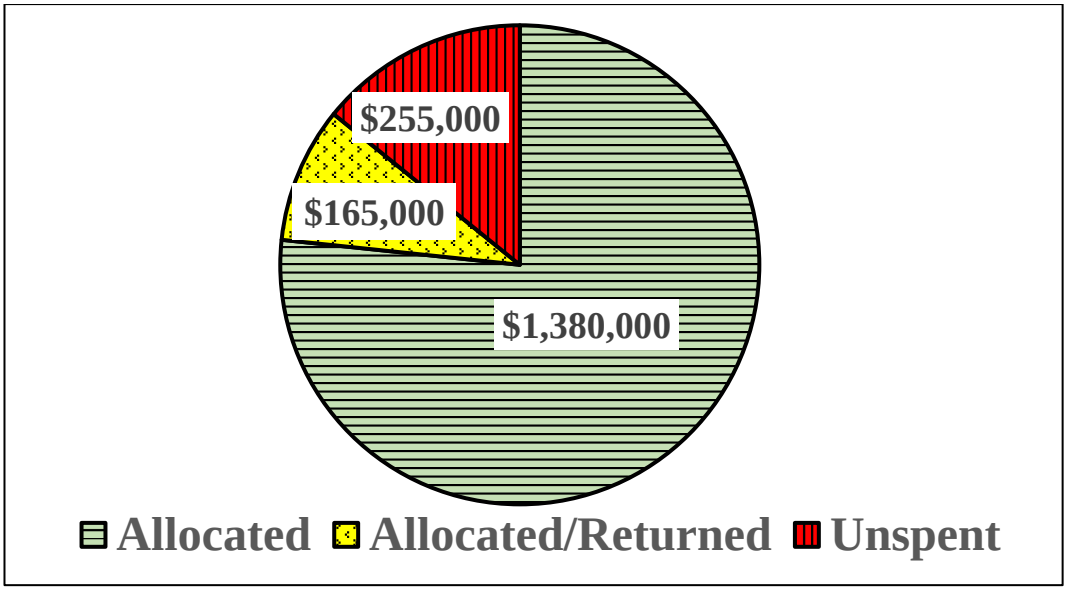


Figure 6. Allocation of AOC grant funds by the end of 2023.

Allocations of grant funds are found in Figure 6 above. A total of $1,380,000 had been allocated as spent or encumbered by the end of 2023 when the grant program ended. The allocated funds supported 17 farms, $840,000 (61%), one private hatchery with a small nursery, $240,000 (22%), and three aquaculture parks, $300,000 (17%). Eleven grants had funds remaining by the end of 2023 totaling $558,528, 40% of the total allocated. Those funds were encumbered so that LDWF could develop new contracts and take over administration in 2024. LASG will continue to track all farmers, under a new LDWF contract with AOC extension outreach and education efforts.

There was $210,000 awarded to four farmers during the grant program who returned the money, all of whom were traditional oystermen (Figure 6). One grantee returned the money because of medical reasons, two because of other business opportunities that arose with a higher priority, and one because of uncertainty about fulfilling the contractual obligations. One of those returned grants was awarded to another applicant from the third round who did not originally receive one. The three returned grants plus the unspent funds totaled $420,000. There was no pool of applicants remaining from the three rounds of grant opportunities that qualified for an award to be offered to them to replace those who backed out.

Several years before the AOC grant program began, the Meraux Foundation had expressed a desire to LDWF and LASG officials about interest in securing an AOC aquaculture park for St. Bernard Parish using some of the Foundation's private acreage in the Biloxi Marsh area. But the Meraux Foundation did not submit a park application during any round of funding. However, after funds were returned by farmers opting out of the program, and with the second hatchery funds not used, the LASG team contacted the Foundation in the fall of 2022 expressing a willingness to have dialogue about a park possibility if they were still interested. The $420,000 remaining funds would allow for a Biloxi Marsh aquaculture park grant of $100,000 and a critical mass of six funded grow-out farms within it.

The Meraux Foundation bylaws do not allow them to receive any grant funds directly (Blaize Pezold, Environmental and Coastal Program Manager for Meraux Foundation, pers. comm.). Therefore, the Meraux Foundation assisted their land manager in submitting a proposal as a private LLC with use of their Biloxi Marsh private water bottoms as the AOC site. The AOC selection committee, after consultation with its science advisory group, accepted the proposal contingent on development of a coastal use permit (CUP) application and at minimum having it submitted to the state prior to grant approval. Unfortunately, by May 2023 the CUP had not been developed. Also, by summer 2023 LASG had commissioned an economic study of AOC within Louisiana (Petrolia 2023), and it became evident that the

financial challenges of AOC farm success would have been difficult since the park location was located 21 miles one-way from the nearest landing. The decision to abandon the Meraux Foundation Biloxi Marsh AOC park application was a mutual decision by all participants. Unfortunately, this left unspent funds by June 2023 with not enough time to solicit a fourth public call, select, and sign contracts for a fourth round of funding. Additionally, after the second round of funding it became evident that there was much less interest from the public in submitting applications.

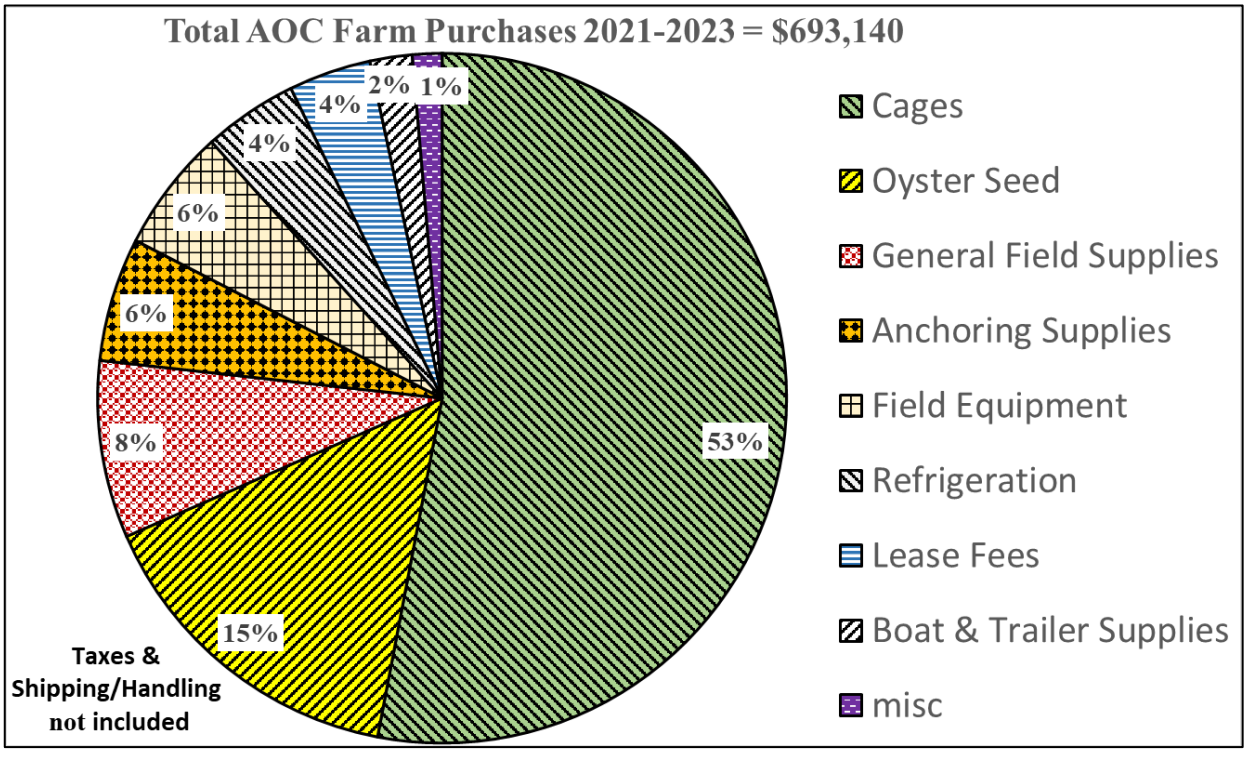


Figure 7. Expenditures of nursery and grow-out farm grant funds by category.

A breakdown of how the farmers used their money for nursery and grow-out farms, $693,140, during the three years of the program is seen in Figure 7 above. Early in the grants process it became evident that those with both types of farm grants, nursery and grow-out, were expending funds that crossed between the two and therefore was no need to continue separating them. Although grant restrictions did not allow purchases of fuel, boats and motors, vehicles, or boat trailers, it did allow repairs to trailers and retrofitting a boat for AOC function. The expenditures accounted for in Figure 7 are the actual costs of items excluding taxes, which vary by location. Costs also excluded shipping and handling, which were inflated due to the COVID era of supply chain challenges. Some of the shipping expenditures required shipping from China, a major supplier of cages.

The largest farm expenditure of grant funds, $367,401 (53%), was for AOC cages (Figure 7). Typical types of cages purchased are seen in Figure 8. Included in the cage category is the purchase of two shellevators® (not pictured) by one farmer at a total cost of $20,000. Cage purchases also included the necessary floats and clips. Some of the farmers did not purchase assembled cages but instead purchased pre-assembly kits or raw materials for construction by themselves. The second highest expenditure for farms, $106,947 (15%), was for the purchase of oyster post-set seed from a hatchery and larger seed from a commercial nursery. The third highest farm expenditure, $57,648 (8%), was for general field supplies which included such items as gloves, rain gear and waders, wet suits for winter walking the farm, ice chests, pvc pipe to mark the lease, and small tools such as a drill or ratchet set. Largest purchase costs items in in the field supplies category were pressure washers and portable generators to clean cages and

oysters of fouling organisms and mud. The most unique item purchased in the general field supply category was a $2,946 solar generator kit.

The Anchors and associated supplies, $40,244, and field equipment, $40,049, were both at 6% of total expenditures. Anchoring is itemized as a separate category because it was a high priority purchase to the farmers. Living and working in Louisiana with hurricanes and strong northerly winter winds in shallow deltaic estuaries require significant anchoring of cages and ingenuity on what type of anchoring system to use and how to deploy. Field equipment consisted of oyster tumblers and washers.

Another high priority was refrigeration, at $30,694.56 (4%). Refrigeration is a necessity in a hot summer climate with stringent regulatory requirements. Refrigeration focused on small units and associated supplies for small boat and truck hauling. Lease fee expenditures at $26,823.15 (4%) were for tenant lease rentals in aquaculture parks which ranged from $200, $2,000, or $3,000 per year. The lower range of fees is reflective of aquaculture park partly subsidized by local government.

Boat and trailer, $13,707.49 (2%), and miscellaneous, $9,625.36 (1%), were the lowest expenditures during the three-year program. Boat and trailer repair expenses include retrofitting boats for AOC work, for example adding a jack plate for shallow water traveling or for welding a davit winch for cage retrieval. The miscellaneous category had items such as surety bond costs to assure proper removal of AOC gear from the water if damaged by a storm or if default on the grant, storage rental, and advertising logos and signage for direct sales of oysters at farmer's markets. The most expensive item in the miscellaneous category was the purchase of a $1,746 tent and frame, 10 ft. x 15 ft. in size, with full color farm logo imprinted for use at fairs and farmer's markets for the sale of oysters.

Figure 8. Typical gear types deployed by Louisiana AOC farmers in the grant.

Outreach and Education

LASG has worked with LDH's Molluscan Shellfish Program and LDWF's Office of Fisheries to develop educational and outreach materials for public health education, LDWF permitting procedures, fundamentals of AOC husbandry, developed videos and factsheets, and conducted workshops; some of those efforts are documented in this report while all can be found on the LFF website. A total of 27 grants

were awarded during the three-year grant period: 3 aquaculture Parks, 1 private hatchery, 6 nursery farms, and 17 Grow-Out farms. Team outreach efforts were focused on providing information to grantees, to state agencies, and to the public. The program developed six workshops for the AOC farmers, including a day-long event with state and federal agencies who have AOC regulatory oversight over the fishery. Also represented at the day-long workshop was staff with the Small Business Develop Center (SBDC) to offer information and assistance. Another example of community interaction, the program team was significantly involved in highlighting AOC at the Louisiana Fisheries Forward biannual Expo in Metairie, La., including AOC vender booths. Examples of those activities are found in Figure 9. A listing of presentations and workshops are found in Appendix 7.

Figure 9. Examples of AOC outreach and education.

At a day-long AOC grower's workshop with state and federal agencies held at the LSUAg center in Raceland, La., a business priority survey was conducted with 11 of 17 AOC farmers responding to the questionnaire. The results showed that their top three business needs in order of importance were business planning help, budgeting help, and help developing direct sales clients (Table 3). This survey information led to the program joining in a collaborative opportunity with IDF to offer a three-hour one-on-one business model training session for each grantee with a private business consultant in July 2023; eleven grantees took advantage of this opportunity.

Table 3. Survey results from the agencies workshop with AOC farmers.

# Survey Respondents = 11 of 17 AOC Farmers	
Survey Question: On a scale of 1-7, with score of 1 the highest, what is your highest business development priority within your AOC business?	(Lower # Higher Rank) Rank
Business Planning Help?	3.2
Budgeting Help?	3.3
Direct Sales Options?	3.3
Financing Options?	4.2
Branding Your Business?	4.5
Eco-Tourism Partnering?	4.5
Digital Marketing Options?	5.1

All education materials were uploaded to the Louisiana Fisheries Forward (LFF) web site. LFF is a voluntary education and training program from the LDWF, LASG and LSUAg group. Program educational efforts, beyond the presentations and workshops, focused on providing timely information that could be used by AOC farmers and the public to understand the regulatory requirements of AOC, the basic needs to start an aquaculture farm such as videos and whiteboards. Part of this effort was through collaborative work with the LASG Communications Department staff, the LDWF staff, and private consultants. The results were three videos explaining the essential first steps in developing a successful AOC business: site selection, gear selection, and the proper methods of handling and harvesting oysters while on the water (Figure. 10). Additionally, two whiteboards were developed, how to develop and submit a coastal use permit (CUP) and how to set oyster larvae on microcultch (Figure 10).

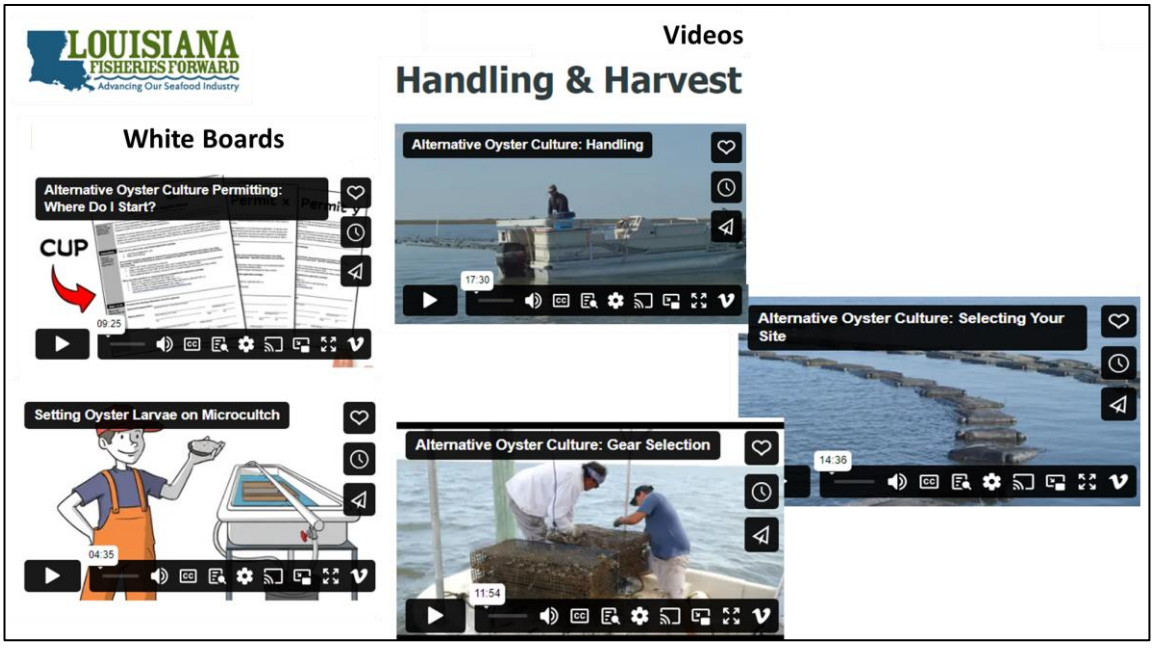


Figure 10. Examples of AOC videos and whiteboards on LFF website.

Factsheets were developed to help individuals whether in business or thinking about it. Factsheets included information on insurance for AOC farmers and on how to direct-sell your oysters as a retail commodity (Figure 11). The AOC page on the LFF web site also included links to additional beneficial information. The additional information sources were listed under 14 categories: Regulatory information, Permits, Learning More, Site & Gear Selection, Pollution Closure Maps, Salinity Maps, Planning & Financing, Ongoing Management, Risk & Insurance, Retail Sales, Handling Best Management Practices, Refrigeration & Transportation, Seed & Larvae, and Sanitation & Health (Figure 12).

Figure 11. Example of AOC factsheets available on the LFF website.

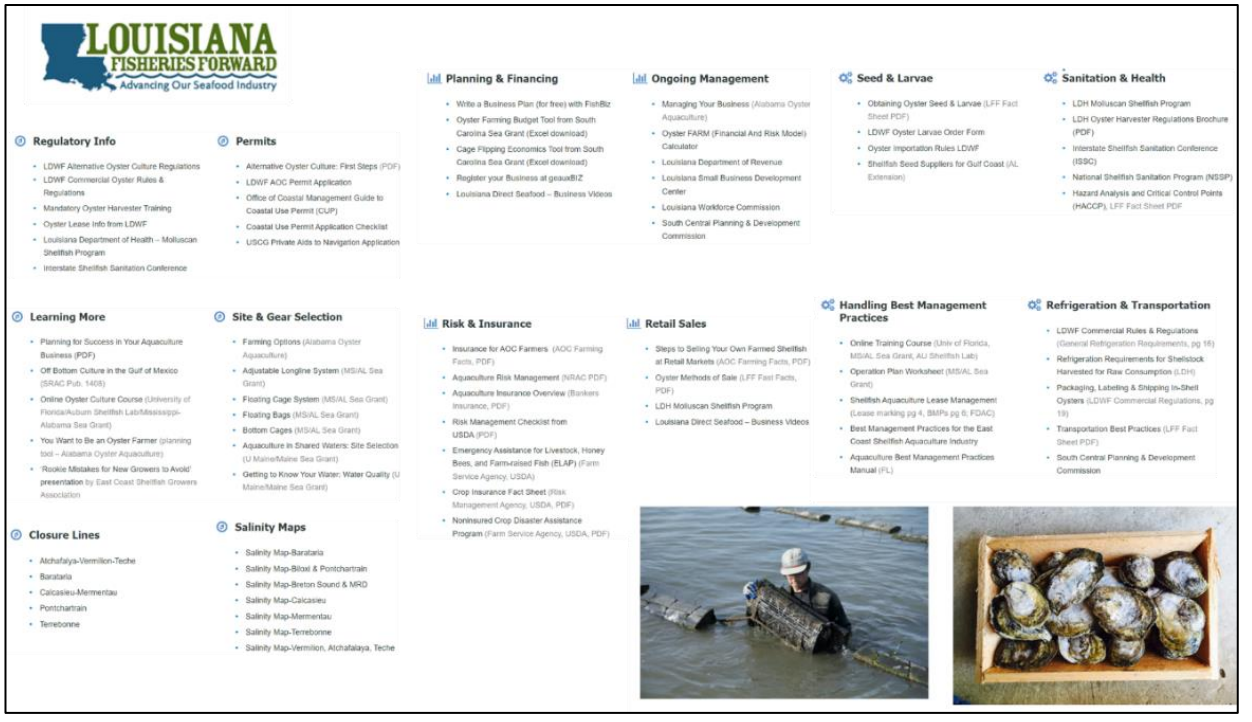


Figure 12. The 14 AOC information categories are available on the LFF website.

We submitted quarterly reports to LSU and LDWF where much of the program teams' efforts are documented. But what was more abstract and difficult to document were the many hours program team members spent listening to AOC farmers and the public. Whether from an experienced AOC farmer, from someone new to fishery, or from the public, there were daily inquiries for us to address. We helped them to understand and interpret regulatory requirements properly, to address supply and equipment needs, and to function as a soundboard for their concerns and allow us to bring those concerns to the appropriate regulatory agency or entity. A good example of this process of listening to a concern and addressing it was assisting LDH in lifting the restriction of a nursery farm being prohibited from seed cultivation at a land-based facility adjacent to a shoreline in prohibited waters while remaining in compliance with federal public safety rules. Through the efforts of LDH and LDWF, that regulatory prohibition was modified in 2022 to allow nurseries to hold seed oysters less than one inch shell length in such waters before transferring to an AOC farm in open waters for continued growth and opportunity to depurate.

LASG recently conducted a workshop with Cameron AOC farmers using a business spreadsheet-based tool developed by Petrolia (2023) and will do more such workshops in the coming year. The LDWF has also continued funding AOC outreach and education efforts through LASG with a 2024-2025 grant and industry workshops and education outreach activities are being planned.

Regional and National Resources

During the three-year grants program, we repeatedly emphasized the importance of "knowing your fishery" by introducing grantees to other accessible local, regional, and national information available to them. Off-bottom oyster aquaculture Support Services are numerous across the region and country. Regionally, Florida Sea Grant Extension and Education Program within the University of Florida's Institute for Food and Agricultural Sciences (UF/IFAS) has developed an online oyster aquaculture course for beginning growers along the Gulf of Mexico Coast (https://oyster-culture.teachable.com/). Mississippi-Alabama Sea Grant (MASG) Consortium working in collaboration with the Auburn Shellfish Lab has developed the Commercial Oyster Aquaculture Sector Training (COAST) Program as a workforce development initiative (https://masgc.org/projects/details/commercial-oyster-aquaculture-sector-training-coast-program). Additionally, the MASG has developed an Oyster Farm Self-Assessment Resiliency Index document for off-bottom farmers to prepare for disasters

(https://masgc.org/assets/uploads/publications/1204/22-059.pdf). Texas Sea Grant in 2021 launched the Oyster Mariculture web site with the latest information for off-bottom farmers (https://oyster.texasseagrant.org/index.html).

Other states' examples include the Mississippi Department of Marine Resources which was awarded a Restore Act Grant for the development of an off-bottom oyster aquaculture training program and a commercial aquaculture park off the coast of Biloxi (https://dmr.ms.gov/deer-island-commercial-aquaculture-park/). The Florida Department of Agriculture and Consumer Services' aquaculture shellfish website lists the permitting application procedures for establishing an off-bottom farm as well as information on water quality and oyster farming best management practices, among other information (https://www.fdacs.gov/Agriculture-Industry/Aquaculture/Shellfish). And, the Texas Parks and Wildlife Department has also developed a website with a comprehensive list of topics to establish off-bottom oyster culture in their state (https://tpwd.texas.gov/fishboat/fish/commercial/com_cf/faqs.phtml).

State Sea Grants are aided by a cooperative partnership at the National level with Sea Grant's National office (NSG) efforts which include addressing funding opportunities, and priority research, extension, and education needs. NSG recently developed a five-year, 2024-2028, Aquaculture Investment Plan to guide its efforts in supporting aquaculture research, extension, and education (https://seagrant.noaa.gov/?s=oyster+aquaculture&categories=aquaculture). National Science and Technology Council Subcommittee On Aquaculture recently published its draft Strategic Plan for Aquaculture Economic Development (https://www.ars.usda.gov/sca/Task%20Forces%20and%20Working%20Groups/Strategic%20Plan%20for%20Aquaculture%20Economic%20Development%282023%29.pdf), and the National Oceanic and Atmospheric Administration (NOAA) recently published its five-year, 1924-1928 Strategic Plan for Aquaculture (https://media.fisheries.noaa.gov/2022-10/Strategic-Plan-102422-web.pdf). The U.S. Department of Agriculture (USDA) through its Risk Management Agency recently launched a Shellfish Crop Insurance Pilot Program to provide off-bottom oyster producers with coverage options (https://www.rma.usda.gov/en/ Topics/Shellfish).

Trade Organizations are established throughout the Gulf of Mexico and Atlantic states, including Louisiana. There are two recently established organizations: the Louisiana Oyster Aquaculture Association with the President as a member of the Louisiana Oyster Task Force, and the Gulf Shellfish Farmers Association (GSFA; www.gulfshellfishfarmers.org/) based in Mississippi. Two well established trade organizations with many farm-related resources are the Oyster South Foundation (OSF;www.oystersouth.com/) and the East Coast Shellfish Growers Association (ECSGA; https://ecsga.org/); both host annual trade association meetings that are well attended by farmers from across the country. Oyster South has a YouTube channel with much information (https://www.youtube.com/@oystersouth1427/featured).

Moving Forward with Challenges

Many of the challenges faced by off-bottom AOC oyster culture farmers in Louisiana are similarly faced by many of today's coastal fisheries. The traditional oyster fishery has been a mainstay and economic driver in Louisiana for over 150 years and must be part of this discussion. AOC has its uniqueness, of course, and where appropriate we discuss the similarities and differences between AOC and the traditional oyster fishery. AOC is a way to potentially diversify the oyster industry within Louisiana, not to replace it.

There are many aspects of any business that require decisions and actions to address economic sustainability (O'Shea et al. 2019) as well as the potential ecological benefits of bivalve aquaculture (Shumway et al. 2003), all beyond the scope for discussion with this report. An oyster's physiological needs and the potential of oyster summer mortality events that can severely impact finances (Bodenstein et

al. 2023) and the economics of using triploid vs. diploid oysters in farming for faster shell growth as an economic incentive (Walton et al. 2013) are just two examples.

We focus on five challenges and needs that are foundational for an AOC business in Louisiana:

Hurricanes

The common occurrence of hurricanes in the Gulf of Mexico may be the most significant economic challenge to long-term sustainability for off-bottom oyster culture. Hurricane influences on an aquaculture farm is not unique to Louisiana, but a factor in every state bordering the Gulf of Mexico and South Atlantic. For example, Hurricane Hermine in September 2016 devastated the off-bottom oyster farms in Florida as did Hurricane Zeta in October 2020 for the Mississippi Deer Island Aquaculture Park off the coast of Biloxi. From the beginning of AOC efforts to establish farms in 2005 to end of the grants program in 2023, a span of 18 years, coastal Louisiana residents have experienced 26 named storms consisting of 16 hurricanes, eight of which were category three or higher in wind strength, nine tropical storms, and one tropical depression (NOAA 2023). In Louisiana, as in the other states, off-bottom oyster aquaculture rebounded after each storm. But the challenges of personal and economic stress will not diminish with predictions that hurricanes have the potential to become stronger as ocean water temperatures in the Gulf of Mexico become warmer (Salarieh et al. 2023).

There is a misconception by the public that unlike the traditional oyster industry with stationary leases, AOC is more mobile and can move when in harm's way from hurricanes or human-induced habitat-threatening influences. But AOC farms are in a fixed place with significant infrastructure investment in cages with living oysters, floats, rope, and anchors, all not easily disassembled and moved. An added factor influencing constrained mobility is the difficulty of relocation due to navigation and regulatory compliance requirements.

Before the grants program began, the nine active grow-out farms were just rebounding from category three Hurricane Zeta that passed in October of 2020. Zeta made landfall in southeastern Louisiana and according to the NOAA National Hurricane Center, "*The [Zeta] Louisiana landfall intensity is estimated at 100 kt. Peak 700-mb flight-level winds of 119 kt [137 mph] were measured at 1843 UTC 28 October, a couple of hours before landfall."* The Caminada water bottoms were 3-5 ft. deep prior to Zeta and easily walkable. But after Zeta passed, the water bottoms were scoured to depths as much as 20 ft. resulting in a notable change in habitat and, according to the AOC farmers, no longer suitable for their cultivation methods that involved walking the farm. Those individuals who had farms destroyed in Caminada redeployed either to the Grand Isle Park in Bayou Rigaud or to the Southern Belle Park. There were no active tenants in the Grand Isle Park (defined as GI Park #1) near Caminada Pass after hurricane Zeta and remains so by the end of 2023.

Ten months after Hurricane Zeta, on August 28, 2021, and eight months into the grants program, Hurricane Ida made landfall as a category 4 storm near Grand Isle. According to the NOAA National Hurricane Center, *"The maximum winds at landfall were 130 kt [150 mph] – category 4 on the Saffir-Simpson Hurricane Wind Scale – and the central pressure was near 931 mb. As best as can be determined, the 130-kt landfall intensity is equal to that of Hurricane Laura of August 2020 and the Last Island Hurricane of August 1856, with these three category 4 storms tied for the strongest on record to make landfall in Louisiana west of the Mouth of the Mississippi River."* Hurricane Ida destroyed all nine AOC farms within the state and devastated not only the town of Grand Isle, but communities throughout southeastern Louisiana. This prevented LASG grants program from advertising the first-round AOC grants and funding as we focused on helping communities with Ida recovery efforts. When the grants program resumed, it was evident that the funds made available were essential for the recovery of the fishery for the purchase of supplies and equipment.

An adequate anchoring system is essential for weathering any storm, with hurricanes being the ultimate test. AOC farmers have purchased different types of anchors with different degrees of success, but none seem to adequately hold when a hurricane passes over a farm. Figure 13 below depicts how a line of connected cages is marked with a yellow float indicating the submerged location of an attached

anchor. The ability to holdfast in a storm is not solely dependent on the type of anchor but include variables such as soil type, the number of cages per line creating drag when water currents are strong, and the weight of those cages with various sizes of oysters, to name just a few.

When a CUP is reviewed by state and federal agencies the applicant must show and describe the type of anchoring system that will be deployed. It is the responsibility of the applicant to notify the agencies if the anchoring system is modified or changed and if it penetrates deeper than permitted. Louisiana is unique compared to other states with a system of 50,000+ miles of buried oil and gas pipelines that crisscross the state with the majority located in the coastal parishes (Louisiana Department of Natural Resources, LDNR; www.dnr.louisiana.gov). We addressed this as a precaution when the three aquaculture parks with multiple farm sites were funded. It was required that each do a magnetometer survey by an engineering company to determine if any buried pipelines were present to avoid the potential of injecting an anchor that could potentially hit a pipeline. For example, Cameron had three park sites to choose from and one site was immediately rejected when magnetometer survey imagery detected a buried pipeline (Figure 14). AOC farmers must be knowledgeable of the potential for pipelines under their location.

Figure 13. Yellow floats indicating locations of buried anchors attached to lines of cages.

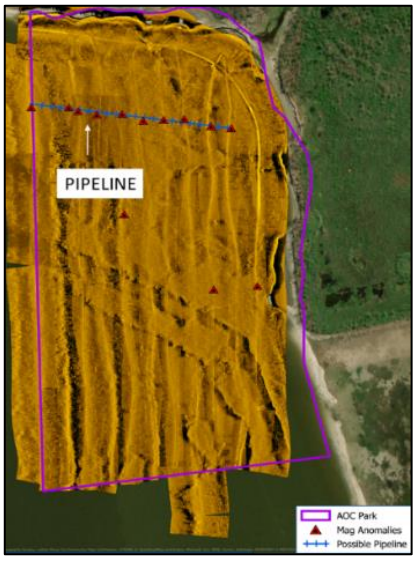


Figure 14. Location of a underground pipeline found in a magnetometer survey

Coastal Restoration

The two most influential environmental physiological drivers for oyster survival and growth are water temperature and salinity (Shumway 1996). Low salinity becomes more lethal when the synergistic effects of high temperature and low salinity are present together (LaPeyre et al. 2016). Generations of Louisiana traditional oystermen have experienced and learned to how work within the estuary's variable annual salinity habitat changes and AOC farmers should take note of their success strategies (Melancon et al. 1998). Similarly, for a commercial AOC fishery to be potentially profitable, oysters must survive in large numbers within the proper salinity range and grow quickly with sufficient food in the water to filter for consumption. This is especially needed during the spring through fall months in hot water temperatures when metabolism is the highest and oysters more susceptible to stress (LaPeyre et al. 2016).

Potential influences on Louisiana's coastal fisheries, especially as it relates to salinity habitats, are well documented historically (Viosca 1927) and currently (USACE 2022). Government-initiated coastal restoration efforts in Louisiana are planned with the goal of benefiting the public (CPRA 2023). No coastal restoration effort is more influential and controversial on the oyster fishery than existing and proposed Mississippi River diversions into the state's estuaries. Salinity habitat will significantly change with the opening of the Mid-Barataria Sediment diversion (MBSD) scheduled to be operational later in this decade. Most of the state's AOC farms are located within the Barataria estuary. The present state

management plan for the MBSD discharge into the Barataria estuary continuously at 5,000 cubic feet per second (cfs), equivalent to 2, 244,300 gallons per minute (gpm). When the Mississippi River (MR) reaches a flow stage of 450,000 cfs the diversion will increase into the Barataria estuary up to a maximum of 75,000 cfs, equivalent to 33,664,500 gpm. Historical fifty-year Mississippi River flow data indicates that the MBSD with that river flow trigger of 450,000 cfs could flow from early fall into summer when temperatures remain high during part of that period (USACE 2022).

Most AOC farms and the Grand Isle Park are in the MBSD predicted discharge area of influence. There is a high potential that salinity will not be in the proper salinity range for oyster survival when the diversion is flowing (USACE 2022), and we have emphasized this to the AOC farmers. In response, the GIPC is presently working to draft legislation for the 2024 session to create an additional eight one-acre lease site near Grand Isle in a location that they consider to be less influenced by the MBSD diversion and still located within their jurisdiction.

A strategy practiced by Louisiana traditional oysterman to cope with the economic burden of changing salinity habitats is to have oyster leases in multiple locations (Melancon et al. 1998). An AOC farmer may want to consider this strategy. One advantage an AOC farm may have over a traditional oyster lease is a shorter time to recovery from a destructive event. A destroyed AOC farm by either catastrophic mortalities or equipment losses can potentially be back in operation within a year with the purchase of new equipment and available oyster seed and selling oyster by early second year, assuming the farmer has the financial means. In contrast, a traditional oyster lease, assuming not smothered by sediment deposits, will require 2-3 years to rebound to preexisting conditions with enough annual natural oyster spat recruitment. During this rebound period the traditional oyster lease farmer must wait on mother nature and is losing potential revenue. However, the traditional oysterman, unlike an AOC farmer, is not burdened with the upfront purchase costs of culture cages, seed, associated infrastructure supplies, and navigational safety requirements.

Farm Economy

Each AOC farmer, although often working in a loose-fitting collaborative arrangement with other farmers, especially if located in an aquaculture park, is an independent businessperson with their own management strategies and goals. Most Louisiana farmers are working at a level we coin as “sweat equity farming,” meaning that they are a labor force of one (the owner) or two. The farmer is a laborer, business manager, sales marketing manager, and delivery person. The small AOC farmer in Louisiana expects a high premium price for each single oyster they sell to justify their investments of time and effort on their farm. One potential advantage Louisiana farmers may have to offset some of the costs is a long growing season with its tropical to subtropical climate and nutrient-rich waters that stimulate fast growth. Some of the farmers within the grants program have witnessed seed to market oyster growth in six to eight months, whether diploid or triploid, especially when seed is deployed in early spring.

After the passage of Hurricane Ida in 2021, few of the farms in Louisiana had rebounded and attained oyster sales by the end of 2022. But by the end of 2023 the number of those selling oysters was 10-12 farms out of the 23 presently permitted. All the farms are small and range in size from 0.5-2.0 acres. Petrolia (2013) has recommended that for a Louisiana farm to have a better chance the smallest size should be about four acres minimum to address economy of scale. But to increase farm size requires more upfront investment, with labor as a significant cost (Petrolia 2023). Other Gulf and Atlantic states’ off-bottom oyster farms range from two to ten acres in size with a trend towards larger sized farms (Petrolia 2023).

AOC oysters are marketed for the half-shell trade and are advertised as a boutique-type product for upscale specialty markets. The boutique sales pitch is universal with off-bottom farmers in other states as well, and the Louisiana farmer must compete with them on a restaurant menu. Many of the Louisiana AOC farmers by 2023 have a premium target sales price of $1 per oyster. Many confirm that they are receiving this price or very near it and claim they are making a profit, but we do not know how economically successful they are as small farms. Louisiana farmers are receiving such a high price due to direct marketing efforts to restaurants and the public in quantities as small as a dozen in a mesh bag to as

large as a bag of 50-100 oysters. Most of the larger quantities sold as well as some of the smaller quantity sales are delivered to the doorstep of the customer at the farmer's expense.

Petrolia (2013) documents that at a purchase price of $1.00 per AOC oyster, a restaurant would need to price that item at a minimum of $3.00 per oyster for the half shell market to justify putting it on the menu. The $1.00 per oyster is a business model that may work for the small farmer that typically sells small quantities at a time but may be difficult for a larger farm that must sell oysters in large quantities at one time. Growers must move their oysters before they become too large for the half shell trade and become a sack-trade product with a much lower value. Petrolia estimates that for a wholesaler to be involved in marketing the boutique oyster, a reasonable dockside price to the farmer is around $0.50.

Documenting a farm's acreage can lead to a misunderstanding of how much is under cultivation. For example, one private-acreage farmer with a LDWF permit for 40 acres had planned to potentially develop up to four separate sites totaling eight acres but had developed only two acres by the time Hurricane Ida hit the coast, and after Ida had one acre under cultivation, 3% of area. Another example, a farmer with a 15-acre LDWF permitted traditional oyster lease was cultivating only two acres with cages, 13% of area. Even for parks not all acreage is under cultivation. The Cameron aquaculture park footprint is 48 acres with 30 acres of actual cultivation area. The remaining 18 acres, 38%, of the park area is reserved for navigational easements. Each farmer determines how small or large they want to develop their farm footprint and how much area they want to keep as a public buffer zone or for farm navigation purposes.

Oyster Seed Availability

All oyster seed in AOC cages are a product of hatchery spawns. In Louisiana there is one inland private oyster hatchery selling post-set seed oysters. There are a limited number of other hatcheries located in other Gulf states, and those facilities tend to give priority to their own constituents prior to selling seed to Louisiana buyers. Oyster hatcheries are essential for the development of off-bottom oyster culture. Farmers everywhere state that a sufficient and timely quantity of quality seed supply is essential to stagger farm production throughout the year for supplying to market. However, the timing of seed availability and a farmer's seed needs throughout the year is a bottleneck.

Hatcheries can hold oyster seed for only a short period of time and require outlets to hold until seasonally needed by a farmer. This outlet to hold seed has developed into a small number of commercial scale seed nurseries in other states but by the end of 2023 there were none in Louisiana. Commercial seed nurseries have their own challenges including having enough buyers and selling seed at an optimum size before too large to sell and the associated economic costs to hold for a long period. The economic challenges of a seed nursery in Louisiana are unknown.

The quantity and timing of seed is a challenge not only for farmers, but also for oyster hatcheries which rely primarily on manipulating the natural summer through fall oyster spawning cycle. Research, both private and government funded, is addressing the need for quality oyster brood stock and seed to be available throughout the year and to not be so tied to the oyster's natural spawning cycle. Part of that research effort is in the development of recirculating aquaculture systems (RAS) to manipulate the oyster's spawning cycle and to also not be so dependent on the estuarine water quality entering a hatchery for culture uses. Louisiana's inland private hatchery is an RAS.

Louisiana has a second government run hatchery run by LASG with oversight by LDWF. In the early years of the AOC fishery, seed sales in Louisiana were dominated by LDWF using the Grand Isle hatchery. That practice still exists, but in recent years most seed supplies have shifted to the private hatchery with the Grand Isle hatchery as a secondary supplier when needed. Louisiana law does allow importation of seed from other selected out of state hatcheries and nurseries through a permitting system and Louisiana farmers, including grant recipients, have utilized those additional sources.

Legislative and Regulatory Requirements

Molluscan shellfish are one of the most heavily regulated fisheries within the United States because they are water-filtering animals, e.g., the National Shellfish Sanitation Program (NSSP 2019). On top of federal regulations, individual states have laws and regulations governing Molluscan fisheries and convene biennially to discuss those issues, e.g., the Interstate Shellfish Sanitation Commission (ISSC, www.issc.org). In Louisiana the LDH has primary oversight for establishing rules and regulations for public health with the LDWF sharing oversight to enforce those requirements. The LDWF has the additional responsibly to develop rules and regulations to manage both fisheries, traditional and AOC, as a fishery resource.

The Louisiana legislative and regulatory requirements for AOC, like other states, is a complex system to navigate and interpret. State laws and regulations have a 150-year history in Louisiana as it pertains to governance of the traditional oyster industry, but AOC as an active commercial fishery date back only to 2005 with the establishment of the first aquaculture park. The traditional oystermen, as well as LDH and LDWF, have the generational experience to understand the many nuances that are associated with interpreting and enforcing the laws and regulations, but it is sometimes a challenge when governing AOC. Couple the LDH and LDWF enforcement efforts with the many AOC farmers that are new to the fishery, and you have a recipe for confusion. We have witnessed this confusion at both the state and farmer levels. But what Louisiana experiences in regulatory responsibilities is not unique as other states are addressing the same issues governing off-bottom oyster aquaculture (Weber and Mitchell 2013).

Marino et al. (2019) was commissioned by the Gulf States Marine Fisheries Commission (GSMFC, www.gsmfc.org) to document regulatory constraints to off-bottom oyster aquaculture in the Gulf of Mexico states and offer recommendations to improve the fishery. Marino summarized the regulatory requirements of Florida, Alabama, Mississippi, Louisiana, and Texas. Gulf-wide recommendations were: (1) Establish favorable legislative intent and agency regulatory policy statements, (2) Regulatory streamlining/agency coordination, (3) Non-exclusive aquaculture parks/use zones/pre-permitting, (4) Provide regulatory flexibility, (5) Provide clear and centralized information for applicants, (6) promote shellfish initiatives, (7) Identify off-bottom industry representation, (8) Ensure industry input in regulatory processes and research, (9) Develop consistent and reliable sources of seed oysters, and (10) find ability to address storm recovery/crop insurance. Marino also listed recommendations specific to each state, but they are essentially no different than the Gulf-wide recommendations. Louisiana has addressed some of those AOC recommendations prior to and since Marino's 2019 report.

Concluding Remarks

Off-Bottom oyster cage culture is not unique to Louisiana and has become established within the last two decades by all the northern Gulf and South Atlantic states. Louisiana has a rich fisheries culture and many of the AOC farmers who, if not themselves traditional commercial fishers, have generational heritage within their family. There is also an entrepreneurial spirit within the small AOC farmers, such as using social media as a direct-sale method, ecotourism, and selling AOC merchandise; examples, Bayou Rosa Oysters (https://bayourosaoysters.com). This generational heritage and entrepreneurial attitude are strengths for small AOC farmers without precluding the importance of developing larger farms; starting small and growing the business may be a good strategy for learning such a technical fishery. AOC produces a boutique-type half-shell oyster for the market and presently is a small part of Louisiana's total oyster production but does offer an opportunity to diversify the industry. More information on AOC can be accessed at the Louisiana Fisheries Forward (www.lafisheriesforward.org), the LDWF (www.wlf.louisiana.gov/subhome/commercial-oyster), Louisiana Sea Grant (www.laseagrant.org/outreach/aquaculture/), and from your local Louisiana Sea Grant/LSU AgCenter Marine Fisheries Extension agent.

Observations that may Assist AOC Development for Potential Success in Louisiana:

- Solutions are needed to reduce the destructive forces of hurricanes on AOC farms.
- Importance of documenting economic information to assist in business decisions and success.
- Outreach and formal training opportunities will help to understand the technical aspects of AOC and better ensure that informed decisions are made prior to entering the fishery.
- The direct-sale market generates a premium price and is the economic driver for small farms.
- Large-scale farms may need the development of wholesale distribution for growth of AOC.
- Commercial-scale oyster seed nursery farms may have the potential to support growth of AOC.
- Traditional oyster fishery laws and regulations may need tweaking for AOC development.

Literature Cited

Banks, Patrick, S. Beck, K. Chapiesky, J. Isaacs. 2016. Oyster Fishery: Fishery Management Plan. Louisiana Department of Wildlife and Fisheries, Office of Fisheries. https://www.wlf.louisiana.gov/resources/ category/ marine-fishery-management-plans/oyster. 214pp.

Cabellero, Robert. 2023. The 2022/2023 Louisiana Public Seed Grounds Oyster Harvest. Presentation to the Gulf States Fisheries Commission, State of the Gulf Oyster Workshop, August 8, 2023, Gulf Shores, Alabama. https://www.gsmfc.org/publications/GSMFC%20Number%20322.

Callam, Brian. 2018. Transforming Lives in Coastal Communities Through Economic Development: Breeding *Crassostrea virginica* for Alternative Oyster Culture. Dissertation, Louisiana State University. https://digitalcommons.lsu.edu/gradschool_dissertations/4731. 171pp.

Coastal Protection and Restoration Authority (CPRA). 2023. Louisiana's Comprehensive Mater Plan for a Sustainable Coast. https://coastal.la.gov/our-plan/2023-coastal-master-plan. 187pp.

Dupy, John, N. Windsor, C. Sutton. 1977. Manual for Design and Operation of an Oyster Seed Hatchery. Virginia Institute of Marine Science, Special Report No. 142 in Applied Marine Science and Ocean Engineering. 104pp.

La Peyre, Megan, J. Geaghan, G. Decossas, J. La Peyre. 2016. Analysis of Environmental Factors Influencing Salinity Patterns, Oyster Growth, and Mortality in lower Breton Sound Estuary, Louisiana, using 20 years of data. Journal of Coastal Research, 32(3):519-530.

Louisiana Department of Wildlife and Fisheries (LDWF). 2001. Oyster Stock Assessment Report on the Public Seed Grounds and Seed Reservations. LDWF, Marine Fisheries Division, Oyster Data report Series No. 7. https://www.wlf.louisiana.gov/resources/category/stock-assessments/oyster. 52pp.

Louisiana Department of Wildlife and Fisheries (LDWF). 2019. The 2019 Stock Assessment Report of the Public Oyster Seed Grounds and Reservations of Louisiana. Oyster Data Report Series No. 25. https://www.wlf.louisiana.gov/resources/category/stock-assessments/oyster. 51pp.

Louisiana Department of Wildlife and Fisheries (LDWF). 2020. Louisiana Oyster Management and Rehabilitation Strategic Plan. https://www.wlf.louisiana.gov/resources/category/oyster. 18pp.

Louisiana Department of Wildlife and Fisheries (LDWF). 2023. The 2021 Stock Assessment Report of the Public Oyster Seed Grounds and Reservations of Louisiana. Oyster Data Report Series No. 28. https://www.wlf.louisiana.gov/resources/category/stock-assessments/oyster. 40pp.

Louisiana Sea Grant Program (LASG). 2013. Grand Isle Oyster Hatchery Marks 20 Years as Research Facility. LASG Press Release, March. https://www.laseagrant.org/2013/hatchery-20-years/.

MacKenzie, Clyde, Jr. 1996. History of Oystering in the United States and Canada, Featuring the Eight Greatest Oyster Estuaries. Marine Fisheries Review. 58(4):1-78.

Marino, Lawrence, A. Carr, J. DeNike. 2019. Addressing Regulatory Constraints to Off-Bottom Oyster Aquaculture in The U.S. Gulf of Mexico Region. Final Report to the Gulf States Marine Fisheries Commission. 89pp.

Maxwell, Venessa. 2007. An Evaluation of an Inshore Aquaculture Park for Sustainable Coastal Community Development. Dissertation, Louisiana State University. https://repository.lsu.edu/cgi/viewcontent.cgi?article=3923&context=gradschool_dissertations. 82pp.

Maxwell, Vanessa, J. Supan, L. Schiavinato, S. Showalter, G. Treece. 2008. Aquaculture Parks in the Coastal Zone: A Review of Legal and Policy Issues in the Gulf of Mexico State Waters. Journal of Coastal Management, 36:241–253.

Melancon, Earl, T. Soniat, V. Cheramie, R. Dugas, J. Barras, M. Lagarde. 1998. Oyster Resource Zones of the Barataria and Terrebonne Estuaries of Louisiana. Journal of Shellfish Research, 17(4):1143-1148.

National Marine Fisheries Statistics (NMFS). 2023. NOAA Fisheries. https://www.fisheries.noaa.gov/.

National Oceanographic and Atmospheric Administration (NOAA). 2023. NOAA Historical Hurricane Tracks. https://oceanservice.noaa.gov/news/historical-hurricanes/.

National Shellfish Sanitation Program (NSSP). 2019. Guide for the Control of Molluscan Shellfish 2019 Revision. U.S. Food and Drug Administration.

O'Shea, T., R. Jones, A. Markham, E. Norell, J. Scott, S. Theuerkauf, T. Waters. 2019. Towards a Blue Revolution: Catalyzing Private Investment in Sustainable Aquaculture Production Systems. The Nature Conservancy and Encourage Capital, Arlington, Virginia, USA. 163pp.

Petrolia, Danial. 2023. Economic Analysis of Alternative Oyster Culture (AOC) in Louisiana. https://www.laseagrant.org/wp-content/uploads/AOC-Econ-Report-Petrolia-Aug15-2023-Final.pdf. 73pp.

Rogers, Robert. 2003. Turning River Water into Gold: Why Oyster Harvesters Should Not be Permitted to Cash in on Changes in Salinity Caused by the Caernarvon Water Diversion Project. Virginia Environmental Law Journal. 22(1:53-80.

Salarieh, Babak, I. Ugwu, A. Salman. 2023. Impact of Changes in Sea Surface Temperature due to Climate Change on Hurricane Wind and Storm Surge Hazards Across US Atlantic and Gulf Coast Regions. Journal of Applied Sciences, Springer Nature. 5:205. https://link.springer.com/article/10.1007/s42452-023-05423-7.

Shumway, Sandra. 1996. Natural Environmental Factors. Chapter 13, In: V. Kennedy, R. Newell, A. Eble (editors). The Eastern Oyster *Crassostrea virginica*. Maryland Sea Grant College Publication UM-SG-TS-96-01. pp185-230.

Supan, John. 1995. The of Triploid Oyster Larvae *Crassostrea Virginica* (Gmelin) in Louisiana. Dissertation, Louisiana State University. https://repository.lsu.edu/cgi/viewcontent.cgi?article=6984&context=gradschool_disstheses. 87pp.

Swam, Lauren. 2021. Effects of Salinity on Eastern Oysters: Locating Lower-Salinity Tolerant Populations and Defining Resource Zones Suitable to Suitable to Restoration, Fisheries, and Aquaculture. Master's Thesis, Louisiana State University. https://repository.lsu.edu/cgi/viewcontent.cgi?article=6442&context=gradschool_theses. 46pp.

United States Army Corps of Engineers (USACE). 2022. Final Environmental Impact Statement for the Proposed Mid-Barataria Sediment Diversion Project Plaquemines Parish, Louisiana. https://www.mvn.usace.army.mil/Missions/Regulatory/Permits/Mid-Barataria-Sediment-Diversion-EIS/.

Viosca, Percy. 1927. Flood Control in The Mississippi Valley in Its Relation To Louisiana Fisheries. Transactions of the American Fisheries Society, 57th annual meeting, Hartford, Connecticut. pp 49-64pp.

Walton, William, J. Davis, J. Supan. 2013. Off-Bottom Culture of Oysters in the Gulf of Mexico. Sothern Regional Aquaculture Center, Publication No, 4308. 5pp.

Walton, W.C., F. Rikard, G. Chaplin, J. Davis, C. Arias, J. Supan. 2013. Effects of ploidy and gear on the performance of cultured oysters, Crassostrea virginica: Survival, growth, shape, condition index and Vibrio abundances. Aquaculture 414-415:260-66.

Weber, Catherine and D. Mitchell D. 2013. Water-Quality Watchdogs? –A Political, Environmental, and Socioeconomic Analysis of Oyster Farming in Alabama. Agrarian Frontiers a Rural Studies Review. 1(1):1-11.

APPENDIX 1. Rules and Regulations Associated with Grant Contracts

1. General Information:

As part of the Louisiana Sea Grant (LASG) Program and the Louisiana Department of Wildlife and Fisheries (LDWF) "Enhancement and Expansion of Alternative Oyster Culture (AOC) in Louisiana initiative," Iberia Development Foundation (IDF) offers funding to approved applicants for the development, enhancement, and potential sustainability of the fledgling Louisiana AOC industry with funds provided under the Sub-Award agreement #003725 with Louisiana State University.

IDF will contract with applicants through a competitive selection process by using a merit-based scoring system developed by LASG, by using individual interviews and business assessments, or by a combination of both methods. A 7-member Selection Committee (Figure 1), composed of IDF, LASG and Oyster Industry representatives, will make final decision on successful applicants with the help of LASG support staff providing technical background. Additional information can be found at Louisiana Seafood Future web site (https://www.laseafoodfuture.com/).

The funding provided to IDF will be used to accomplish the following purposes:
(1) Implement industry AOC startup funds for new nursery and grow-out farms (Nursery & Grow-Out Funds),
2) Implement industry AOC startup funds for new private hatcheries (Hatchery Funds),
3) Implement AOC startup funds for designated management use areas, hereafter referred to as AOC Parks (Park Funds),
4) Enhance oyster seed production for existing private nursery farms (Nursery Funds),
5) Enhance oyster production for existing private grow-out farms (Grow-Out Funds).
6) Enhance hatchery diploid and triploid production for existing private hatcheries (Hatchery Funds),
7) Enhance existing Park areas having the necessary oyster habitat parameters adequate for growth and survival (Park Funds), and
8) Assure compliance, with LASG assistance, of all contractual obligations.
9) Recover, with LASG assistance, any equipment, supplies and unspent funds if default on contract obligations.

2. Eligibility for Funds:

(Eligibility requirements are subject to change if deemed necessary after discussions and approval by the AOC Selection Committee, IDF, LASG and LDWF)

- Be at least 18 years old.
- Be a Louisiana resident or a corporation organized in Louisiana.
- Possess all current state-required commercial oyster licenses necessary to do business in Louisiana,
- Applicant has not been convicted of or pled guilty to a Class 4 or greater oyster-related violation, as defined in the laws pertaining to wildlife and fisheries, within three years prior to the submission of the application.
- Only existing and new AOC facilities domiciled within Louisiana are eligible.
- The existing or new AOC site must be located in approved, seasonally approved, or conditionally approved waters classified by the Louisiana Department of Health (LDH).
- Only one (1) application per AOC category type per individual, immediate family member, or company will be allowed. However, an individual or company may apply for more than one type of AOC fund (park, nursery, grow-out, or hatchery), but each application will be judged independently on its own merit.

Requirements:

- No salaries and no owner's draw will be allowed on any allocated funds.
- No boats, outboard motors, vehicles, buildings, or land will be allowed for purchase with funds by an AOC awardee; electronic equipment will be allowed for purchase on a case-by-case basis with sufficient justification.

- Equipment and supplies that will be eligible will be those standards that are being used in the industry today and will exclude experimental and novelty methods and equipment.
- All successful applicants will need to follow the guidelines stipulated in, Louisiana RS 56:431.2 (http://legis.la.gov/legis/Law.aspx?d=815717), "For purposes of this Section, 'alternative oyster culture activity' means any on-bottom, off-bottom, or other means of cultivating or growing oysters other than directly on reefs or other water bottoms, including but not limited to the use of on-bottom cages or bags or floating, suspended, or otherwise off-bottom cages or bags, and includes the harvesting of oysters so grown or cultivated."
- Up to $5,000 of the allocated funds are available to help apply for a Coastal Use Permit (CUP); this is dependent on all state and federal guidelines compliances.
    - If a CUP is required, it must be obtained prior to release of additional funds beyond $5,000.
    - If the successful applicant needs funding for professional assistance in obtaining a CUP, the applicant must show proof that the professional help is being performed by a qualified individual or company with a prior successful track record of CUP assistance.
- All contracts will be subject to a 5% withholding applied to the full contract amount, in lieu of a bond requirement, to remove from the water and transport to IDF any equipment or remaining materials and supplies provided with contract funds upon default of the contract must. These remaining funds will be made available to the contractor during the last quarter of the contract.
- Large-type water-based equipment purchased or leased with grant funds will require special consideration due to potential equipment failure resulting in navigational hazard.
    - Rental of such equipment by a farmer utilizing AOC grant funds will be required to provide a signed, dated and notarized contract between the farmer and the equipment owner indicating the owner's responsibility, including personal indemnity, for (1) deployment and proper installation of equipment, (2) proper maintenance to include navigational safety measures, (3) removal in the event of equipment failure or farmer default on AOC contract requiring removal of equipment. This contract must remain in place for the duration of the farmer/IDF AOC contract period. IDF and LASG are not part of this agreement and there are no legal responsibilities toward their involvement.
    - Purchase of such equipment by a farmer utilizing AOC grant funds will be required to provide IDF and LASG with a $10,000 bond for removal of equipment if default on AOC contract, or if failure of equipment, or the equipment is not maintained properly and becomes a navigational hazard. This bond must remain in place for the duration of the AOC contract period.

3. Successful Applicant Contractual Obligations:

A Successful Applicant for Funds will need to submit to IDF the following Information:

- Copy of current photo ID (person who completed and signed application)
- Copy of all necessary current Louisiana Resident Commercial Oyster Licenses
- If the applicant is a business, copies of documentation proving ownership in the business may be required.
- Board Resolution Form is needed if your business is registered as a Corporation, Limited Liability Company, or Partnership
    - Print the name of the company, LDWF license number, and account number which should be the same information stated on LDWF's license. Contracts and payments cannot be made without submitting a board resolution which identifies the person authorized to sign on behalf of the business. Provide the name and title of an individual authorized to act on behalf of the business. This name must match the name on the application.
- Federal W-9 Form;
    - Print full name or business in the appropriate box
    - If registered under business, you must check individual/sole proprietor, corporation, limited liability, partnership or another box.
    - Provide mailing address in space allocated.

- Provide either Social Security number or Employer Identification number that corresponds with Taxpayer Identification number on LDWF license.

- Receipts/Quotes
  - A 1099 will be issued to all participants for any funds received from these contracts. If IDF pays a vendor directly – at the request of the contractor – those funds will not be included in the 1099 issued to the contractor (as identified by the W-9).
  - Invoices and receipts must be submitted by the 15th of the month. Reimbursement payments will be issued within 30 days of receipt of the reimbursement request and all necessary documents to process the request assuming approval of invoice documentation and receipt of funds from LSU. In all cases, IDF will make payment within 3 days of receipt of funds from LSU as required by Federal Statute.
  - Contractors will have a choice of receiving funds via check which will be mailed to the provided address or electronically. The contractor will provide IDF with necessary banking information if electronic payment is selected.
  - All items purchased under this program will need to be justified as a need for an AOC operation. IDF reserves the right to deny a request even if it meets the basic criteria listed based on advice from the selection committee and the program advisors. This denial can be appealed to the OTF AOC subcommittee.
  - Purchases of items costing less than $500.00 will only be reimbursed directly to the contractor as identified by the W-9.
  - Purchases of items costing $500.00 or more will require a quote that is submitted by the 1st of each month to be considered for approval. The contractor will be notified if the item is approved for purchase and an invoice will be required by the 15th to be included in that month's request. These purchases once approved can be reimbursed to the contractor or for payment made directly to the third-party merchant identified by the contractor on the vendor payment request form.
  - Receipts and Quotes (including handwritten) must be on vendor letterhead, original, itemized, dated and legible. Copies of these original documents can be sent electronically to IDF, however IDF will not be responsible for any invoices that do not reach their address via mail or email.
  - Receipts/Quotes must be highlighted indicating those items for which applicant is requesting reimbursement.
    - Manufacturer's equipment specification sheet (if available)
    - Check Mailing Authorization Form (if applicable) can be requested from IDF if payments need to be forwarded to a third party.
  - Additional documentation may be requested if necessary (such as affidavit, bank statement, or signed check to verify receipt submitted)

If additional information not included with the application is required to prove eligibility, the applicant agrees to provide that information in a timely manner. If an application is incomplete, it may be returned to the applicant to make the appropriate corrections. If an applicant is unable to sign documents, the applicant must have power of attorney to authorize another individual to sign on behalf of the applicant.

All applicants' names and tax identification numbers will be screened by an IRS database to identify any discrepancies. All applicants with a name and tax identification number mismatch will be notified to provide appropriate documentation to correct the discrepancy.

Applicants wishing to withdraw from the program after their application has been approved must do so in writing. If for any reason an applicant cannot purchase or install the required equipment and would like to withdraw from the program, the applicant should notify IDF as soon as possible. Doing so will allow IDF to use program funds more effectively. All items purchased with IDF funds will be required to be returned before release from the contract obligations.

Falsification of any information provided on the application, invoices, receipts or reporting will be cause for disqualification from the program.

4. Timeline and Benchmark Requirements:
The contract will stipulate designated benchmarks that must be met to continue receiving funds and will also stipulate a process for retrieval of grant property if the benchmarks are not met. If benchmarks are not met the applicant will have the ability to present their cause for extension consideration to the Oyster Task Force Advisory Group and the Selection Committee (Figure 1), with the final decision made by the Selection Committee.

- Timeline – Prior to signing the contract, a timeline will be established for on-the-water implementation of the awarded contract (Figure 1). This timeline will be specific to the applicant and developed by the applicant in conjunction with LASG staff, with final approval by IDF and attached to the contract.

- Benchmarks (Accountability) – Quarterly Documentation of Progress. The contractor will agree to allow IDF, LASG or its designees to enter their workplace to document the contractors' activities covered under this program. Any pictures or other documentation will become the property of IDF and LASG and can be utilized for educational outreach materials. A report of the awardees progress will be created and signed off on by the contractor and submitted to IDF on a quarterly basis.

- Clawback Procedures. If the awardee is deemed not to be satisfying the contractual obligations, then all legal measures will be taken to retrieve all items purchased with program funds, and to terminate the distribution of any remaining funds.

- On-site inspections by IDF or LASG as their representative will be conducted. If applicant fails the first inspection, applicant will be notified by letter and given a deadline to rectify deficiencies, at which point the facilities will be re-inspected. If the applicant fails the re-inspection, applicant will be notified by letter of funding termination.

- IDF, during regular business hours and upon reasonable notice to applicant, may inspect, audit, or copy records pertaining to this program. It is further agreed that IDF shall have the option of auditing all records and accounts of applicant that relate to this program at any time during normal business hours, as often as deemed necessary, to audit, examine and make excerpts or transcripts of all relevant data. Applicant's failure to cooperate will result in forfeiture of funds and applicant will be responsible for repaying the full amount of funds disbursed. The applicant understands and agrees that revocation of this payment will require the return of all funds disbursed. The applicant will be obligated to repay some, or all funds received under this program in the event that application including any information provided therewith or thereafter contains any material misrepresentations.

5. Payment Use of Funds:
- Items purchased for a specific Nursery and/or Grow Out Farm site must be utilized at that location. Applicants that are not initially awarded funding could be selected later should more funding become available. Approval of an application does not guarantee an applicant funds disbursed through this program as this is a reimbursable contract. Income received through participation in this program is legally required to be reported to the Internal Revenue Service. Applicants will not be reimbursed for any items purchased using any other federal grant funds as that would represent a duplication of benefits, which is not allowable under federal regulations.

Reimbursement will only be approved for new purchased supplies, cages, and other consumables. Any purchases of equipment will need to adhere to federal guidelines. Reimbursement for labor costs

associated with professional installation of equipment is limited to 15% of the total cost of equipment and not to exceed $4,500. Exceptions to this limitation may be funded on a case-by-case basis. All supplies, cages and consumables as well as any approved equipment must be purchased new.

Approval by IDF to purchase equipment under this program does not constitute any certification, assurance, or guarantee. Improper use or operation can easily reduce the effectiveness of any equipment installed.

6. Important Additional Information:

It is important that when purchasing AOC equipment that the facility at which the equipment is to be used has been inspected and can support such equipment. Work including, but not limited to, equipment mounting, vessel modification, remodeling, insulation, fiberglass work, wiring, fabrication, plumbing, electrical upgrades, may be required and should be done by persons experienced and qualified to perform such work. Please consider this when applying for this program. Applicants will not be reimbursed for equipment purchased that was not utilized at the specified location.

APPENDIX 2. Online Nursery & Grow-Out Farm Application

Type or print all information (you must be a Louisiana resident or corporation organized in Louisiana) Application instructions and definitions for alternative oyster culture (AOC) are found at (laseafoodfuture.com/aoc)

Name of Applicant: _____

Address of Applicant: _____

_____

Contact Person _____ Phone Number_____ Email_____

La. Commercial License #_____ La. Oyster Harvester License #_____

Are you presently in the traditional oyster business? (Y/N) __If Yes, how many years? _____

Are you currently in an AOC business? (Y/N) _____ If yes, how many years? _____ If yes, then what type(s) of AOC business are you presently in? _____

Have you, immediate family members, or any of your companies applied for or have present or pending AOC grants/contracts? (Y/N) ____ If Yes, explain_____

_____

Provide physical address of any land-based part of operation for in this grant_____

_____

Provide GPS coordinates of any water-based part of operation for this grant (if site split into multiple locations, also put those GPS coordinates in comments section below and explain why split):

Lat. _____ Long._____ Acres in Grow-Out? _____

If AOC Grow-Out is on a state-issued oyster lease, what is lease(s) number(s)? _____

If Grow-Out is located within an established AOC park provide a COPY of your park contract agreement with this application. If funded, when would you plan to start operation? _____

Why interested in AOC? _____

_____

_____

_____

Other Comments (use additional blank sheets if necessary) _____

_____

_____

_____

Signature of Applicant: _____ Date: _____

(We will contact you if need more information; if approved, we will then need your tax I.D. #)

APPENDIX 3. Questions Posted online for Applicants to Review Before Interview.

Emailed to all Applicants and also published online at LSF website.

Led by either Dr. Earl Melancon as chair of the Committee or by Dr. Brian Callam, LASG Oyster Hatchery Director and a member of the Resource Group. All transcription taken during the phone interview will be secured by Dr. Melancon or Dr. Callam in their respective office. All transcriptions will be held by Dr. Melancon for security and for summation. Recordings and summaries will be made available to the Selection Committee to aid in their evaluation process. The anticipated time to perform the phone interview is one hour or less. The applicant will have the opportunity to opt out of any or all questions asked. Specific questions that will be asked in the phone interview of the application process are below. Please note that during the interview process, additional questions may arise due to the responses of the individual. If additional questions arise, they will be documented with the application.

The following ten main interview questions (Q) with follow-up questions (A, B, etc.) will help give the Selection Committee a feel for how much thought and preparation the applicant has put into their plan to have an AOC business; this is part of the evaluation process.

Q1. Why did you decide to apply for a grant?

A. Will you be applying for more than one type of grant? If so, can you tell me how you will integrate each part into your business?

B. Are you aware that each grant application is an independent process, and there is no guarantee that if you are successful in one category you will have success in another?

Q2. Are you planning to conduct your business as a sole proprietor, or do you have partners/associates involved with you that were not listed on the application form?

A. Expertise and role of each partner(s)/associate(s) in your business?

B. How long have you had a relationship with your partners/associates?

C. Will you be involved with day-to-day activity on the water as a farmer, or will you be hiring or sharing profits with others working for you to do the day-to-day water activities?

Q3. Have you ever been involved in any other aquaculture business before?

A. Have you developed a business plan for your aquaculture business?

B. Would you like us to help you develop your business plan?

C. Do you think a plan could help you better manage your operation?

Q4. What are some of your most pressing concerns as you start/continue in your AOC business?

Q5. What type of supplies/equipment do you plan to purchase with the grant funds?

A. If you were to receive a grant, what is your plan/strategy for funds and use in the first few months in the program?

B. Are you aware that any single water-born item of purchase at $5,000 or more in value will require a bond for removal?

C. If you are applying for a nursery, be prepared to discuss how you will cultivate larvae or seed using equipment.

D. If you are applying for a grow-out, be prepared to discuss how you will cultivate seed using equipment.

Q6. Do you anticipate or expect to have any vandalism or theft issues?

A If so, any thoughts on how you can address this issue?

B. Have you thought about any security measures you may be able to apply?

Q7. Do you have additional monetary resources besides this grant to assist you in developing your AOC business?

A Do you have an adequate boat equipped for AOC work?

B. Do you have an adequate vehicle equipped for AOC product transportation and refrigeration?

Q8. What will be the source of your seed oysters?

A. What size seed do you plan to use?

B. How many oysters do plan to put in your cages?

Q9. Do you possess, and how long have you had, the necessary AOC licenses to operate a business?

A. Taken the mandatory on-line LDWF Oyster Harvester Training Program?

B. Possess an Alternative Oyster Culture Permit from LDWF if have an AOC business outside an AOC park?

C. Possess Oyster Harvester License and Commercial Fisherman License?

D. If plan to sell oysters Wholesale / Retail, do you possess license with LA Department of Wildlife & Fisheries?

E. If you plan to sell to the public, do you possess an LDH seafood Board of Health permit?

Q10. This question is specifically for those applicants with an AOC site already established in an Aquaculture Park or have a lease agreement with a private landowner.

A. Do you have a signed lease agreement in your name/business with the park?

B. How long have you had the lease agreement and when is the renewal or termination date?

C. Are you willing to supply a copy of the lease agreement to us for documentation?

D. Would you mind if I contacted the GI Port Commission/landowner to verify the information?

E. Have you ever attempted to obtain, or do you have AOC liability or crop insurances in place?

The following four main interview questions (Q) with follow-up questions will help give the Selection Committee a feel for how much thought and preparation the applicant has put into understanding the habitat and public health requirement for oyster aquaculture husbandry:

Q11. How did you decide the location of your AOC site?

A. Salinity regime?

B. Depth of water, especially during low tides in winter?

C. Do you know how much water is required for the type of oyster cages/equipment you will use?

Q12. Is there a need for a Coastal Use Permit (CUP) for your AOC site? If so, do you already have a CUP for your AOC site? (not applicable if park holds CUP)

A. If yes, are you willing to share a copy with us for documentation?

B. If no, have you started the process of getting a CUP and how far along are you in the process?

C. Having difficulties with the process?

D. Are you planning to hire someone to help you acquire a CUP?

a. Who and what experience does that individual/Company have in CUP assistance?

b. Do you plan to use some or all the $5K of the grant to help pay for that assistance?

Q13. Based on your AOC water site location, do you have a landing site and processing site for your oysters for market?

A. About how long does it take by water to get to you landing site from your AOC site?

B. Are you familiar with the industry time/temperature requirements for oyster refrigeration after harvest? How will you accommodate time/temp requirements?

Q14. Are you familiar with the Louisiana Department of Health (LDH) seasonal pollution closure lines?

A. Based on historical lines, do you think that the LDH lines will have an impact on your AOC business?

B. If so, how will you address those issues?

<u>Question to ask only to a present AOC Farmer</u>**:**

Q15. Have you sold any oysters in the last three years, and if so, can you give us proof of those sales? Note: we are interested more in consistency of sales and not as much about quantity of sales.

<u>Final Question</u>:

Q16. Is there anything else you would like to add to the interview for the Selection Committee to know as they evaluate your application?

APPENDIX 4. Evaluation Metrics Used to Aid in Selecting AOC Nursery and Grow-Out Farm Applicants (This was on the LSF website for all applicants)

Dear Applicant,

The following assessment pages introduce you to the application process. It provides an opportunity to evaluate an applicant's personal qualifications and experience (element A), the AOC site location as it influences the biological and physiological needs of the oyster (element B), and the ability to work and harvest without influences of public health concerns (element C). Additionally, you will be able to evaluate an applicant's personal thoughts on what AOC means to them and how prepared one is to start a business (element D), and any outside financial efforts they may be pursuing to bolster their business through grants, etc. (element E). Together, the five elements (A-E) will be used to calculate an application Qualifying Score. Besides the Qualifying Score, there will also be a phone interview which will be used in the evaluation process.

All five assessment elements (A-E) are important. However, each is not necessarily of the same value when considering the potential success or failure of their AOC business efforts. For example, one's greatest desires and efforts cannot be achieved if the quality of the AOC location site does not meet the needs of the oyster or the needs for public health concerns when the oysters are sold for human consumption (Louisiana Department of Health-LDH). Therefore, such elements should carry more weight in the evaluation process.

To accomplish the need to weigh the value of the five assessment elements (A-E), a value representing a fraction of the whole was used; whole = value of 1.0 = 100%. For example, element "B" is salinity and covers biological and physiological needs of the oyster and assigned the highest weight of 0.5. This means that with the whole evaluation process of summing values for A through E, 50% of the Final Score weight will be attributed to the importance of element "B" alone. Assigning a weight was not arbitrary, and each element score and sub-score within an element has a rationale described within the evaluation process.

Assisting the Selection Committee is a professional Resource Group of biologists who will be available to answer questions as the committee discusses applicants. The Resource Group has no vote in the process of evaluating applications and who are required, like the Selection Committee, to sign affidavits of data security and confidentiality.

Explanation of Evaluation Scores:

Element A = Applicant's Competitive Qualifications. This is competitive compared to others of the same Grant Type. Using the information from what was filled out on the application and the Interview answers, rate this applicant on a scale of 1-5 with 5 being excellent. (consider not rating this element until after reviewing all applicants of same grant type).

Score of 5= Excellent: within top 10% of all applicants (exhibits outstanding qualities)
Score of 4 =Very Good: within 75-90% of all applicants (above average quality)
Score of 3= Good: within 50-75% of all applicants (routine/average quality)
Score of 2 = Below Average: within 25-50% of all applicants (marginal quality)
Score of 1 = Poor: within bottom 25% of applicants (missed the mark, has major deficiencies)

Element B = Biology & Physiology of Oyster. An oyster is an animal that can cope with a wide range of salinities. However, below 8ppt salinity *(ppt = parts per thousand = 8g (grams) sea salts dissolved in 1,000g of water*) growth, reproduction, and larvae development is significantly reduced, and below 5ppt in hot summer waters can quickly (days) result in physiological stress and death. The salinity score represented by a 1-5 scale takes those biological and physiological needs into consideration. Also, highly variable salinity changes at a site can also increase physiological stress, and thus becomes an important consideration as well; the higher the salinity variability, the higher potential for stress as a negative factor.

Element C = LDH Pollution Closure Lines. The Louisiana Department of Health, through its Molluscan Shellfish Program, provides the oyster industry with four (4) seasonal closure maps

delineating those areas that are open and closed to harvest to protect the consumer, and ultimately the industry as a whole from negative public opinion. The area within each seasonal closure line may vary from year to year, and thus the need to document six (6) past years of closure. Although it is a personal business decision about placing an AOC farm in an area that has the potential to be closed, to maximize potential income an AOC site should be active most months, if not all year. This element valuation on a scale of 1-5 allows for that personal business decision of the applicant as to the location of his operation. However, as an evaluator, it is the prerogative to agree or disagree. Documented economic information is scarce for a Louisiana AOC operation, but indications are that success requires a great deal of flexibility in ability to establish and stagger multiple crops through the year for sale to allow to allow for maximum income potential.

Element D = Applicant's Reason for wanting to pursue AOC. There is a place on the application for the applicant to express why they want to be in the AOC business. There is also an opportunity to have a response during the telephone interview. This is where the applicant can express their individualism and how they want to develop their AOC business. The evaluation process should compare all applicants of same grant type before scoring this element. This element is perhaps the most subjective to score.

Element E = Applicant's efforts to pursue additional financial grants/opportunities. Score Element E is a special consideration in the nursery and grow-out farm pre-applications. It is an incentive for grant applicants to consider teaming with others, for example a foundation, that may have ability to match or offset some of the costs to enhance or develop an AOC business. Such a cost sharing would allow the selection committee to use those savings to help additional applicants. What will NOT be allowed is the ability for an applicant to provide self-generated funds as a match; this would put those applicants without the same financial ability at a disadvantage.

Evaluation Value Score Card used by Selection Committee:
Applicant Name_____ Contact Person _____Phone #_____
Estuary of AOC Grant?_____ If has Land-Based Part, Address?_____
Checklist: (circle or fill in answers). Below Information applies to Applicant, unless otherwise noted
La. Resident? Y N Commercial Oyster Licenses? Y N In Good Standing? Y N
Traditional Oysterman? (1) Y N if Yes, # of years? _____ if have Partner Name_____
If an applicant partnering with a traditional or AOC oysterman, then their license & years of experience can be used. AOC Oysterman? Y N If Yes, # of Years? _____
AOC businesses Presently Have? (circle all that apply) Park Hatchery Nursery Grow-out
Present/Pending Other Grant Money? Y N if Yes, with who?_____Amount?_____
Is AOC (check one) in an established Park?_____ on a Traditional Lease?____ Other?_____
CUP Needed for AOC? Y N if Yes, (check one) Have? ____ Applied/Pending? _____ Need? _____
If applied for a permit, date submitted? _____ If funded, how soon can start? _____

SCORING APPLICANT

_____ (A) Using above information and interview, what is application qualification score based on competitiveness with other applicants of same grant type? Note: Please consider scoring this after reviewing all candidates for the same type of grant.
(Scale 1-5): 1= Poor; 2= Below Avg; 3= Average; 4= Above Average; 5=Excellent. *(evaluated based on the pool of applicants)*

_____ (B) Appropriate site location for operation based on salinity needs of oyster?

Weighted $SCORE_{sal} = (0.10\mathbf{S_1} + 0.25\mathbf{S_2} + 0.50\mathbf{S_3} + 0.15\mathbf{S_4})$
Salinity Weight: 0-6.0ppt = Poor; 6.1-10.0ppt = Below Avg; 10.1-16.0ppt = Average; 16.1–20.0ppt = Above Avg; ≥ 20.1ppt = Excellent.

Salinity Variability Weight: 6.00-5.01=Poor; 4.01—5.00=Below Avg.; 2.01-4.00=Average; 1.01-2.00=Above Avg.; 0.01-1.00=Excellent.

Sub-Scores (S_i): (with descriptions)

_____ **S_1** = value for 5-yr avg salinity (2015-2019)

Rationale for 0.10 Weight: historical average provides important but minimal information on habitat variability through the seasons.

_____**S_2** = value for 5-yr avg salinity in winter, December-February (2015-2019)

Rationale for 0.25 Weight: oyster growth reduced, somewhat dormant physiological state, but capable of living in very low salinity for an extended time.

_____ **S_3** = value for 5-yr avg salinity in summer, June-September (2015-2019)

Rationale for 0.50 Weight : oyster growth maximum, overall physiological state active, not capable of living in a very low salinity for an extended time.

_____S_4 = value for 5-yr avg salinity variability (2015-2019)

Rationale for 0.15 Weight: the more variable the salinity, the more variable the physiological response, especially during summer months potentially leading to more stress.

_____ (C) Appropriate site for operation based on LDH Pollution Closure Lines?

Weighted $SCORE_{LDH} = (0.17\mathbf{S_5} + 0.33\mathbf{S_6} + 0.17\mathbf{S_7} + 0.33S_8)$

Rational: The sub-score variable (Si) is based on LDH having four seasons for delineating pollution area closures. Each season score is based on number of months closed within a 6-year period. An AOC business, to maximize profitability, should be active most months, if not all year.

Use LDH Seasonal Pollution Closure Maps per Basin based on years 2016-2021, sub-scores rated as follows on scale 1-5:

6 closures during the 6-year period = Poor = 1 point
4-5 closures during the 6-year period = Below Average = 2 points
2-3 closures during the 6-year period = Average = 3 points
1 closure during the 6-year period = Above Average = 4 points
0 closures during the 6-year period = Excellent = 5 points

Points:

_____ **S_5** = Number of March-April closures during the 6-year period.
_____ **S_6** = Number of May-August closures during the 6-year period.
_____ **S_7** = Number of September-October closures during the 6-year period.
_____ **S_8** = Number of November-February closures during the 6-year period.

_____ (D) Score based on Application Answer of why interested in pursuing AOC and on Phone Interview Answers and Explanation? ***Note: Please consider scoring this after reviewing all candidates for the same type of grant.***

Score on scale of 1-5 with 1 = Poor; 2 = Below Avg; 3 = Average; 4 = Above Avg.; 5 = Excellent.

_____ (E) Present or Pending Other Money for AOC use?

Any documented effort to get extramural funds, whether successful or not = 5pts

Calculation of Final Weighted Score:

ScoreTotal = 0.25(**A**)+0.40(**B**)+0.20(**C**)+0.10(**D**)+0.05(**E**)

YOUR FINAL $_{\mathbf{ScoreTotal}}$ = 0.25(___) + 0.40(___) + 0.20(___) + 0.10(____) + 0.05(_____) = _____

NOTE*: A high score does not necessarily mean funding since there is also a telephone interview. The team will evaluate all evidence brought before them before making a final decision.*

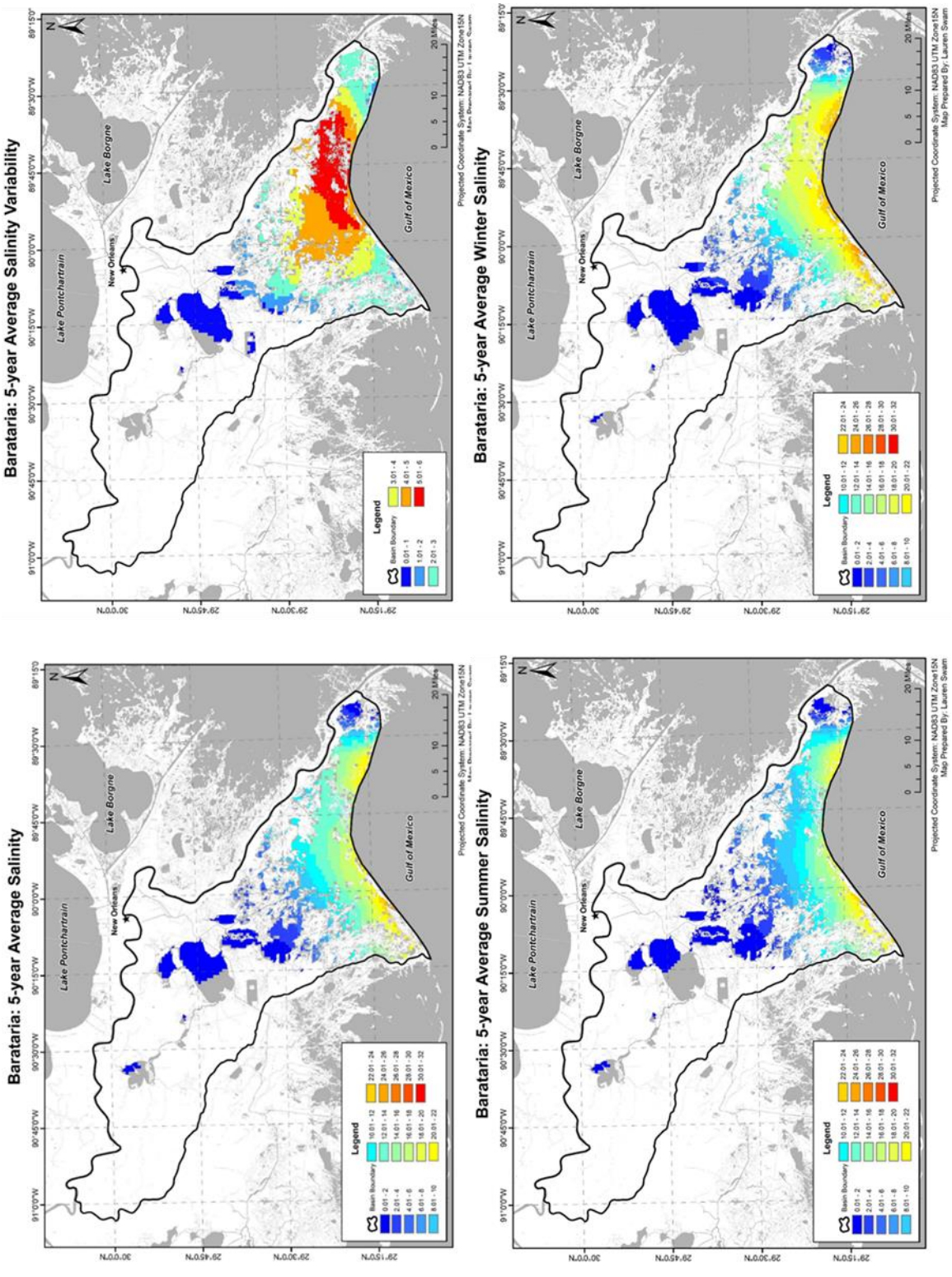
Once the Selection Committee is convened, some observations that the support Resource Group may provide in dialogue with the reviewers to assist them in determining if a score needs revision:

- *If no CUP, does the site have a reasonable chance of receiving a coastal use permit (CUP) if one is needed?*
- *Is the location in or near an important navigation lane that could potentially create impediments for vessels and reduce the chance for a CUP? Near an active oil/gas well site, etc.? on or near another CUP site that could influence potential success?*
- *If applicant states that a CUP has been submitted and pending, did the applicant present proof of the pending permit?*
- *Is there a land-based as well as water-based part of the proposed AOC operation? If so, how far is land-based operation from water-based site of operation and could it possibly have influence?*
- *Does the applicant live a reasonable closeness to AOC operations (based on address supplied on application) and have reasonable access to site through dock or boat ramp facilities? (applicant can address this in comment section of pre-application as well as in phone interview.)*
- *How many acres in proposed AOC water operation? All in one water-site location or separated at a distance that perhaps requires two Coastal Use Permits?*
- *How potentially vulnerable to storms is site?(e.g., not protected by any nearby land or marsh, etc.)*
- *How potentially vulnerable to vandalism is site? (e.g., very remote isolate location)*
- *During wintertime could the site maintain adequate water depth for the type of AOC seed/grow-out cages used? (applicant should address this in comment section of application).*
- *Does private AOC site or Park already have an AOC registered permit? Did they provide a copy of permit if on a private oyster lease or privately owned lands? or if in a Park their lease agreement? (Park lease agreement must be in the name of the applicant). (Note #1 below)*
- *Does the applicant have traditional oyster/AOC experience, or applicant's partner? If partnered, are the roles of each appropriate and adequately documented?*
- *Is the applicant already in an AOC business? If so, based on trip ticket or other means provide, is there a relative consistency in farm sales through the years? If not do they provide an adequate explanation as to why not? (Note #2 below)*

