# Marine Resources Administration

# Shell Recycling Program

## 2022 Collection Year

## Annual Report

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## Acknowledgments

The Shell Recycling Program would not be possible without the hardworking, dedicated staff of the Marine Resources Administration's Bureau of Marine Habitat & Shellfisheries, restaurant partners, program partners, and supporters. Great appreciation is expressed to Les Frie, Ricky DiVaccaro, Michael Lindner, and Michelle White for performing weekly shell collection, data collection/ entry, preparation of materials, and the operation and maintenance of equipment. Special thanks are offered to Jenny Tomko in program outreach planning and execution. Appreciation is extended to the Bureau of Marine Fisheries staff for assisting with shell collection operations. Sincere appreciation is extended to supervisory staff, Kira Dacanay, Jeff Normant, and Russ Babb, for guidance and direction on shell recycling activities. Thanks are extended to all restaurant partners, Hard Rock Hotel & Casino, Dock's Oyster House, Knife & Fork Inn, Steve & Cookies by the Bay, and Golden Nugget Casino. Finally, thanks to all program partners and supporters, including the Jetty/ Jetty Rock Foundation, Stockton University, Rutgers Cooperative Extension, the Atlantic Coast Fish Habitat Partnership, Atlantic County Utilities Authority, and the Casino Reinvestment Development Authority.

## Executive Summary

This report documents recycled shell collection in 2022 by the Marine Resources Administration's Shell Recycling Program in Atlantic City, New Jersey. Included are the economic and potential ecological benefits, logistical tasks, partners, outreach, and challenges associated with the collection of shell. Additionally, this document summarizes program operations, origins and history, the partners' roles, and the recycled shell's intended use. In 2022, a total of 3,362 bushels (92.45 tons) were collected from five restaurant partners. A separate report providing a complete analysis of the MRA's shellfish enhancement activities, in which recycled shell is a critical component, will be produced and available in the coming months. Full shell planting activities are not described in this report.

## Introduction

Eastern oysters (*Crassostrea virginica*) are a keystone species, meaning they are an integral part of a healthy ecosystem. As reef-building organisms, oysters provide structural habitat for many of New Jersey's commercially and recreationally important species, such as striped bass, blue crab, and summer flounder. The three-dimensional structure the reefs create offers protection from predators and forms a nursery ground for juvenile finfish. Additionally, adult oysters can filter significant volumes of water, helping to improve water quality by cycling excess nutrients.

Oysters are critical socially and economically in the United States, recognized as one of the most popular seafood dishes served at seafood restaurants. Traditionally, when oysters and other bivalve shellfish (such as hard clams, *Mercenaria mercenaria*) are consumed at a local restaurant, the leftover shell is put in the trash for disposal in a landfill. Shell recycling programs aim to beneficially reuse what otherwise would be a waste product by collecting the shell and using it for oyster enhancement efforts. The cured shell provides the hard substrate required for oyster populations to grow and succeed. In addition to the ecological benefits, shell recycling produces significant cost savings for local restaurants (see Table 5) by reducing the total weight of trash produced. Recycling shell also allows local restaurants to display their commitment to environmental stewardship, providing a good advertising platform to engage consumers.

In February of 2019, NJDEP Marine Resources Administration (MRA), the Jetty Rock Foundation (JRF), Rutgers Cooperative Extension (RCE), and Stockton University (SU) collaborated on the development of a conceptual shell recycling program in Atlantic City, New Jersey. The program was developed after the Hard Rock Hotel and Casino in Atlantic City (HRC) learned of an existing program in Long Beach Township, New Jersey, and expressed interest in recycling shell. The Jetty Rock Foundation and Long Beach Township built a successful model through their Oyster Recycling Program, demonstrating how municipalities can make shell recycling efforts successful, and it sparked the interest and development of this program in Atlantic City. Many other shell recycling programs exist throughout the United States.

As anticipated, the benefits of shell recycling have become appealing to additional casinos and area restaurants. As the partnership moved forward, many logistical challenges became apparent. Transportation, storage, and curing locations for the shell are among the most challenging,

especially with the prospect of adding more casinos/restaurants. Shell was being collected by RCE using an F-250 pickup truck and stored at the SU marine field station, which was quickly running out of available storage space. Trucks were manually loaded at the casino and unloaded at SU marine field station. The process was incredibly time-consuming and labor-intensive. Additional partners were sought to help with these challenges but without success. Consequently, in October 2019, after careful consideration and discussions with partners, the MRA agreed to take on a larger coordination role in this project to help continue its growth and success. Having assumed the lead role in the program, MRA dedicated staff, equipment, and resources. The program has expanded significantly since 2019 and now serves Hard Rock Hotel & Casino, Dock's Oyster House, the Knife & Fork Inn, and Golden Nugget Hotel & Casino. The program continues in efforts to expand to additional venues in the Atlantic City region.

## Program Implementation

### Partnerships, Roles, and Support

Project Partners & Supporters

**NJDEP Marine Resources Administration:**

MRA is responsible for protecting and managing New Jersey's marine habitat, resources, and industry. Improving the overall conditions of shellfish habitat and increasing shellfish populations through various enhancement and restoration programs is a focus of the MRA. These programs provide a net benefit to the ecology of New Jersey's estuarine waters and afford harvest opportunities for commercial and recreational shellfishermen. The MRA is the coordinating agency for this program and will collect, store, and plant the recycled shell primarily to enhance the Mullica River oyster reefs, one of the last self-sustaining oyster populations on the Atlantic coast of New Jersey.

**Jetty/ Jetty Rock Foundation:**

Jetty/Jetty Rock Foundation is an outdoor coastal lifestyle apparel brand and certified corporation that runs charitable initiatives through its 501(C)3 nonprofit. Jetty is the content/media creation partner of the Shell Recycling Program. Jetty designed the Shell Recycling Program logo and all promotional materials. Jetty will continue producing media, signage, apparel, and content for the program moving forward.

**Rutgers Cooperative Extension:**

RCE provides science-based educational programs and brings knowledge of the state university to local communities. Extension efforts include educational programming and applied research in fisheries, aquaculture, and coastal resource management, part of which is the Barnegat Bay Shellfish Restoration Program that focuses on estuarine ecology, environmental stewardship, and shellfish biology, restoration, and aquaculture. RCE assists the shell recycling program where necessary by providing resources in Ocean and Atlantic Counties, including personnel, relevant educational programming for the public and volunteers, and support for other logistics involved (i.e., vehicles, shell transport, and planting)

**Stockton University Marine Field Station:**

The SU marine field station houses research vessels, sampling equipment, and staff to conduct research-driven programs. Faculty at the SU conduct oyster restoration and monitoring projects throughout New Jersey's coastal bays and seek external funding and partnerships to support those projects. The University is well situated, geographically and strategically, to serve the program through student engagement, research, and monitoring.

**Atlantic Coast Fish Habitat Partnership:**

The Atlantic Coast Fish Habitat Partnership (ACFHP) endorsed the Shell Recycling Program in 2019. ACFHP's focus is *"enhancing, preserving, and protecting Atlantic diadromous, estuarine, and coastal fish habitats."* The Shell Recycling Program aligns with ACFHP's mission-centric work by enhancing coastal fish habitat with the collected shell being beneficially reused to provide much-needed hard substrate to local oyster reefs.

**Catrachos Trash & Recycling:**

In 2021, Catrachos Trash and Recycling (CTR) assisted the program's expansion by providing several 64-gallon recycling containers for shell collection (see Figure 13). The containers facilitated a more efficient shell collection process and allowed additional venues to join the program. CTR continues to display support for the program, and the supplied containers are still used regularly.

**Casino Reinvestment Development Authority:**

The Casino Reinvestment Development Authority (CRDA) facilitates economic and community development in Atlantic City. The Shell Recycling Program aligns with the CRDA's mission by achieving cost savings for local restaurants, keeping waste out of landfills, and engaging with the public. CRDA funded the purchase of additional shell recycling containers (see Figure 12), expected to arrive in early 2023.

**Atlantic County Utilities Authority:**

The Atlantic County Utilities Authority (ACUA) continually seeks ways to provide responsible waste management services through the protection of waters and lands. Shell recycling fits within the overall mission of the ACUA in using a waste product to benefit local ecosystems. ACUA has displayed public support for the program and assisted in fostering a relationship with CRDA. Additionally, ACUA hosts an annual Earth Day festival that provides an excellent platform for the program's public engagement.

**Restaurant Partners[1]:**

Table 1

*Active Restaurant Partners*

| Start Date | Venue |
|---|---|
| February 2019 | Hard Rock Hotel & Casino |
| January 2020 | Dock's Oyster House |
| August 2020 | The Knife & Fork Inn |
| October 2021 | Steve & Cookies by the Bay |
| September 2022 | Golden Nugget Hotel & Casino |

Areas for Future Partnership

**Collection Assistance:**

At this time, MRA can only dedicate staff members to collect shell on a weekly basis. This limits the ability to include additional casino or restaurant participants. Many prospective restaurants are deterred from joining the program when requests for more frequent collection due to odor or storage constraints cannot be met. Vehicle/staff support for supplementary shell collections during the week would provide the opportunity for more venues to join the program.

**Public Drop-Off Locations:**

The top question received by MRA staff is where the public can drop off shells from personal shellfish consumption. Currently, the program does not offer a public drop-off location. MRA staff has contacted local trash and recycling centers and county parks and recreation departments to find a suitable public drop-off location, but they have yet to be identified. This is an area for a future partnership that would help increase public engagement and environmental stewardship education.

Shell Collection

Shell is picked up weekly by MRA staff on an agreed-upon schedule with the restaurant partners. In 2022, staff continued use of its dump trailer (see Figures 13-16) equipped with a hydraulic lift arm to maximize efficiency. The dump trailer allows for the collection of up to 175 bushels of shell (nearly five tons) in one trip. The capacity of the dump trailer has allowed for continued expansion. In September 2022, the Golden Nugget Hotel & Casino became a restaurant partner.

[1] Steve & Cookies by the Bay was a restaurant partner through July 2022. Due to odor and collection frequency, Steve & Cookies opted to no longer participate in the program.

All restaurant partners keep shell separate from their regular trash stream and place them in the designated Shell Recycling Program containers. Each venue uses 64-gallon recycling containers (see Figures 12-13). To accurately assess the amount of shell collected from each venue, the total volume of the container was determined relative to the US standard bushel. Staff estimated that the maximum number of bushels per container is 6.90 bu/container (e.g., a 64-gallon container has a volume of 8.56 cu ft, and a standard US Bushel has a volume of 1.24 cu ft. 8.56/1.24= 6.90 bu./container)

During pickups, staff recorded pertinent data (see Figure 5), which included a percentage estimate of the fullness of each container. This percentage and the maximum bushels per container were used to estimate the number of bushels collected. All shell was transported back to Nacote Creek Research Station, where it was left to cure for a minimum of six months.

In 2022, a total of 3,362 bushels of shell were collected, an estimated 92.45 tons. This marks a **39.5%** increase in collected shell from 2021 (see Table 3 and Figures 2-4).

Curing Site & Maintenance

Prior to shell being returned to a marine environment for oyster reef enhancement, it must cure by being subjected to the elements to rid it of any potential pathogens or bacteria that may be left on the shell. This primarily refers to Dermo disease (*Perkinsus marinus*), which is not harmful to humans but can be detrimental to native oyster populations. The curing process reduces the risk to the native shellfish population when adding the shell back into the marine environment. According to Bushek et al. (2004), a minimum curing of one month is needed to dramatically reduce the risk of spreading *P. marinus*. Out of an abundance of caution, most shell recycling programs use a six-month curing period prior to planting shell back in the marine environment.

In following this protocol, MRA staff spreads the collected shell as thin as possible and tends to it regularly using a front-end loading tractor. Spreading the shell out and rotating piles allows for maximum exposure to the elements, speeding up the curing process. Regularly tending the shell ensures that all shells are safe to be planted after six months. Additionally, this process ensures that any unintended trash present in the collected shell is removed and will not enter the marine environment.

One of the many challenges in recycling shell is finding an adequate storage location to place the shell while curing. Due to the strong unpleasant odor and the amount of space needed, it can be challenging to identify appropriate locations, especially within New Jersey's heavily developed coastal communities. In 2020, the MRA developed two storage sites at the Nacote Creek Research Station in Port Republic, a long-term storage and short-term staging area (see Figure 1). Shell is stored in the long-term storage area (see Figures 16-17) until it is cured and then is loaded back into the dump trailer to be transported down to the short-term staging area by the waterfront (see Figure 18). Placement here allows for the easy loading of the shell onto a barge for shell planting. The Nacote Creek Research Station is uniquely situated, only a short boat ride away from the Mullica River oyster reefs, allowing for an efficient shell planting process.


*Figure 1.* Shell Curing Locations

## 2022 Shell Planting[2]

The Summer of 2022 marked the second annual shell plant on the Mullica River oyster reefs with recycled shell. The Mullica River is the initial focus for enhancement using collected shell as it houses one of the last self-sustaining oyster reefs on the Atlantic coast of New Jersey. These reefs are an excellent platform to enhance and expand due to this oyster populations' resiliency. A full report on the MRA's shellfish enhancement efforts is under development and will provide additional detail on the planting process, equipment, methods, and results.

The MRA rented a 40-foot-long by 24-foot-wide barge from a local contractor that was delivered to the Nacote Creek Research Station. Shell was loaded from the staging area onto the barge using a 3032e John Deer tractor. The tractor loaded shell onto a 30-foot-long portable electric conveyor that was staged overhanging the bulkhead with the end centered over the barge (see Figure 19). The barge and conveyor were shifted periodically throughout the loading process to ensure the barge was loaded evenly for proper weight distribution. Once loaded, the barge was towed to the planting site by the MRA's 42-foot research vessel, RV Zephyrus. Shell was then planted using a series of high-pressure water hoses, including a new water cannon (see Figure 21), to blow shell off the barge and onto a 2-acre parcel within the Mullica River oyster reefs. Shell planting commenced over several weeks throughout June and July to align with the oyster spawn. Planting during this time allows for the greatest likelihood of successful recruitment.

The Shell Recycling Program, while it expanded considerably in 2022, did not collect enough shell to meet the MRA's enhancement goals. As a result, the recycled shell was supplemented with additional shell sources for the 2022 shell plant. In total, 5,000 bushels (125 tons) of shell was planted: 2,410 bushels (66 tons) of recycled oyster and clam shell and 2,590 bushels (58 tons) of surf clam shell. The recycled shell planted in 2022 was collected in 2021 in accordance with shell curing protocols. Shell collected in 2022 will be planted in the Summer of 2023. The planted shell will allow this resilient oyster population to expand and succeed. The MRA intends to plant shell on these reefs annually to provide the substrate needed for continued success.

## Outreach

2022 brought continued progress in branding the Shell Recycling Program, community engagement, and content creation. One of the priorities set for 2022 was to attend public events to raise awareness of shell recycling and engage with the community. The program attended four events (see Table 2 and Figures 6-9).

[2] Recycled shell planted in 2022 was collected in 2021. Shell collected in 2022 will be planted in 2023 in accordance with shell curing protocols.

Table 2

*Events attended in 2022*

| Date | Event |
|---|---|
| 4/23/2022 | A.C. Community Day Cleanup and Party in the Park |
| 4/24/2022 | Atlantic County Utilities Authority Earth Day Festival |
| 6/7/2022 | Mr. B's Backyard Nature Fest |
| 12/6/2022 | Presentation for Toms River Regional Schools |

To assist in outreach efforts, MRA staff worked with Jetty to create a pop-up tent, a collapsible banner, and a brochure for the Shell Recycling Program (see Figures 6-11). The brochure and banner outlined the shell recycling process and displayed all partners and supporters.

MRA staff developed a QR code with New Jersey Fish & Wildlife's Bureau of Information and Education to allow easy public access to the Shell Recycling Program webpage. The QR code will be included in all promotional materials and is now displayed on the back of the dump trailer.

## Challenges and Lessons Learned

While 2022 demonstrated a significant increase in the program shell collection, branding, and general program awareness, the program still faced many challenges and lessons learned throughout the year.

### Trash in Collected Shell

One of the continuing challenges associated with shell collection is receiving shell that contains trash. This includes excess food waste, plastic utensils, cans, bottles, straws, etc. Ensuring that these items do not find their way back into the marine environment is a top priority for the MRA. To minimize this issue, MRA has discussed the importance of this matter with restaurant partners and has instituted a protocol for tending to shell (see Curing and Maintenance) during the curing process in which any remaining trash is removed. Additionally, MRA staff uses a vessel and crew dedicated to collecting remaining trash that makes its way into the marine environment during the planting (see Figure 24).

### Odor Produced by Shell Collection at Restaurants

Another continuing challenge associated with shell collection is the odor produced by the accumulated shell at the venue and insects being attracted to the area. This continues to be an issue for venues that have outdoor seating during the warmer months. MRA staff continues to work with restaurant partners to find cost-effective solutions to alleviate this issue.

Collection Frequency

Due to the above issue regarding odor, many venues request more frequent shell collection than the standard once-per-week currently in place. Due to staff and equipment limitations, MRA is currently unable to collect shell more than once per week. This results in some restaurants not participating in the program. Collection frequency and the odor produced by the shell directly led to Steve & Cookies by the Bay's departure from the program in July of 2022.

The Shell Recycling Program does not have dedicated full-time staff. The full-time staff working on this program contribute considerable time to shell collection (see Table 4.), amongst other non-shell recycling duties. Adding additional part-time dedicated staff will assist with program operations.

Equipment

The program dump trailer has been an exceptional upgrade to the performance of the Shell Recycling Program that has permitted expansion, more efficient collections, and decreased manual labor. Despite these benefits, there is concern that as the program expands, dependence on the trailer increases, and should the trailer have mechanical or other issues, serving the increased capacity would prove to be challenging.

The MRA, since 2021, has rented barges for shell planting events. As discussed in the shell planting section, the MRA conducts shell planting in June and July to coincide with the oyster spawn. The timing of this is essential as it offers the greatest likelihood of success in recruitment on the newly planted shell. In 2022, shell planting was forced to commence two weeks earlier than planned because the barge contractor had another urgent job during our scheduled use. While shell planting was still successful, the schedule change made accomplishing the task challenging. To avoid this issue in the future, MRA will research the purchase of a barge for future use. Purchasing a barge would also create opportunities for planting more frequently throughout the year.

## Updates and Improvements

Based on lessons learned in 2021, the Shell Recycling Program significantly improved program operations in 2022 with noteworthy updates and improvements.

One of the challenges continually faced by the program is ensuring the longevity of the equipment used. As addressed in the 2021 Shell Recycling Program annual report, the dump trailer is a critical component to the viability and success of the program. In addition to the regular washing of the trailer, and the previously installed stainless steel plating, MRA staff added the application of a corrosion inhibitor after each shell collection. This solution dissolves salt and leaves a coating that protects against future corrosion. The solution is applied to the entire dump trailer and lift arm to ensure the longevity of this equipment.

Collection frequency, odor, and attraction of insects were among the top challenges identified in 2021. While MRA still cannot increase collection frequency, the program attempted to find solutions to foul odor and insects. In 2022, working with Steve & Cookies by The Bay, plastic caps (similar to shower caps) were added to cover the closed containers. This, and using trash liners within the shell recycling containers, alleviated some odor/insect concerns. However,

despite these efforts, odor and insects remain a challenge and ultimately led to Steve & Cookies by the Bay's departure from the program in July of 2022.

To reduce the time full-time staff spends on shell collection, the MRA successfully hired an hourly employee in 2022. This employee assisted with shell collection, equipment operation, maintenance, data entry, and the annual shell planting on the Mullica River oyster reefs. Adding this employee helped reduce full-time staff's time spent on shell collection, which was a goal for 2022.

As discussed in the outreach section, program awareness and outreach were priorities identified for 2022. To meet this need, the MRA attended multiple events (see Table 2) and worked with Jetty to create a program brochure, banner, and pop-up tent (see Figures 6-11).

MRA staff compiled a record of all restaurants serving shellfish in the greater Atlantic City area. This database categorizes restaurants by the number of bivalve shellfish served and proximity to existing restaurant partner locations. This will help target additional restaurant partners and maximize efficiency in shell collection.

