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PUBLIC PERCEPTIONS OF NATURAL RESOURCE DAMAGES AND THE RESOURCES THAT REQUIRE RESTORATION

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Abstract

The public and health professionals are interested in restoring degraded ecosystem to provide goods and services. This study examined public perceptions in coastal New York and New Jersey about who is responsible for restoration of resources, which resources should be restored, by whom, and do they know the meaning of natural resource damage assessment (NRDA). More than 98% felt that resources should be restored; more (40%) thought the government should restore them, rather than the responsible party (23%). The highest rated resources were endangered wildlife, fish, mammals, and clams/crabs. Only 2% of respondents knew what NRDA meant. These data indicate that people felt strongly that resources should be restored and varied in who should restore them, suggesting that governmental agencies must clarify the relationship between chemical discharges, resource injury, NRDA, and restoration of those resources to produce clean air and water, fish and wildlife, and recreational opportunities.

Increasingly, governmental agencies, conservation groups, regulators, and the public have been concerned about restoring degraded ecosystems to provide goods (e.g., fish and game) and services (e.g., clean air and water) to people. Yet restoration of natural resources requires not only governmental agencies and legal constraints, but the support of the public that ultimately has to provide funding (or the demand for funding from others) for restoring these resources. In recent years many state and federal agencies, as well as the private sector, recognized the importance of stakeholder involvement in the decision-making process (Burger et al., 2005, 2007; Goldstein et al., 2000; PCCRARM, 1997; Pittinger et al., 1998). Stakeholders include governmental agencies, federal and state regulators, federal and state natural resource trustees, Tribal Nations, public policymakers, researchers at universities and other institutions, conservationists, other nongovernmental organizations (NGO), and other members of the public. While agencies can and often do make decisions without stakeholder input, where issues are controversial, contentious, or particularly important to stakeholders, decisions are more readily accepted if stakeholders are involved early, often, and in a meaningful way (Burger et al., 2005, 2007). Yet there is little

quantitative data on the public perceptions of who should restore resources, and what should be restored to protect human health and the environment.

This study examined the perceptions of the general public residing in three coastal areas of New York and New Jersey about restoration of natural resources in three general areas: (1) who they believe is responsible for natural resource injuries, (2) what resources should be restored, and (3) who should restore them, as well as their familiarity with the meaning of natural resource damage assessment (NRDA). Of particular interest were coastal resources because they are particularly vulnerable to environmental contamination through runoff and point-source pollution, leading to contamination of water, fish, and wildlife. Therefore, only individuals found along the shore were interviewed.

Information and assessment of public perceptions about resource degradation, responsibility, and rankings of the importance of particular resources to be restored are important for environmental managers, government officials, and public policymakers because of the potential for human exposure to contaminants. In addition, information on public perceptions is helpful for the legal process of NRDA, including determining what resources have been damaged, and the losses of those resources and ecosystem services to the public. NRDA is the process that restores ecosystems to provide healthy environments and resources for people.

NRDA is the process whereby natural resource trustees assess injuries to natural resources, recover costs for these injuries from responsible parties, and restore, replace, or acquire the equivalent of the injured resources, or provide compensation for lost services (Helvey, 1991; Sheehy & Vik, 2003). Natural resources under CERCLA (section 101; Bilyard et al., 1993) are defined as “land, fish, wildlife, biota, air, water, groundwater, drinking water supplies, and other such resources.” An injury to a natural resource is a measurable adverse change in the chemical or physical quality or viability of that resource, and damages are assessed on the basis of loss or reduction in quantity and quality of natural resources and their services (Department of Energy [DOE], 1993a). Natural resource damages may be recovered by federal and state trustees, and by Tribal governments, for injury to natural resources produced by releases after 1980 (Trimmier & Smith, 1995). For any given site, there can be state and federal trustees, as well as Tribal Nation trustees. Several federal agencies have trustee responsibilities, including the U.S. Department of the Interior (DOI) and the Department of Energy (DOE). DOE is the agency facing the greatest task for environmental remediation of hazardous wastes in the United States, and perhaps the greatest NRDA liability (Crowley & Ahearn, 2002; DOE, 1993a, 1993b, 1997b, 2007; NRC, 1995; Trimmier & Smith, 1995).

Evaluation of NRDA losses may involve environmental impact assessment, ecological risk assessments, and performance assessments of remediation and restoration, among other processes (Bilyard et al., 1993; Malone, 1990). Further, managers involved in remediation often consider the potential for future NRDA claims with an aim toward restoring resources while performing cleanup. There is a need to be proactive in environmental management by integration of different processes (e.g., remediation, restoration, and NRDA; Burger, 2007; Burger et al., 2007a; Reagan, 2006). Despite the general awareness of NRDA by

environmental managers and public policymakers, it is unclear whether the general public and interested and affected parties are aware either of the term or of its implications for environmental management. Further, environmental managers, scientists, and public policymakers have been interested both in assessing injuries to natural resources, and in calculating the cost of natural resource damages (Denton & Hupp, 2003; Ofiara, 2002; Renner, 1998). There have been a number of papers that deal with injuries, damages, and methods of assessing the two (Bascietto & