



reTURN the FAVOR

reTURN THE FAVOR
HORSESHOE CRAB RESCUE PROJECT
Pilot Year Summary Report
February 28, 2014

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2013 PROJECT OVERVIEW

For millions of years, Delaware Bay has played host every spring to the world's largest concentration of breeding Atlantic Horseshoe Crabs (*Limulus polyphemus*). But since the early 1990s, this ancient species has faced extreme pressure. Due to an increased demand for horseshoe crabs as bait for conch and eel fishing, as well as for pharmaceutical bleeding, the population has experienced such a precipitous decline that today the species is considered “Near Threatened” by the IUCN¹.

Exacerbating the issue, thousands of horseshoe crabs die each year after becoming impinged on or behind obstructions such as bulkheads and rip rap. Tens of thousands more are overturned by wave action, making them susceptible to predation and desiccation. Despite recent protective efforts, no current measure of the horseshoe crab population shows any sign of recovery, and most recent estimates calculate that the population will not be fully restored for several decades.

Migratory shorebirds depend on the spawning activity of horseshoe crabs, which produces abundant food in the form of horseshoe crab eggs. This food resource fuels the migration and successful Arctic breeding of more than six shorebird species that stopover on the Delaware Bay each year. The reduction of the horseshoe crab population—and subsequent reduction of horseshoe crab eggs—has greatly impaired the ability of migratory shorebirds to gain sufficient weight. Several of these species have seen their population decline so sharply that they are now listed on New Jersey's endangered and threatened species list. In an effort to prevent human disturbance and maximize the probability of success for these shorebirds, the New Jersey Division of Fish and Wildlife (NJ DFW) closes important shorebird foraging beaches each year.

Due to these closings, neither local homeowners nor any other volunteers were allowed to enter many New Jersey beaches to rescue impinged and overturned horseshoe crabs. As a result, this very preventable cause of mortality has been one of many issues undermining recovery efforts. The benefits of a program that would allow volunteers onto these closed beaches to rescue horseshoe crabs were obvious, but doing so within the confines of the state's Endangered Species Conservation Act—which prevents any disturbance of migrating shorebirds—was problematic.

Additionally complicating matters was the fact that since 2006, the State of New Jersey has had a complete moratorium on the harvest of horseshoe crabs. This moratorium makes it illegal to take or possess any horseshoe crab, alive or dead, from a New Jersey beach. Due to the high demand for these crabs, poaching is infrequent but regular. This made it critical that any effort to rescue horseshoe crabs would not provide potential poachers with any opportunity to remove crabs for profit.

With these issues in mind, a group of conservationists from the New Jersey Division of Fish & Wildlife, the Conserve Wildlife Foundation of New Jersey, The Wetlands Institute, The Manomet Center for Conservation Sciences, and several other organizations from across the northeastern United States began to discuss possible solutions. The goal was to create a volunteer-run initiative to rescue horseshoe crabs while staying in line with both New Jersey's Endangered Species Conservation Act and the horseshoe crab moratorium. Additionally, the initiative needed to be officially sanctioned by both state law enforcement and the New Jersey Department of Environmental Protection.

It was known to project organizers that there was an interested base of volunteers. Many disparate individuals had petitioned The Wetlands Institute and other local conservation organizations about going onto beaches to rescue horseshoe crabs, and some also wanted to post signs encouraging other individuals to do the same. However, this raised concerns about “rogue” volunteers taking action without regard to the existing protective legislation and inadvertently making the situation worse. The reTURN the Favor program

¹ World Conservation Monitoring Centre 1996. *Limulus polyphemus*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.1. <www.iucnredlist.org>. Downloaded on 22 October 2013.



developed as a way to both pacify the concerned public and adhere to existing wildlife protections. A project protocol was drawn up and subsequently approved by both NJ conservation officer Lt. Jason Snellbaker and NJ DFW Endangered and Nongame Species Program chief Dave Jenkins.

A “beach coordinator” would be recruited for each beach. Coordinators were given the duty to recruit volunteers to conduct rescue walks on their assigned beach. All beach coordinators were required to provide the names and contact information of all of the participating volunteers, as well as a schedule of times they would be conducting rescue walks. This allowed a phone chain to be maintained so that any reported activity on closed beaches could be immediately verified as a reTURN the Favor rescue walk. The leader of each rescue walk would be required carry a permission letter with a raised seal and signed by NJ DFW director David Chanda identifying them as an officially sanctioned reTURN the Favor group. This would preclude the possibility of poachers taking advantage of the program. To avoid shorebird disturbance, rescue walks were scheduled for the hour before sunrise and the hour before sunset. Volunteers were also instructed to truncate or not even begin walks if shorebirds were present to avoid disturbance. Beach coordinators were also asked to use provided data sheets to collect data from each rescue walk and send it to the project directors. All coordinators signed a memorandum of understanding to these terms.

Volunteer recruitment was three-pronged. First, local conservation groups The Wetlands Institute, New Jersey Audubon, Citizens United, and The Nature Conservancy were approached asking them to take on the coordination duties for targeted closed beaches. Secondly, letters advising homeowners about the project were delivered to all homes bordering closed beach sections on May 16 and 17, 2013. Thirdly, brochures designed by The Wetlands Institute were on display at their facility.

The Wetlands Institute and The Nature Conservancy both conducted reTURN the Favor rescue walks following the conclusion of horseshoe crab spawning surveys they were already scheduled to perform at several beaches, as well as some independent rescue walks at others. Three local homeowners took up coordination of a beach, and a fourth individual—a local high school teacher—provided data from horseshoe crab rescue efforts with his students at Fortescue that, while not conducted according to defined reTURN the Favor protocol, were still correlated enough to be included in data analysis.

The first data was provided by the teacher from a rescue walk on May 17, 2013; the first official reTURN the Favor walks were conducted on May 23. The final rescue walks were conducted on June 25.

There were no incidents of poaching carried out under the auspices of participation in the reTURN the Favor project, or any reports to law enforcement of suspicious activity on closed beaches that needed to be verified as a reTURN the Favor group. Additionally, there were no reports of any reTURN the Favor rescue groups harassing or otherwise disturbing shorebirds.

Further results of the 2013 reTURN the Favor project can be found in the following section.

PROJECT STATISTICS

TOTALS

A total of 18 New Jersey beaches were identified for potential coverage by volunteer groups. Of these, two (Cooks Beach and South Reeds Beach) were eliminated from consideration in 2013 due to logistical conflicts with an experiment being conducted in the area. Of the 16 beaches remaining, rescue walks were conducted at 8 of them (50%); a total of 43 rescue walks were conducted for an average of 5.3 rescue walks at each covered beach. The beaches hosting the most rescue walks were Pierce's Point (10) and Villas (9), with three other beaches hosting six walks apiece (Figure 1).

The Wetlands Institute led the most rescue walks with 22 (51%), while three local homeowners combined accounted for 14 (33%). The Nature Conservancy and the high school teacher previously mentioned accounted for the remaining rescue walks (Figure 2).

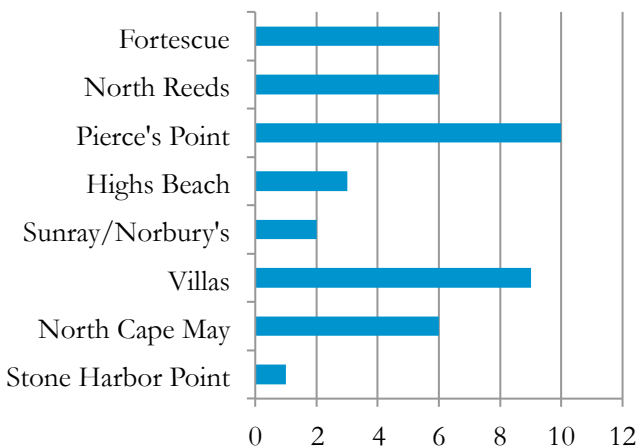


Figure 1. Rescue walks conducted by beach.