MRA coordinated with the Casino Reinvestment Development Authority (CRDA) and the Atlantic County Utilities Authority (ACUA) to obtain additional shell recycling containers for the program (see Figure 12). CRDA funded the purchase of smaller (32-gallon) containers that will help reduce the strain on the lift arm. The containers will display the New Jersey Fish & Wildlife and CRDA logos. To reduce the amount of trash placed in them, the containers will be lime green to differentiate them from other trash receptacles. The new containers are expected to be delivered in early 2023 and immediately used at existing venues and any new restaurant partners. This development directly addressed two challenges identified in the 2021 Shell Recycling Program annual report (strain on the lift arm and excess trash).

MRA purchased a John Deere 5100e utility tractor in 2022 and expects delivery in early 2023. The addition of this tractor will result in increased efficiency. A larger bucket volume, load capacity, and height clearance significantly reduce staff time tending to shell piles, transportation between storage locations, and loading the barge.

MRA purchased a water cannon (typically used on fire trucks) for shell planting (see Figure 21). The water cannon provided greater control and stability when planting shell. This addition allowed for a more efficient shell planting process and increased the safety of shell planting for staff.

## Plans for 2023

MRA staff intends to continue to serve existing restaurant partners weekly in 2023. In addition to regular shell collection, the main priorities for 2023 include the following:

- Integrate new 32-gallon shell recycling containers into the regular collection route.
- Work with program partner Jetty to create new and update existing outreach materials for the program.
- Increase social media presence to increase program awareness.
- Work with New Jersey Fish and Wildlife's Bureau of Information and Education staff to update the shell recycling video that was produced in 2021. Create new video and photo content to be used for social media posts.

- Work with restaurant partners to assist with developing methods to display involvement and commitment to shell recycling.
- Attend more public events and give presentations to better promote the program and generate awareness of shell recycling and the public's role in environmental stewardship.
- Continue researching and working with restaurant partners to evaluate and develop innovative solutions to odor and insect problems.
- Work to develop a public drop-off location for shell to be discarded.
- Obtain a secondary dump trailer that can be used as a backup for shell collection and transporting shell around the Nacote Creek Research Station.
- Add a minimum of two additional restaurant partners to increase shell volume.
- Hire an additional hourly employee dedicated to shell collection and equipment maintenance.
- Plant collected shell from 2022 and supplemental surf clam shell on the Mullica River oyster reefs.

# Appendix

## Shell Collection Numbers

Table 3

*Collection Statistics by Year*[3]

| Year | Total Number of Trips | Average Run Time (h: mm) | Average Number of Bushels Per Trip | Total Bushels Collected | Total Tons Collected |
|---|---|---|---|---|---|
| 2020 | 36 | 1:22 | 18.9 | 672.7 | 18.5 |
| 2021 | 51 | 2:02 | 47.3 | 2410.3 | 66.3 |
| 2022 | 51 | 2:38 | 65.9 | 3,361.6 | 92.5 |

[3] Shell collection numbers were significantly lower than anticipated in 2020 as a direct result of COVID-19. Collection was suspended for three months, and many restaurants did not reopen until 2021.


*Figure 2.* 2022 Tons Collected per Month

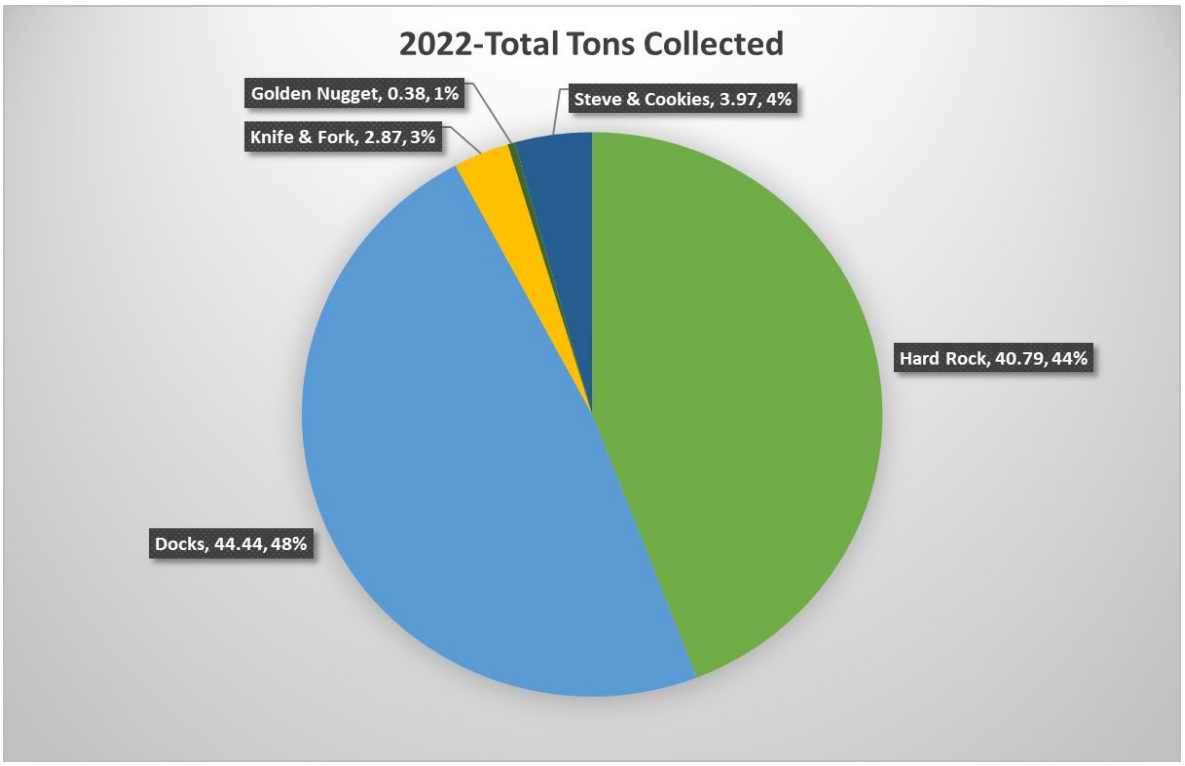


*Figure* 3. Collection Total by Venue

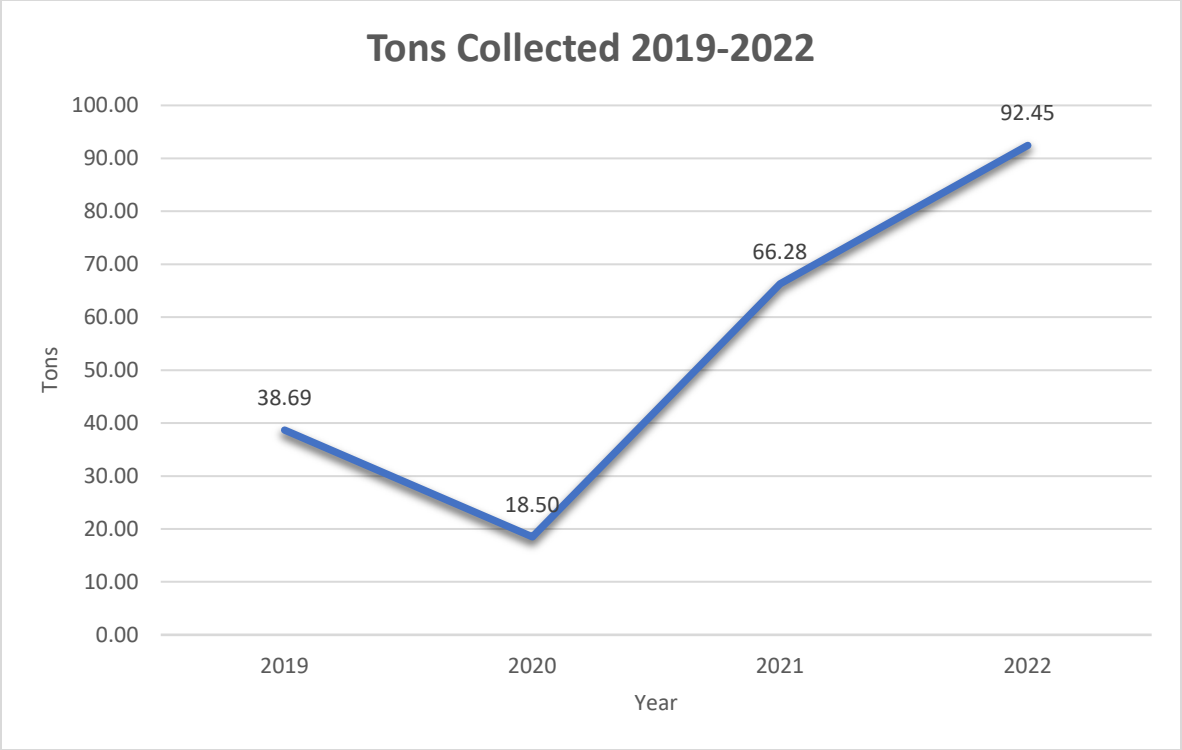


*Figure* 4. Collection History in Tons

## Staff Time

Table 4. Shell Collection Staff Time[4]