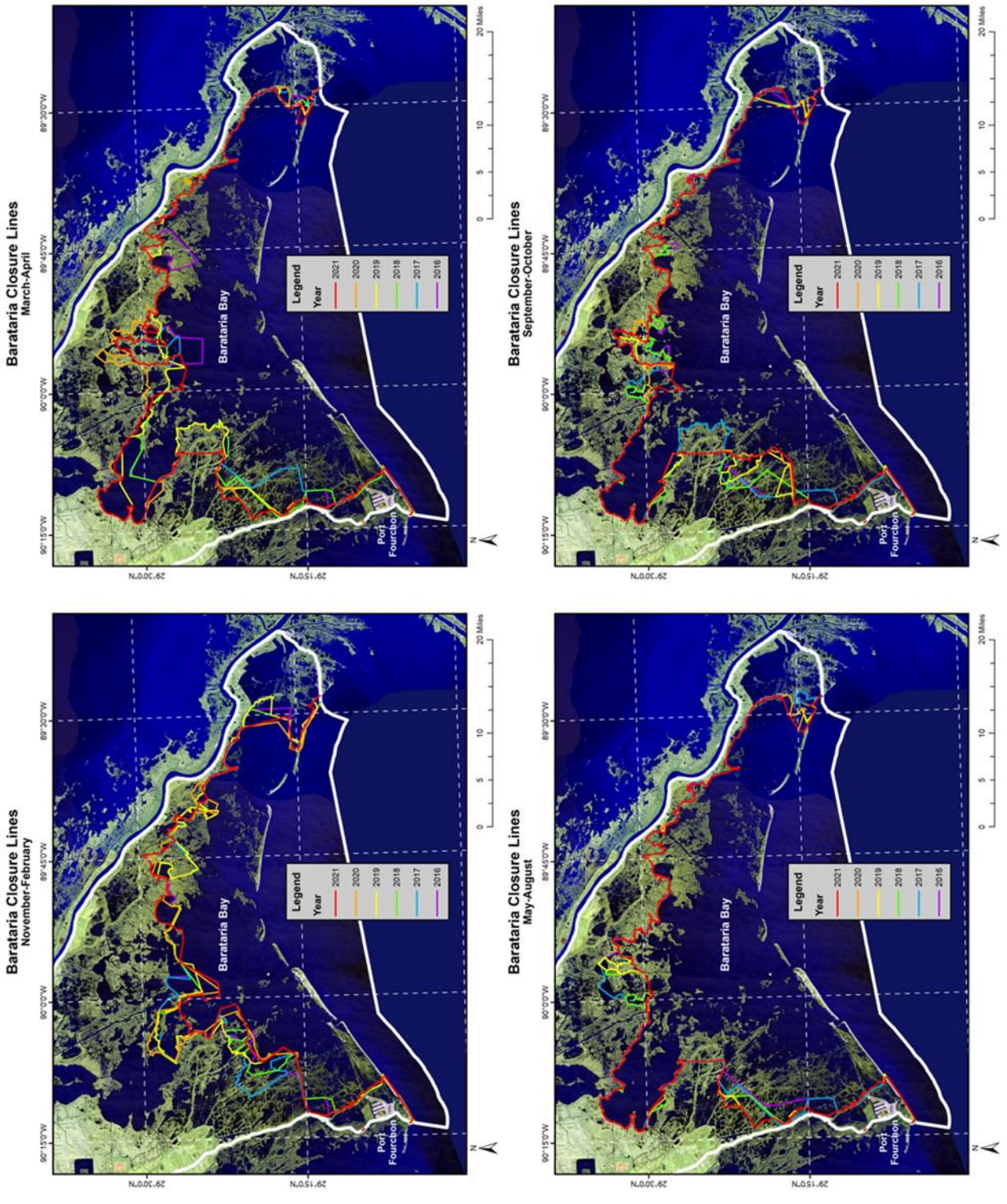
Note 1: If a Coastal Use Permit (CUP) is required for an AOC operation, and if selected, the grant will allow access for up to $5,000 for private assistance in developing the permit, and in developing a bonding process for removal of equipment if one defaults on contract. If the applicant is successful in obtaining an AOC permit, then the remainder of the contractual grant money will become available. If not successful in obtaining a CUP, then no more funds will be allocated, and contract obligations are canceled.

Note 2: For the evaluation process, the actual AOC oyster production for an individual farmer is not critical since we don't want to compare a small producer to a large producer. What we are looking for is consistency in selling, thus showing that they are truly active in the business.

APPENDIX 5. Barataria Estuary Salinity Maps used in the Evaluation Scoring Process. (Full list of maps can be found on LFF website)



APPENDIX 6. Barataria Estuary LDH Pollution Closure Maps used in the Evaluation Scoring Process. (Full list of maps can be found on LFF website)



APPENDIX 7: Timeline of AOC Program Workshops and Presentations*

** Abridged timeline; a full list of activities per quarter is on file with LASG and LDWF.*

Jan – Mar 2021

- LDWF administration sends letter of approval to LASG to proceed concerning the AOC Grants Program.
- Development and administrative approvals of AOC grants public solicitation procedures.
- Development and administrative approvals of grievance procedures for any public concerns of grant selection process or grantee grievances.
- Draft development of AOC website for AOC program information.
- Initial meetings with Iberia Development Foundation (IDF) to develop LSU subcontract language for them to administer the AOC grants and grantee contracts.

Apr – Jun 2021

- Presentation - Rollout presentation of AOC the grants program to the Louisiana Oyster Task Force (OTF) and their official acceptance of the program. Public release of the AOC program information to the media by LASG.
- Presentation - First meeting with the state's AOC farmers in the state to explain the AOC program and opportunities; received feedback to help us improve the program, Meeting was held at the LDWF Marine Laboratory on Grand Isle, Louisiana; zoom capabilities were available for those farmers who could not attend.
- Presentation - First public webinar meeting - Rollout of AOC program to the public with an interactive 1-hr. zoom presentation on the internet with Q&A afterward.
- Presentation - Public meeting - Cameron AOC Aquaculture Park Development - Initial meetings and presentations on the AOC program to the Cameron Parish Port, Harbor, and Terminal District. The Board unanimously agreed for Sea Grant and LDWF to proceed with efforts to establish an AOC Park in the lower Calcasieu Lake.
- Presentation – To the Cameron Police Jury. The Board unanimously agreed for Sea Grant and LDWF to proceed with efforts to establish an AOC Park in the lower Calcasieu Lake.

Jul – Sep 2021

- Presentation - Meeting with the Point au Chien Native American tribal members to introduce and
- Presentation - Second public webinar meeting – Presented a 1-hr. explanation of application evaluation process and the metrics used, with a Q&A opportunity afterward.

Oct – Dec 2021

- Grants - LSU finalizes AOC subcontract to IDF to allow them to be administrator of $1.8M in grant monies by developing and executing grantee contracts and for keeping accounting leger on each.
- Grants - The first round of applications for grant funding was announced to the public. Applications accepted starting 12/08/2021 to 01/13/2023.

Jan – Mar 2022

- Presentation - First webinar meeting with AOC Selection Committee members and Advisory Team to discuss all evaluation procedures and have a Q&A afterward.
- Grants - The first round of state-wide grant applications closed on 01/13/2023. Received 13 grow-out farm applications, seven (7) nursery applications, one (1) Aquaculture Park application, and one (1) private hatchery application.
- Workshop - Meeting with all first-round grand awardees at the LDWF marine lab on Grand Isle to discuss IDF contract procedures, Sea Grant rules and regulations, and purchasing procedures, 02/23/2022.
- Presentation - To the Camerom Port Authority on status and progress to establish an AOC aquaculture park.

Apr – Jun 2022

- Presentation - Webinar meeting with state regulatory agencies to explain the grant program and to help coordinate future activities; participants were LASG, LDWF, LDH, LDNR.
- Grants - The Second round of applications for state-wide grant funding was announced to the public. Applications accepted starting 05/06/2022 and closing 06/09/ 2022 for nursery and grow-out farm applications, and 07/07/2022 for hatchery and park applications. By 07/07/2022, in the second round there were a total of 24 applications: 7 nursery farms, 16 grow-out farms, 1 aquaculture park, and no hatchery.

Jul – Sep 2022

- Workshop - AOC team convened a day-long state and federal agency information and dialog meeting with AOC farmers and interested public. Meeting held on 08/18/2022 at the LSUAg Center in Raceland, La.; agency participants presenting were LASG, LDWF, LDNR, U.S. Coast Guard, U.S. Corps of Engineers, Coastal Technical Assistance Center, and Louisiana Small Business Development Center.
- Presentation - Midterm program update presented to the OTF.

- Grants -Second Round of Grant Contracts signed with IDF – started signing contracts on 10/20/2022. Also, public announcement on LSF web site and by LASG to the news media.
- Grants - The Third round of applications for Cameron-specific grow-out farm grant funding was announced to the public. Applications accepted starting 09/08/2022 and closing 09/31/2022.

Oct – Dec 2022

- Presentation - Cameron Port Authority office with individuals interested in the AOC grant program.
- Presentation - OTF meeting to specifically review and hear grievances by one applicant on the application process and the metrics used in the evaluation process.

Jan – Mar 2023

- Grants - Third Round of Grant Contracts signed with IDF. Started signing contracts on 04/21/2023. Also, public announcement on LSF web site and by LASG to the news media.
- Workshop/Expo - Seafood Summit and Expo. A day-long conference with AOC highlighted at Expo with booths, trade show, chef demonstration of oyster dishes. Metairie, La., on 03/01/2023.
- Presentation - Gulf of Mexico Sea Grant Conference. A 3-day conference for Sea Grant staff throughout the Gulf region. Attended and presented in a work session on Louisiana AOC grant efforts; held Long Beach, Miss.
- Presentation – Aquaculture America National Conference. Presented the Development and Status of the AOC Grants Program in Louisiana; held in New Orleans, La.

Apr – Jun 2023

- Presentation – Louisiana State of the Coast Biannual Conference. Presented in a poster session on the status of the AOC Grants Program; held in New Orleans, La.
- Workshop – A 1-day event with Cameron AOC farmers to introduce them to various culture methods and types of gear used in the oyster cage culture industry; held in Cameron at the Cameron Port Authority building. Local LDWF law enforcement officers were also in attendance to hear about the program.

Jul – Sep 2023

- Workshop – a 2-day event at the LDWF Marine Laboratory on Grand Isle for Cameron AOC farmers to visit and meet with the Grand Isle AOC farmers.

Oct – Dec 2023

- Workshop - A 2-day event at the LDWF Marine Laboratory on Grand Isle for 8-15th grade teachers to learn about the Louisiana AOC industry, tour the oyster hatchery, and experience a farm in operation.
- Workshop – a three-day HACCP workshop for AOC farmers selling direct, Lake Charles.
- Presentation – Update on the AOC Grant Program to the Marine Extension Program staff quarterly meeting. Grand Isle.
- Workshops - A 2-day event at the LDWF Marine Laboratory on Grand Isle for Cameron AOC farmers to visit and meet with the Grand Isle AOC farmers.

Additional Efforts - Throughout the three-year AOC Grants Program, the AOC team has worked with LASG' Communications staff and with professional contractors to develop educational materials for the AOC industry and public, with all made available on the LFF web site.

APPENDIX 8. Louisiana Sea Grant Statement on Relationship of the AOC Fishery to the Traditional Oyster Fishery

There are complex environmental, economic, and political issues confronting today's traditional oyster industry. Alternative oyster culture (AOC) is a part of addressing those issues, but certainly not the sole or primary solution. Louisiana's traditional oyster industry is a volume-based fishery with the vast majority produced from our traditional private oyster leases, e.g. 98% in 2019. Since the year 2000, this traditional production has annually averaged 11,553,068 pounds of oyster meat, contributing 44 percent of the United States' supply (NOAA/NMFS Fishery Statistics). AOC cannot replace this natural fishery in volume or in economic impact.

Louisiana Sea Grant (LASG) introduced oyster hatchery technology to the Louisiana oyster industry because of the traditional industry's need for seed oysters, 40 years ago in the mid-1980s. Amid multiple shifting environmental questions confronting the industry today, none are more immediately challenging than the present failure of oyster production on the Breton Sound public grounds and the pending influences of the proposed large scale Mississippi River diversions. Hatcheries and AOC may help to address a small part of those challenges, but certainly not replace the need for oyster habitat stewardship. What has not changed is LASG's 53-year history of dedicated unbiased research, teaching, and outreach to the oyster industry and to the people of Louisiana.

Fisheries are high-risk businesses. Even so, the nation has seen an increase of "AOC-like" aquaculture for many shellfish species, especially over the last decade in the northern Gulf of Mexico. In Louisiana, with competition from its abundant volume-based and lower-cost traditional reef oysters, the risk to AOC success is potentially higher than in the other Gulf states.

The emphasis on AOC development and expansion in Louisiana must always be placed within the context of the primary goal of promoting and sustaining our state's traditional oyster fishery with its rich history and national leadership role. However, as estuarine habitat and environmental conditions continue to change through natural and human influences, there is a need to offer and expand economic opportunities for oyster fishers and AOC helps to address that need.

For opportunities to promote AOC within the industry, it is necessary to develop marketing strategies that portray the product as a boutique-type, niche oyster. Additionally, we must continue to promote the nationally renowned quality products of the traditional Louisiana oyster fishery.