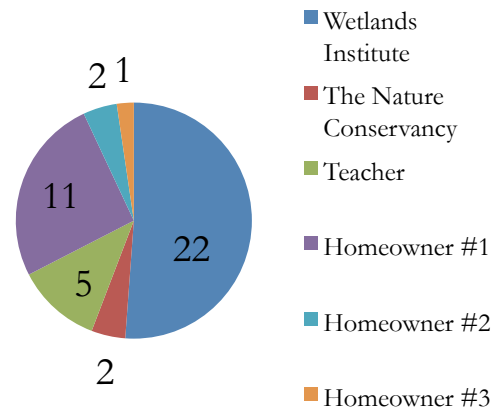


Figure 2. Rescue walks by leader.

In total, over 45 hours of rescue walks were conducted, with the average walk taking 1 hour and 7 minutes². These walks covered nearly 43 km of shoreline. The average walk covered approximately 1 km. The average number of individuals participating in each rescue walk was 5.1 volunteers³. In total, 4,957 horseshoe crabs were rescued (1,320 females/3,637 males); the average number of horseshoe crabs rescued on each rescue trip was 115 (31 females/85 males). See Table 1.

² The duration of three rescue walks was not reported and is not included in the total or the average.

³ The number of volunteers participating in 13 rescue walks was not reported and was not included in this average.

Table 1. Final totals from 2013 season of reTURN the Favor Horseshoe Crab Rescue Project.

reTURN the Favor Project Totals		
	Project Total	Per-Walk Average
Rescue Walk Time	45 hrs. 17 min.	1 hr. 7 min.
Distance Traveled	43 km	1 km
Volunteers	153	5.1
Horseshoe Crabs Rescued	4,957	115
Male Horseshoe Crabs Rescued	3,637	85
Female Horseshoe Crabs Rescued	1,320	31

Twelve rescue walks were conducted during morning hours, finishing by 10:00 a.m. Three occurred during the afternoon (against project directives); all three of these were conducted by local homeowners. 25 took place in the evening (starting at 5:30 p.m. or later), and 22 of these began after 7:00 p.m. Four rescue walks began after midnight, the latest ending at 1:15 a.m. Lastly, the ending time for three additional walks was not reported; of these, two occurred in the morning and one at night. See Figure 3.

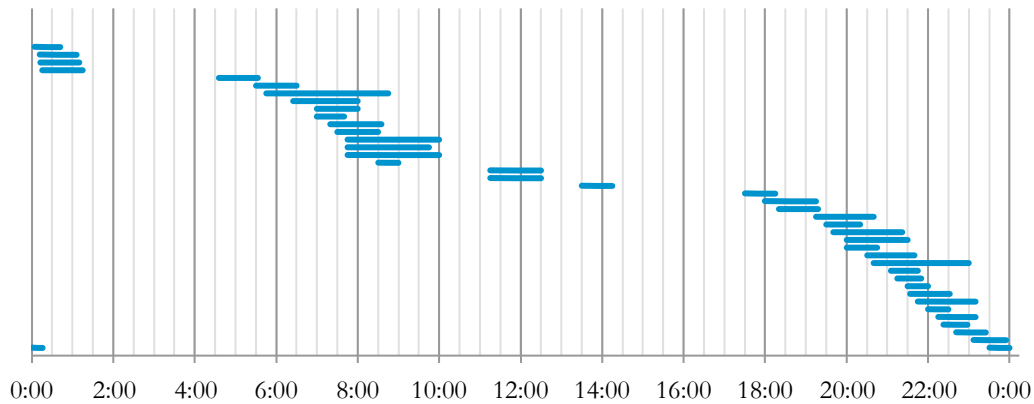


Figure 3. Time of reTURN the Favor rescue walks.⁴

Male and female horseshoe crabs were examined separately to determine if either gender was overturned or impinged at a higher rate at any location or under any conditions (Table 2). It was known that the population dynamic is currently skewed with males notably outnumbering females, and thus the result that many more male crabs were rescued than females was expected. However, for 11 of the 12 data subsets examined in which impinged crabs were rescued, the ratio of male to female impinged crabs is higher than—and in 10 of the 11 subsets, more than double—the ratio of male to female overturned crabs. As male horseshoe crabs are on average smaller than females, it is possible this is a result of their smaller size resulting in the males being washed further ashore; however, this is speculation.

A few other outliers deserve attention. At Pierce's Point, the ratio of overturned males to females was 3.39 to 1, nearly 0.7 higher than the next highest overturned male to female ratio. The cause of this is unknown. Pierce's Point was also the only examined subset where the ratio of impinged male to female crabs (1.3 to 1, the lowest of any examined subset) was lower than the ratio of overturned males to females. However, the low number of impinged horseshoe crabs rescued at Pierce's Point (23) and abnormally high ratio of overturned males render this result less significant than it first appears.

Male and female horseshoe crabs were not considered separately during the remaining data analysis.

⁴ The ending times of three rescue walks were not reported; these walks are not included in this graphic.

Table 2. Gender ratios of rescued horseshoe crabs.

Ratios (M to F)			
	Overturned	Impinged	Combined
Total	1.82	5.32	2.76
Beach			
Fortescue	2.60	5.44	5.36
North Reeds	1.54	4.20	1.56
Pierce's Point	3.39	1.30	3.19
Highs Beach	1.08	<i>n/a</i>	1.08
Sunray/Norbury's Landing	2.70	<i>n/a</i>	2.70
Villas	1.93	7.00	1.96
North Cape May	1.26	<i>n/a</i> ⁵	1.28
Tidal Stage			
Falling	1.93	4.70	2.87
Low	1.16	<i>n/a</i>	1.16
Rising	1.73	6.35	4.00
High	2.20	5.50	2.26
Falling & Low	1.72	4.70	2.53
Rising & High	2.01	6.33	3.22
Surf Condition⁶			
Calm	2.23	2.86	2.25
Rough	1.35	3.00	1.36

BY BEACH

The beach where the greatest number of crabs was rescued was Fortescue. A total of 2,212 overturned and impinged horseshoe crabs were rescued there, nearly twice as many as the second highest total at a single beach (1,172 rescued at North Reeds) (Figure 4). The greatest number of crabs rescued per rescue walk was also at Fortescue (369); North Reeds is again second with 195 (Figure 5). Villas was third in both categories (831 crabs total, 92 per walk). No overturned or impinged horseshoe crabs were found during a single rescue walk conducted at Stone Harbor Point, and it is not included in these graphs.

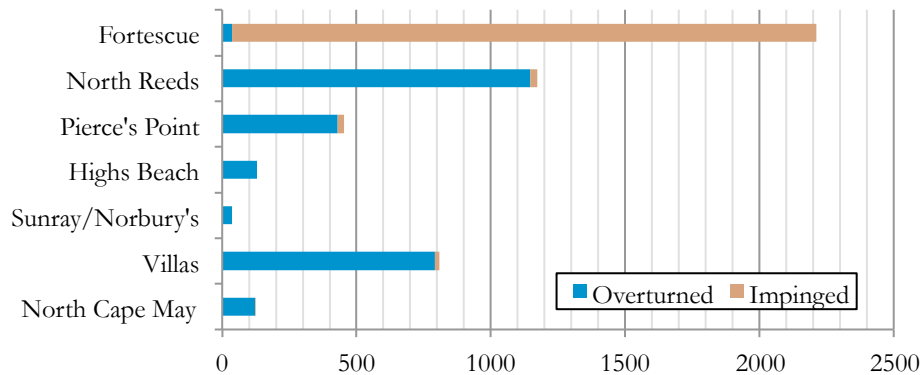


Figure 4. Total horseshoe crabs rescued by beach.

⁵ Two impinged male horseshoe crabs and no impinged female horseshoe crabs were rescued at North Cape May.

⁶ Surf condition was not reported for eight rescue walks; these walks are not included.

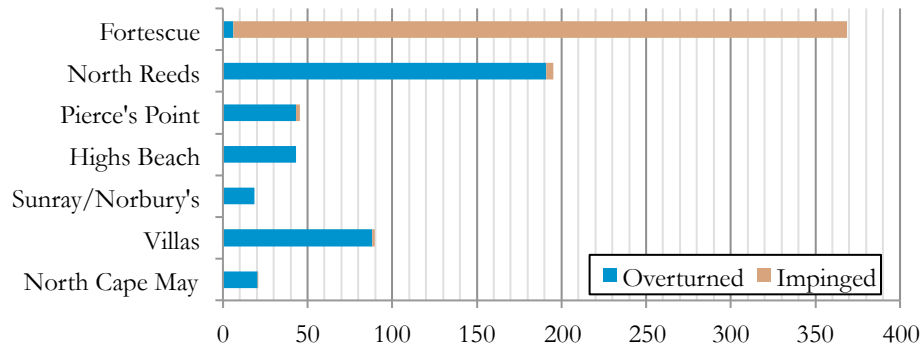


Figure 5. Horseshoe crabs rescued by beach per rescue walk.

Fortescue's large numbers are almost entirely due to the fact that far more impinged horseshoe crabs were rescued there than at any other beach (2,176 at Fortescue, 62 at all other beaches combined). The high school teacher's five rescue walks were conducted at a small section of beach where the sand is completely covered at high tide and abuts a long pile of concrete rubble; it is in this rubble that hundreds of horseshoe crabs were found impinged. One of the teacher's walks took place after the peak spawning period and recorded much lower numbers than their other four walks. If it is assumed that crabs died if stranded for more than 48 hours (four tide cycles)⁷, the average of their remaining walks (519) can be taken as an estimate of the total number of horseshoe crabs getting stranded every four high tides during the period of May 17 to June 16. Therefore, approximately 130 horseshoe crabs were stranded every tide cycle, and with two tide cycles a day, it can then be estimated that over 7,500 horseshoe crabs were overturned or impinged at this section of Fortescue Beach alone during this time.

Extrapolating this method to the eight beaches covered by reTURN the Favor walks in 2013, a preliminary estimate can be made of 13,650 horseshoe crabs stranded on these beaches during the month of May 17 to June 16 (Table 3). While in theory it would be possible to use this to generate a rough estimate of the total horseshoe crabs stranded across all eighteen New Jersey beaches selected for possible coverage, this would be ill-advisable due to the differing sizes of and differing spawning conditions at each beach.

Table 3. Estimated number of horseshoe crabs stranded, May 17-June 16, 2013.

Horseshoe Crabs Rescued		
Beach	Crabs Rescued per Rescue Walk (May 17-June 16)	Estimated Total Crabs Stranded (May 17-June 16)
Fortescue	519	7,785
North Reeds	195	2,925
Pierce's Point	45	675
Highs Beach	43	645
Sunray/Norbury's Landing	19	285
Villas	81	1,215
North Cape May	8	120
Stone Harbor Point	0	0
Total	119	13,650

⁷ Current regulations require horseshoe crabs removed for pharmaceutical bleeding be returned to the water in less than 48 hours to prevent mortality. The wind and high temperatures typically present on New Jersey beaches in spring, as well as the risk of predation by gulls, make it likely that many stranded horseshoe crabs live for a shorter period of time.

BY TIDAL STAGE

Rescue groups were advised to conduct walks at falling or low tide based on the assumption that more horseshoe crabs would be left stranded at these times. However, rescue walks were conducted in nearly equal numbers on rising and high tides, likely due to the time restrictions (Table 4).

Table 4. reTURN the Favor rescue walks conducted during each tidal stage.

Rescue Walks by Tidal Stage	
Tidal Stage	Rescue Walks
Rising	8
High	10
Rising/High Total	18
Falling	19
Low	2
Falling/Low Total	21
Unreported	4

The high numbers at Fortescue are a result of the unique conditions there, where large piles of rip rap resulted in an impingement hazard unlike that found on any other beach covered by reTURN the Favor rescue walks in 2013. As very few impinged crabs (compared to overturned crabs) were rescued at other beaches, these rescued impinged crabs have been removed from further calculations in this section to remove this potential source of bias. With this done, the results are somewhat surprising (Figure 6). As expected, the lowest rescue rate was at high tide, but this rate is unexpectedly high at 67 overturned horseshoe crabs/rescue walk. This may be due to the fact that more water is moving at high tide than any other tidal stage, resulting in a high number of horseshoe crabs being overturned. Both of the rates for rising and falling tides are only slightly higher, and when rounded to the nearest whole number they are identical at 74. The rate for low tide is over twice as high as all other values at 176; however, this is at least partially artificial. Only two rescue walks were conducted at low tide; both occurred at North Reeds Beach, the beach with the highest rate of overturned crabs (see Figure 5).

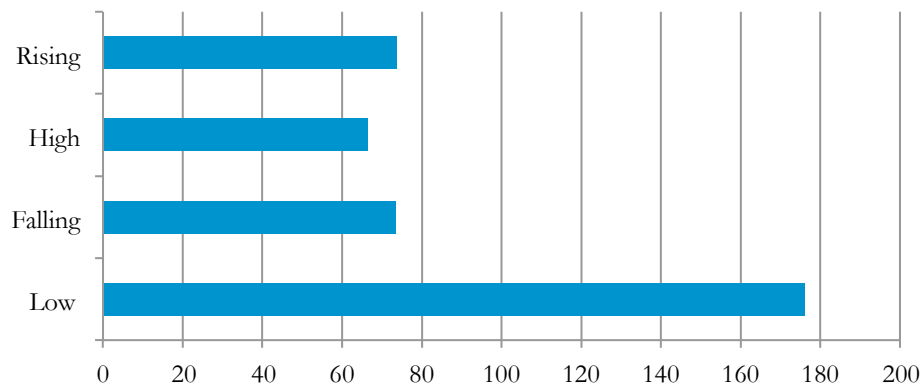


Figure 6. Average number of overturned horseshoe crabs rescued per rescue walk by tidal stage.

When the totals from rising and high tides (the tidal stages when fewer crabs were expected to be stranded) are combined, and those from falling and low tides (the assumed times of higher stranding) are combined, the results fall more closely in line with expectations (Figure 7). An average of approximately 84

overturned horseshoe crabs were rescued on each rescue walk that took place either on a falling tide or at low tide, while an average of about 68 were rescued on each walk conducted on a rising tide or at high tide. However, this difference is not as large as might be expected, and these values indicate that continuing to conduct rescue walks at all tidal stages would be productive.

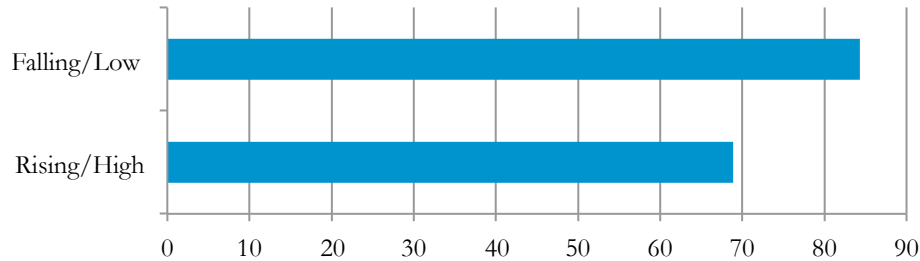


Figure 7. Overturned number of horseshoe crabs rescued per rescue walk by combined tidal stages.

BY SURF CONDITION

Of the 43 rescue walks conducted by reTURN the Favor rescue groups, the condition of the surf was reported for 35 of them. The surf was reported rough for 14 rescue walks, while the surf was calm for the remaining 21. It was assumed that rough seas would result in a greater number of horseshoe crabs being overturned, and therefore rescue walks taking place during rough surf would have a higher average number of overturned horseshoe crabs rescued. Impinged crabs were not included in the calculations in this section.

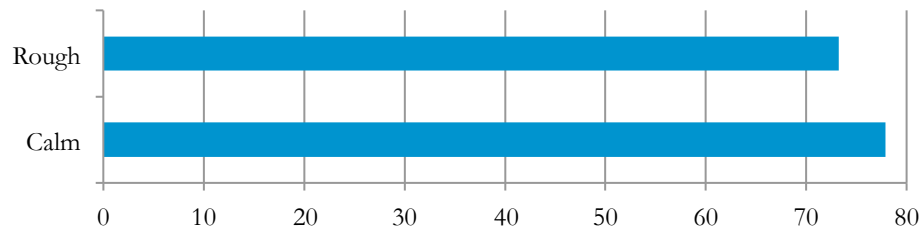


Figure 8. Overturned horseshoe crabs rescued by surf condition.

However, this did not turn out to be the case, as the average number of crabs rescued during calm conditions (78) was actually higher than that during rough waters (73) (Figure 8). This may be as a result of the fact that water conditions during a rescue walk do not necessarily reflect the conditions that stranded the crabs rescued during that walk. In other words, a rescue walk that takes place during calm conditions may be rescuing horseshoe crabs that were stranded during rough conditions several hours prior, or vice versa. It also may be due to the fact that fewer horseshoe crabs are attempting to spawn during rougher conditions.

PER UNIT EFFORT

One of the goals of the pilot year of the reTURN the Favor project was to establish the maximum number of horseshoe crabs that could be theoretically rescued. To this end, estimations of unit effort (horseshoe crabs rescued per volunteer, horseshoe crabs rescued per hour, etc.) were calculated for each walk with known values.

There were 28 rescue walks for which both the duration of the rescue walk and number of volunteers participating were reported (see Appendix A); only the data from these 28 are used in the following section. The time needed to rescue an overturned crab was assumed to not be significantly different than the time needed to rescue an impinged crab, so no distinction was made between the two types of rescues in the following calculations.

In theory, the more horseshoe crabs in need of rescue, the longer each rescue walk should take. The data indeed showed a relatively strong positive correlation between the two (Figure 9). All walks lasting less than an hour rescued fewer than 200 horseshoe crabs, and all walks rescuing more than 400 horseshoe crabs took two hours or longer.

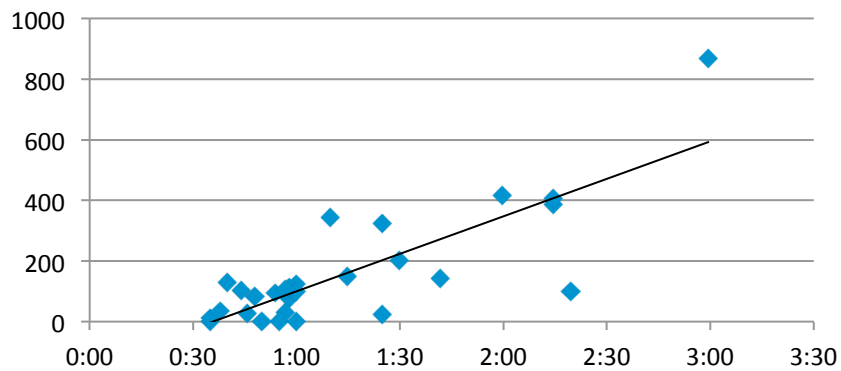


Figure 9. Duration of Rescue Walk vs. Number of Horseshoe Crabs Rescued

Similarly, when more volunteers are participating, in theory each rescue walk should last a shorter period of time. However, this was not the case (Figure 10). There was only a weak correlation between these two variables, and it was positive, not negative. All walks lasting longer than an hour and a half were conducted with six or more volunteers.

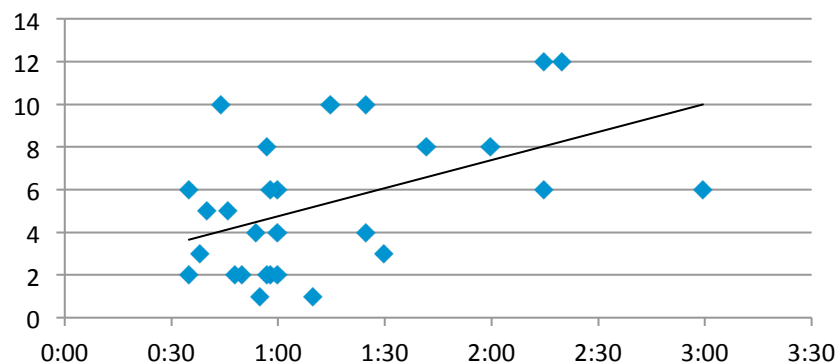


Figure 10. Duration of Rescue Walk vs. Number of Participating Volunteers

To further explore this, the average number of horseshoe crabs rescued per hour was calculated for each rescue walk and compared to the number of volunteers on each walk. The purpose was to determine how many volunteers would be needed to rescue the most horseshoe crabs in the shortest amount of time. In theory, adding more volunteers would increase the rate of rescue.

However, the results show no significant correlation between the rate of crab rescuing and the number of volunteers participating in the walk (Figure 11), and the highest rate of rescue (295 crabs/hr) was recorded by a single volunteer. Therefore, it seems likely that it is the number of stranded horseshoe crabs present that limits the rate of crab rescue, not the number of volunteers participating. Note that while this means that a single volunteer can be just as effective at rescuing horseshoe crabs as a group, this does not necessarily mean that potential volunteer groups should be split up, as the social and educational aspects of rescue walks make small groups more attractive to volunteers than working alone (see Figure 17).

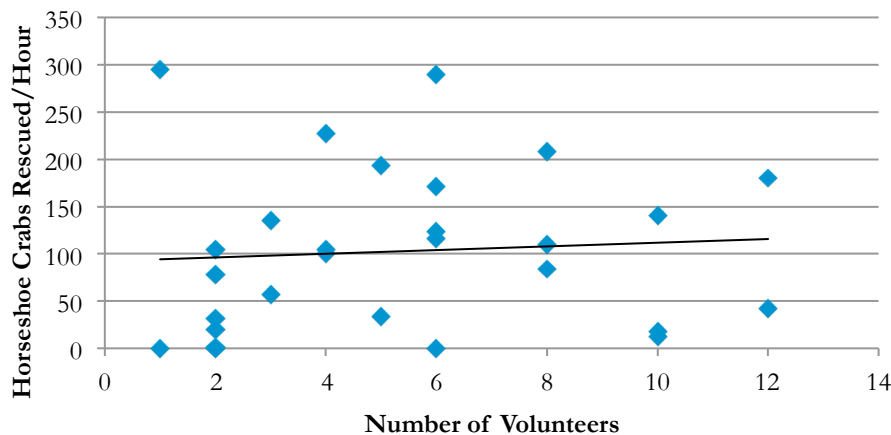


Figure 11. Number of Volunteers vs. Average Number of Horseshoe Crabs Rescued per Hour

It appears that the major factor limiting the number of horseshoe crabs that can be rescued is the number in need of rescue. With the potential exception of high-impingement areas such as Fortescue, horseshoe crabs in need of rescue did not occur in high enough densities that single volunteers were unable to rescue all of those on a designated beach within a reasonable amount of time. As such, it seems advisable that future recruiting and scheduling efforts do not have to be based upon assigning a certain number of volunteers to each walk, as any number will be sufficient to rescue all horseshoe crabs present. While it may be prudent to encourage two or more volunteers to participate together due to safety concerns, scheduling multiple volunteers per walk would not be necessary to maximize rescue numbers.

While having larger (5+) numbers of volunteers participating in rescue walks does not appear to have any affect on the rate at which horseshoe crabs can be rescued (see Figure 11), it is important to note that larger groups could be beneficial to the project in other ways – most notably, engagement of volunteers. Allowing large groups to participate would get the maximum number of people involved in the project, building the volunteer base for subsequent years. Similarly, having more people participate in rescue walks led by experienced leaders (such as The Wetlands Institute staff members) increases the educational outreach of each rescue walk. However, it seems important to find an appropriate limit, as once volunteer groups grow too large, they become unmanageable and the educational component is largely lost. Finding out what this limit should be is a goal that could be examined closer in subsequent seasons. Prospective volunteer groups larger than this as-yet undetermined limit would be split up between different beaches and/or nights.

Ultimately though, it seems unwise to attempt to have a large number of volunteers on every rescue walk, as increasing the number of volunteers does not necessarily mean an increase in volunteer engagement. Attempting to have a certain higher number of volunteers on each rescue walk would likely require



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combining unrelated small groups and/or individuals, a task likely to be a scheduling issue for both project staff and beach coordinators. Moreover, it would likely decrease coverage of the Bay's beaches with little to no benefit to the rate of horseshoe crab rescue or volunteer engagement, especially if the group's leader is less experienced. Avoiding a heavy-handed approach and allowing the sizes of groups on each rescue walk to largely determine themselves seems to be the best strategy, at least for the 2014 season.

POST-PROJECT VOLUNTEER SURVEY RESULTS

In an effort to gauge volunteer opinion of the project and solicit suggestions for improvement, a volunteer “exit survey” was created beginning in mid-June of 2013. The original survey was revised to a 20-question, online-based questionnaire using the website surveymonkey.com. On August 9, 2013, emails were sent to the 22 volunteers from the project for whom e-mail addresses were known, asking them to complete the survey; twelve did so. A reminder e-mail was sent on August 24, which garnered one additional response. Due to the lack of further responses, the survey was closed on September 10, 2013 and the results tabulated.

NAMES, GENDER, AND AGE

Twelve individuals completed the survey online; a thirteenth responded via an e-mail to the crabwarden@gmail.com address. The online survey was completed on this volunteer’s behalf. Overall, 59% of the volunteers to whom the survey was sent completed it in some form.

Of the respondents, approximately 25% were male and the remaining 75% female (Figure 12). This likely does not provide an accurate estimate of the gender split among all volunteers, as the split was closer to 2 to 1 among all volunteers contacted for the survey (32% male/68% female) and among all known volunteers (33% male/67% female).

The volunteer respondents varied widely in age, with equal numbers in their 20s, 30s, and 40s. The greatest number of individuals was in the 50-59 age range (Figure 13).

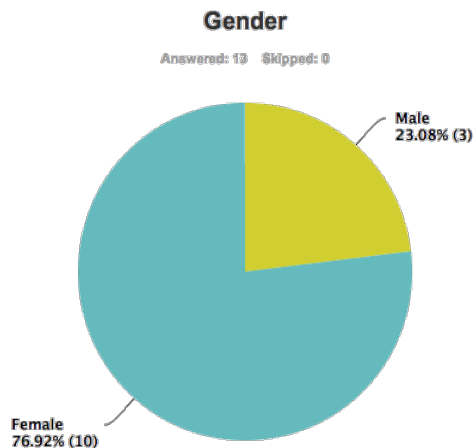


Figure 12. Gender of post-project survey respondents.

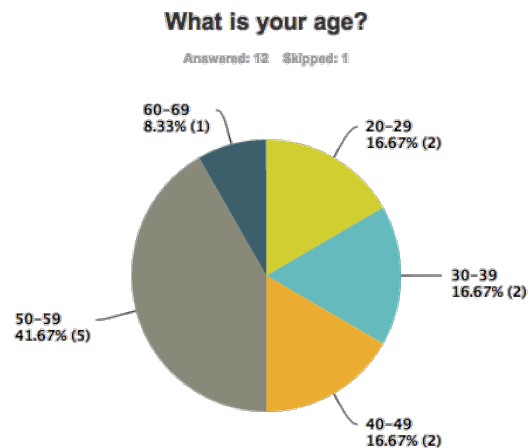


Figure 13. Age of post-project survey respondents.

TRIPS AND PARTICIPATION

A majority of the volunteers contacted for the survey (69%) reported that they participated in five or fewer rescue walks (Figure 14). Of the four that reported participating in more, three were Wetlands Institute staff acting as group leaders; the fourth was a local homeowner who served as a beach coordinator.

Most respondents (83%) reported being part of a group (between 3 and 11 people total) rather than working alone or with one other person (Figure 15). This information could, however, be skewed due to the fact that most volunteers for whom contact information was known participated in rescue walks conducted by The Wetlands Institute. This is evidenced by the fact that both volunteers who reported working in smaller numbers were local homeowners, not Wetlands Institute staff. It is unknown whether this accurately reflects the true number of volunteers participating in each rescue walk in 2013.

In how many "Re-turn the Favor" rescue trips did you participate this year?

Answered: 13 Skipped: 0

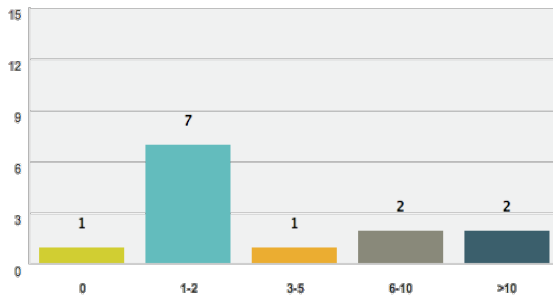


Figure 14. Rescue trips conducted by each volunteer.

What is the typical number of other individuals you volunteered with?

Answered: 12 Skipped: 1

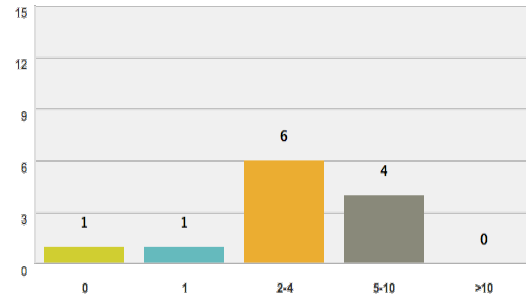
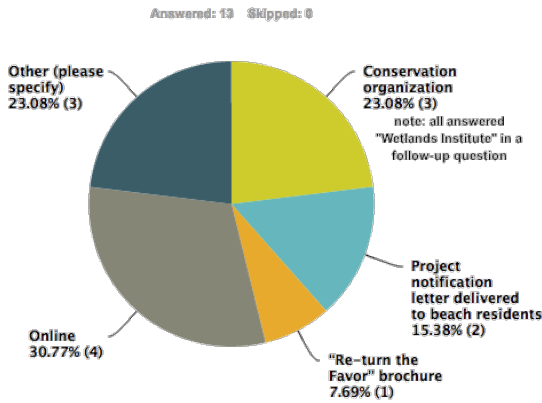


Figure 15. Average group size for rescue trips.

When asked how they first became aware of the reTURN the Favor project, two-thirds of the volunteers reported either finding out about the project online or through The Wetlands Institute (Figure 16). This figure may be artificially inflated; as previously mentioned, most of the volunteers surveyed participated in walks led by The Wetlands Institute. The remaining volunteers learned about the project from the letters delivered to local homeowners informing them of the project, from reTURN the Favor brochures, and from personal communication with one of the project organizers.

As for why they chose to participate, nine respondents indicated a desire to help the environment, while a tenth answered "other" but specified their motivation as "desire to get the [horseshoe crabs] back in the water." With ten of twelve respondents (83%) specifying environmental motivations, this is double the number of respondents who provided any other answer (Figure 17). A significant proportion (42%) of respondents also indicated that participating with friends or family members was a factor, which indicates that seeking to preserve small groups on rescue walks might help to attract and maintain volunteer interest. Though sending out volunteers individually would cover more beaches and times, it would seemingly be less desirable for volunteers, and retaining small groups may be the better strategy overall.

How did you first find out about the "Re-turn the Favor" project?



What made you want to participate in the "Re-turn the Favor" project? (Please select all that apply)

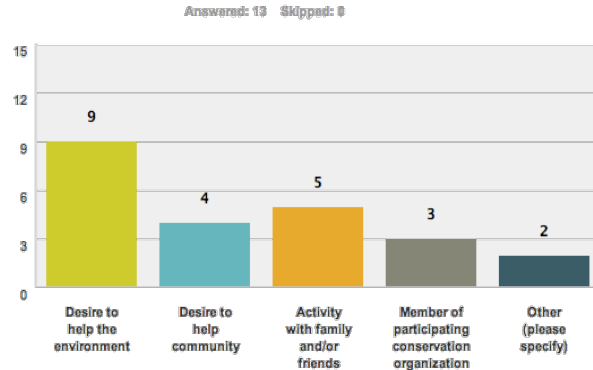


Figure 16. How volunteers discovered reTURN the Favor. Figure 17. Why volunteers took part in reTURN the Favor.

INTEREST

Half of the survey respondents strongly agreed with the statement that the project guidelines were made clear to them (Figure 18). In total, 67% of the respondents thought the guidelines were made clear, and only one respondent (8%) expressed that the requirements were not made clear.

The guidelines for participation in the "Re-turn the Favor" project were made clear to me.

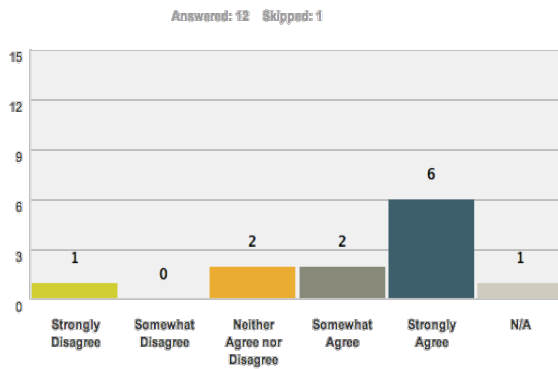


Figure 18. Did volunteers understand the requirements?

After participating in the "Re-turn the Favor" project, I became more interested in horseshoe crab and shorebird conservation.

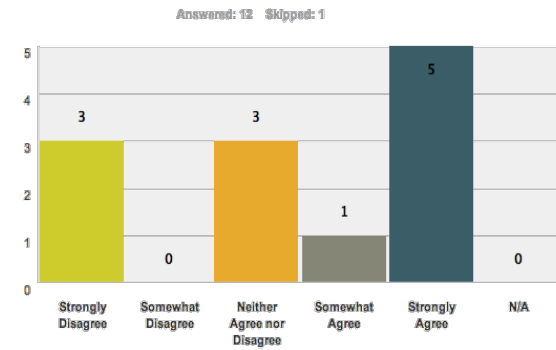


Figure 19. Did the project pique volunteer interest?

The respondents were largely split when asked to compare and contrast their attitudes about horseshoe crab and shorebird conservation before and after participation in the reTURN the Favor project (Figure 19). The question asked volunteers to agree or disagree with the statement that they became more interested after participation in the project. In total, half of the respondents expressed that they became more interested, while one quarter neither agreed nor disagreed. A final three respondents (25%) disagreed with the statement; note that these responses do not necessarily indicate a loss of interest as a result of the project but only the absence of *increased* interest.

I would be willing to attend a pre-season training/input session to help train new volunteers and to help the project develop a better schedule and protocols.

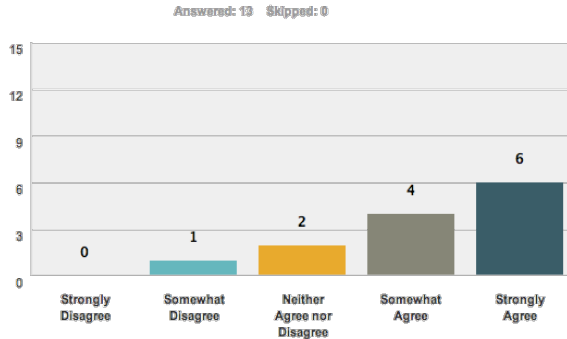


Figure 20. Volunteer willingness to attend a training session.

I am interested in participating in the “Re-turn the Favor” project again next year.

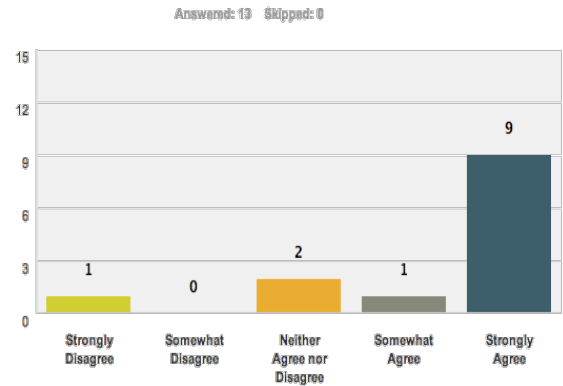


Figure 21. Volunteer desire to participate next year.

A majority (77%) of survey respondents expressed willingness to attend a pre-season training session, while only a single respondent (8%) expressed that they would not be willing to do so (Figure 20). Additionally, the lone individual reporting they would be unwilling to attend specified in the next question that they did not plan to participate in 2014.

Most respondents (69%) expressed a strong desire to participate in next year’s reTURN the Favor project (Figure 21). Only one volunteer indicated they would not be returning, but stated that this was because they were from out of state, not due to a bad experience.

FREQUENCY AND TIME

Several questions dealt with volunteer opinion about the time restrictions in place to protect shorebirds and aimed to learn what alterations to these restrictions would be desirable for volunteers.

When asked whether they thought the time restrictions were too strict, 42% of respondents felt they were, while an equal percentage of respondents had no opinion (Figure 22). Only two respondents (17%) expressed that they did not feel the time requirements were overly strict.

When asked whether they actually followed the time restrictions, answers were slightly difficult to interpret (Figure 23). Five respondents (42%) indicated that none of the rescue walks they participated in took place outside of the recommended time periods, while three more (25%) indicated that they often participated in walks outside the recommended times. However, the remaining four respondents (33%) chose “N/A,” an option that was intended to be used by individuals who had expressed interest in the project but for various reasons had never participated in a rescue walk. Three of these respondents are known to have participated in rescue walks, so it seems most plausible that their responses can be interpreted as meaning the same thing as “never.” This would raise the number of individuals at least claiming to have followed the time restrictions to eight, or 67% of the respondents.

The results to this question should be treated with caution, as it was well-known to the project leaders that rescue walks were being frequently conducted outside of the recommended times. (For example, several walks led by The Wetlands Institute took place after the completion of horseshoe crab spawning surveys that usually did not finish until several hours after sunset.) Additionally, one homeowner answered “never” despite the fact that their submitted data sheets indicate both rescue walks they led took place outside the recommended times. It is possible that perhaps a fear of some retribution (or perhaps simply misunderstanding the question and/or the time restrictions) caused them and some other respondents to not answer this question truthfully.

The time restrictions for rescue trips were too strict.

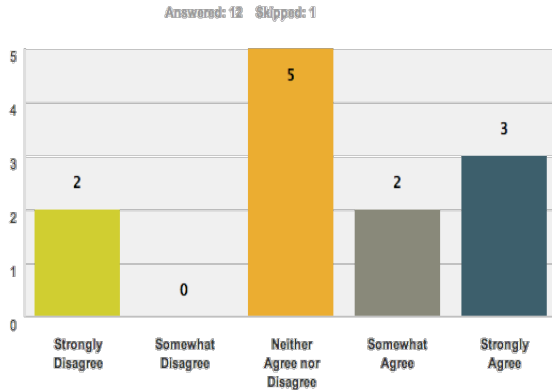


Figure 22. Were the project's time restrictions too strict?

How often did you participate in rescue trips that were conducted at times other than the recommended hour before sunrise and hour before sunset?

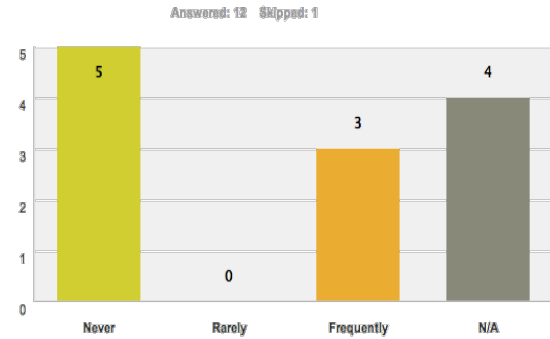


Figure 23. Reported adherence to project time restrictions.

In general, most volunteers expressed much more willingness to participate in rescue walks after sunset than before sunrise. Only three survey respondents (27%) indicated they would be willing to go out before sunrise, while over half of respondents (55%) said they would not be willing to do so (Figure 24). However, nine of twelve respondents (75%) indicated they would be willing to go out after sunset (Figure 25). No respondent indicated a stronger willingness to take part in rescue trips before sunrise than after sunset. As a majority of this year's rescue walks took place in the afternoon or evening (see Figure 3), it would seem that continuing this next year would be desirable.

If I participate again, I would be willing to take part in rescue trips at or before sunrise.

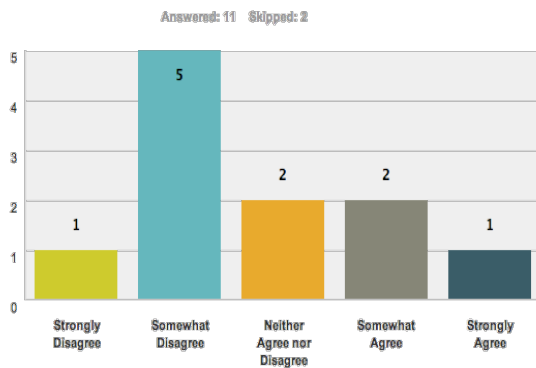


Figure 24. Volunteer willingness to rescue crabs pre-sunrise.

If I participate again, I would be willing to take part in rescue trips at or after sunset.

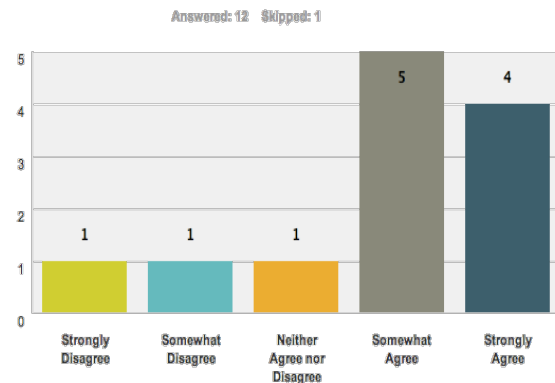


Figure 25. Volunteer willingness to rescue crabs post-sunset.

Volunteers were asked what their ideal participation in rescue walks would be if there were no time restrictions in place. There was no general consensus on how many rescue walks each volunteer would be willing to participate in per week, but most (71%) provided an answer of 3 or fewer (Figure 26). The most common reply was one rescue walk (43% of respondents).

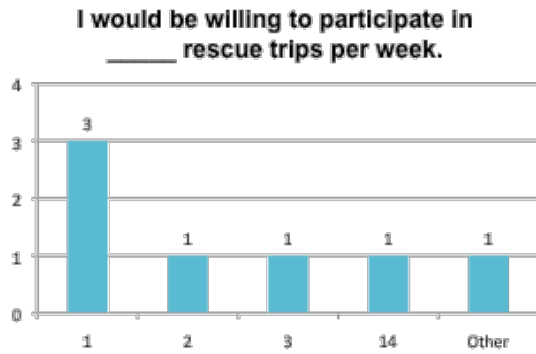


Figure 26. Desired number of rescue walks per week.

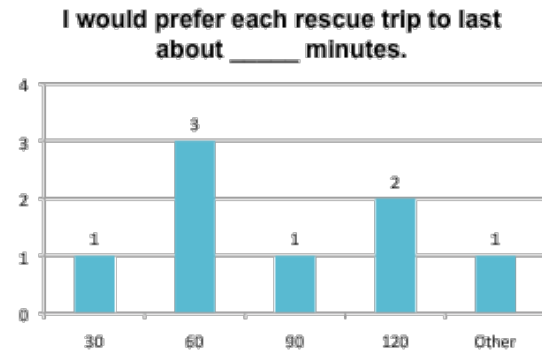


Figure 27. Desired duration of rescue walks.

Similarly, there was no general consensus on how long volunteers would prefer each rescue walk to last (Figure 27). The most common answer was one hour (38% of respondents); however, an equal number of respondents (four) expressed a willingness to participate in walks lasting longer than an hour as those who desired each walk to last an hour or less. Two volunteers provided a desired walk time of two hours with a third answering “as long as it takes,” indicating 38% of respondents were willing to take part in rescue walks lasting two hours or more.

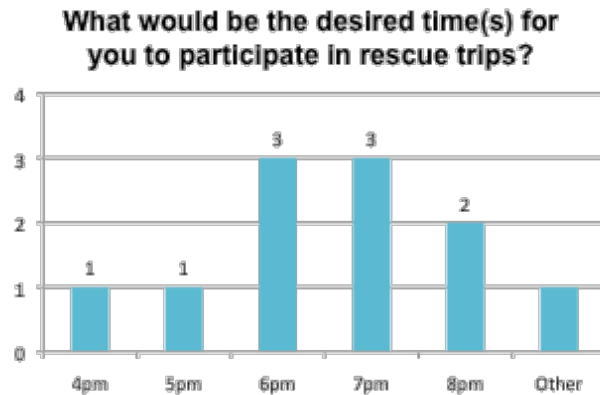


Figure 28. Desired time to participate in rescue walks.

When asked what their ideal time of day for conducting rescue walks would be, most respondents indicated that pre-sunset (between 6-8 pm) would be ideal (Figure 28). Early afternoon hours were only provided by a single respondent, whose answer of “4-8 pm” covered the entire range of responses. In addition to the charted responses, a final volunteer answered “after work,” which further indicates the preference for late afternoon or early evening hours.

SHOREBIRDS

In an effort to determine how well the time restrictions prevented volunteers from disturbing shorebirds, volunteers were asked how often they encountered flocks (Figure 29). No volunteers indicated that they encountered flocks of shorebirds “often” or “very often,” while over half (55%) reported never encountering shorebirds. Of the five respondents who indicated infrequent but regular encounters with shorebird flocks, three were known to have conducted their rescue walks at non-recommended times. Similarly, only one of the respondents who reported never seeing shorebirds also indicated that they participated in rescue walks outside of the recommended times (17%). Had compliance with time restrictions been better, shorebird encounters would almost assuredly have been even lower.

How frequently did you encounter flocks of shorebirds while participating in rescue trips?

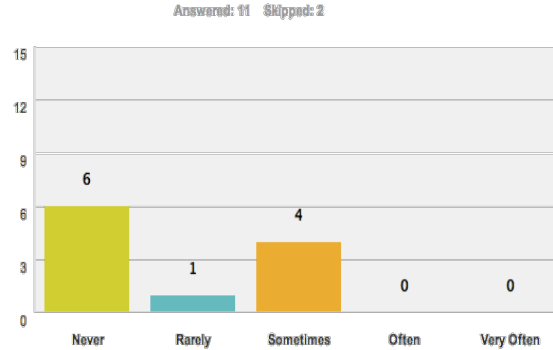


Figure 29. Frequency of shorebird encounters during rescue walks.

COMMENTS

The final question asked whether or not volunteers had any additional suggestions or comments for how the reTURN the Favor project could be improved next year; seven of the volunteers surveyed (54%) opted to do so (see Appendix B). Of these, three did not provide actionable suggestions; their responses were merely general comments.

The first of the four commenters to provide suggestions for improvement proposed that participating rescue groups be given “printed mini handouts for people who ask questions about horseshoe crabs, what we are doing, why, etc...”. This is something that had been considered by project organizers prior to and during the 2013 season but never came to fruition. reTURN the Favor brochures could fill this void, provided they are produced in greater numbers for the 2014 season. Another idea would be producing project-specific business cards; this was discussed prior to the 2013 season and a small number was printed by The Wetlands Institute, but the cards were never mass-produced. As these cards would be smaller and more portable than brochures, this makes them perhaps a better solution.

The second commenter stated that earlier times might be desirable, as “when approaching darkness, I think some may be a little uncomfortable being in a rather isolated area, especially if you were the only volunteer.” While this is true, the time restrictions are based on the behavior and presence of shorebirds. As they cannot be altered to allow pre-sunset rescue activity, alternative solutions should be considered. Attempting to maintain small groups rather than sending out single volunteers should help allay these fears, as well as maintaining the social aspect valued by several volunteers (see Figure 17).



A third commenter expressed their dismay with the creation of the reTURN the Favor project as a separate entity, rather than an extension of Just Flip ‘Em!®⁸, a similar program already in place in Delaware and other states. “Having two separate, but equal projects on opposite sides of the same habitat just puts one more ‘us against them’ facet to an already ridiculously over-inflated controversial subject with way too many self-interested entities vying for attention... If it was because of some kind of politically or money-related reason - BOO! We need more collaboration around the Bay and less controversy!” The project organizers’ original intent was to do just this, but concerns regarding the additional protections in place in New Jersey (i.e., beach closures for shorebirds and the horseshoe crab harvest moratorium) eventually led to the creation of reTURN the Favor as a separate initiative. It is possible that if these issues can be resolved, the two projects may be more unified in the future.

The same volunteer also expressed that she was “very frustrated not to be able to get on the beaches to flip crabs during the day even when no birds were around.” While this is an understandable sentiment, it may not be worth attempting to alter the project parameters to allow this sort of access. Aside from the possibility of opening up loopholes that poachers and other individuals could utilize to gain beach access, the argument can be made that the temporary absence of shorebirds does not indicate habitat undesirability for shorebirds. Taking a temporary lapse in shorebird presence as justification for conducting a rescue walk could deter shorebirds from using a stretch of beach they might well wish to – not exactly the sort of disturbance that the time restrictions were created to prevent, but disturbance nonetheless.