| **Staff** | **Hours** |
|---|---|
| Full-Time | 213.3 |
| Part-Time | 72.08 |
| **Total** | **285.4** |

[4] This time accounts for shell collection. It does not account for program development, outreach, shell maintenance, or shell planting.

## Economic Data

Table 5.

*Estimated Waste Disposal Savings*[5]

| Venue | Tons Collected | Estimated Waste Disposal Savings |
|---|---|---|
| Hard Rock | 40.79 | $3,100.35 |
| Docks | 44.44 | $3,337.31 |
| Knife and Fork | 2.87 | $217.92 |
| Steve & Cookies | 3.97 | $313.14 |
| Golden Nugget | 0.38 | $26.20 |
| **Total** | 92.45 | $6,995.33 |

[5] Estimated savings calculated using disposal fees listed by Waste Management at $80 per ton until July, when the price was lowered to $70 per ton. This estimated cost saving may vary depending on the waste disposal company or fee changes.

## Shell Recycling Program

**Date:**_____

**Staff:** _____

**Container type:** _____

**Start Time (Leaving Nacote):** _____

**End Time (Returned to Nacote):** _____

**Percentage Filled**

| # of cans | S&C | K&F | Dock's | HR | GN |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |
| 10 | | | | | |
| 11 | | | | | |
| 12 | | | | | |
| 13 | | | | | |
| 14 | | | | | |
| 15 | | | | | |
| Total # of full cans | | | | | |
| Total # of bushels | | | | | |

**Comments:**

*Figure 5.* Sample Shell Collection Data Sheet

# Program Photographs

## Outreach


*Figure* 6. Shell Recycling Program at Mr. B's Backyard Naturefest in June 2022

*Figure* 7. Engaging with students at Mr. B's Backyard Naturefest in June 2022


*Figure* 8. Shell Recycling Program tent at Atlantic City Community Day Clean-up and Party in the Park in April 2022


*Figure* 9. Table display at the Atlantic City Community Day Clean-up and Party in the Park in April 2022

Promotional Materials


*Figure* 10. Brochure for the Shell Recycling Program designed by Jetty


*Figure* 11. Collapsible banner designed by Jetty to highlight the Shell Recycling Program at events


*Figure* 12. Mockup of new Shell Recycling Program containers coming in early 2023

## Shell Collection


*Figure* 13. Shell container being placed within lift-arm at Dock's Oyster House

*Figure* 14. Shell being dumped into dump trailer at Hard Rock Hotel & Casino

*Figure* 15. Dump trailer full of shell after collection at Hard Rock Hotel & Casino

## Curing and Maintenance

*Figure* 16. Shell being dumped at the long-term storage/ curing site

*Figure* 17. Accumulated shell at the long-term storage and curing site

*Figure* 18. Accumulated shell at the staging area along the waterfront where shell will be loaded onto the barge

Shell Planting

*Figure* 19. Conveyor over a barge loaded with shell at the Nacote Creek Research Station

*Figure* 20. A barge full of shell being towed by R/V Zephyrus to the Mullica River oyster reefs to be planted


*Figure* 21. Shell being planted over the Mullica River oyster reefs by MRA staff using the new water cannon

*Figure* 22. Shell being planted over the Mullica River oyster reefs by MRA staff- side view

*Figure* 23. Shell being planted over the Mullica River oyster reefs by MRA staff

*Figure* 24. Vessel collecting any remaining trash to ensure it is removed from the marine environment

## References

Bushek D, Richardson D, Bobo MY and Coen LD. (2004). Short-term shell pile quarantine reduces the abundance of Perkinsus marinus remaining in tissues attached to oyster shell. Journal of Shellfish Research, 23(2): 369-373.

# Program Supporter Logos