A final volunteer provided three distinct suggestions. The first was that the rescue walks should begin earlier in the season, a sentiment that all involved with the project share and one that, in all likelihood, will be implemented in 2014. The second was that more beaches should be covered, another sentiment with which all involved with the project would likely agree. Project organizers need to evaluate and improve volunteer recruitment, training, and management to increase participation and ensure that more beaches are covered.

Lastly, the volunteer stated that we should attempt to “get volunteers for local beaches than trying to find people to drive over an hour and the same on return.” This, however, is a reflection of a single miscommunication with this particular volunteer about the location of their residence, rather than a universal issue. Several actions have already been taken to address this issue, including the scheduling of a pre-season training workshop where volunteer information will be gathered, as well as the implementation of a system where volunteers can sign up for rescue walks at specific beaches. Care will be taken to pair volunteers with the nearest beaches possible in future years while still ensuring reasonable coverage of the Bay.

⁸ Just Flip ‘Em!® is a registered trademark of the Ecological Research & Development Group (ERDG).

RECOMMENDATIONS

Following the conclusion of the 2013 reTURN the Favor project, the project organizers prepared the following list of suggestions for how to improve the 2014 iteration of the program.

PROJECT LOGISTICS

These changes would help increase the number of horseshoe crabs rescued, as well as aid recordkeeping and communication between volunteers and project leaders.

1. Start the project sooner (~May 1) and end the project later (~July 1) to better coincide with the start and end of horseshoe crab spawning.
2. Extend the hours that volunteers can enter closed beaches. Switching to the hours expressed as ideal by this year's volunteers (see Figure 16) is impossible due to the need to avoid shorebirds, but at least loosening the restrictions would make official participation less intimidating to potential volunteers. This would also allow conservation groups to better combine rescue walks with existing surveys (e.g., spawning surveys) without bending the rules.
3. Develop better methods for acquiring volunteer information such as a pre-service questionnaire requesting contact information and preferred beaches. A pre-walk sign-up sheet would work better for one-time volunteers.
4. Better communicate important dates, such as beach closures and re-openings, to volunteers.
5. Find sources of funding to support the expansion of the program.

DATA COLLECTION

These changes would help the project generate greater amounts of more useful data.

6. Better communicate the importance of data collection to volunteers to inspire compliance with desired protocols. Many volunteers this year did not use the data sheets they were sent, picking and choosing which statistics to report.
7. Improve the data sheet to include currently missing key statistics (distance traveled and number of volunteers) and ensure standardization of data recording. Also, certain variables such as water condition and tidal stage were defined only in the "survey protocol" document. As many beach coordinators provided their volunteers with data sheets but not the survey protocol, this often resulted in confusion. Defining these variables on the data sheet itself would prevent this. The creation and distribution of a "mock" filled-out data sheet as a sample might be useful.
8. Better define each "tidal stage": if high during walk, high, and if low during walk, low – otherwise, rising or falling. Calculating exact times (e.g., Low +1 hr. 22 min.) during data analysis using NOAA information may be useful. Also, define when surf condition should be recorded.
9. Standardize the area beach being covered by rescue walks at each beach. While slight variations in area and conditions are possible at most beaches, some in particular (most notably Fortescue) are markedly different at different sections (open beach vs. rubble piles). Knowing which particular section of beach was covered would be valuable.
10. Create separate post-project "exit surveys" for beach coordinators and temporary volunteers.

EDUCATION AND OUTREACH

These changes would help the project attract and retain volunteers, as well as help take advantage of the educational opportunities that the project provides.

11. Hold a pre-season workshop to train potential beach coordinators and regular volunteers on the desired project protocols. The creation of a volunteer handbook with basic guidelines may also be beneficial.
12. Better explain to coordinators and volunteers the story of crabs and shorebirds and the reasoning behind our restrictions (i.e., why preventing shorebird disturbance is important), as well as help coordinators better educate their volunteers. The pre-season workshop would provide an excellent opportunity for this.
13. Provide shorebird stewards and rescue group leaders with project-specific brochures and/or business cards, which can be used to direct to the project anyone they encounter who was interested in participating.
14. Provide some sort of parting gift to all volunteers (perhaps a certificate of participation/appreciation with the number of crabs they saved?), as well as a more substantial gift (T-shirt?) for all beach coordinators. Alternatively, providing T-shirts to all volunteers to be worn while on rescue walks might be considered.

MANAGEMENT IMPROVEMENTS

These changes would not fundamentally alter project parameters, but would improve the organizational and professional appearance of the project.

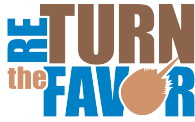
15. Create a reTURN the Favor logo and use it across all project materials. An initial mockup was developed on July 2, 2013; the logo used in this report was created by staff at The Wetlands Institute in January of 2014. This new version is being implemented in all materials being developed for the 2014 season.
16. Define and standardize the official name and proper capitalization of the project across all project materials: “reTURN the Favor Horseshoe Crab Rescue Project,” as well as certain commonly used phrases (e.g., “RtF,” “rescue walks,” “overturned and impinged,” “crab.warden@gmail.com” [if still used – see number 16], etc.). Due to potential copyright issues with the ERDG, the word “flip” should never be used.
17. Choose a few official colors and font(s) to use for all project materials (one main font, one “fancier” for use in titles, etc.). These choices should depend largely on the input of the graphics firm and the logo redesign (see number 13).
18. Get a new e-mail address better suited to the name of the project (e.g., returnthefavor@wetlandsinstitute.org or returnthefavor.nj@gmail.com).
19. Develop a website for the project (either independent, or a page hosted by The Wetlands Institute or elsewhere), including general information, contacts for interested volunteers, and educational information. If possible, it would be helpful to maintain a schedule of upcoming rescue walks on the website so that interested volunteers can participate without needing to contact project leaders for information.



APPENDIX A

RESCUE WALKS WITH ALL DATA REPORTED

Beach	Date	Time	Distance (km)	Volunteers	Total Crabs Rescued
Fortescue	5/17/2013	2:15	0.338	6	385
North Reeds	5/23/2013	1:10	1.2	1	344
Villas	5/23/2013	0:40	1.2	5	129
Fortescue	5/24/2013	2:00	0.169	8	416
Highs Beach	5/24/2013	0:58	1.1	2	75
North Reeds	5/25/2013	0:57	1.2	2	30
Villas	5/25/2013	1:25	1	10	25
Stone Harbor Point	5/25/2013	0:55	1	1	0
North Cape May	5/25/2013	0:35	1	6	0
Villas	5/27/2013	0:54	1	4	94
North Reeds	5/27/2013	1:30	1.2	3	203
North Cape May	5/27/2013	0:46	1	5	26
North Reeds	5/29/2013	1:25	1.2	4	322
North Reeds	5/31/2013	1:00	1.2	6	123
Fortescue	5/31/2013	2:15	0.338	12	406
North Reeds	6/3/2013	1:15	1.2	10	150
North Cape May	6/6/2013	0:50	1	2	1
Villas	6/6/2013	0:58	1	6	112
Villas	6/8/2013	0:44	1	10	103
North Cape May	6/8/2013	0:35	1	2	12
North Cape May	6/10/2013	1:00	1	2	0
Fortescue	6/14/2013	3:00	0.338	6	869
Fortescue	6/21/2013	1:00	0.338	4	100
Villas	6/21/2013	1:42	1	8	143
Villas	6/23/2013	2:20	1	12	98
Fortescue	6/25/2013	0:38	1	3	36
Villas	6/25/2013	0:57	1	8	104
North Cape May	6/25/2013	0:48	1	2	84



APPENDIX B RESCUE WALK DATA SHEET

“Re-turn the Favor” Horseshoe Crab Rescue Project – Data Sheet

Location: _____ Date (dd/mm/yy) _____ Start Time: _____ End Time: _____

Group Leader: _____ Scribe: _____ No. of Volunteers: _____

Tidal Stage: _____ Water Conditions: _____ Distance Surveyed: _____

Use “tick” marks to record crabs rescued. At the end of survey, tally the tick marks in each box and circle it for data entry

	Overturned on Beach	Entrapped – Man-made Structures	Entrapped – Natural Hazards
Males			
Females			
Comments:			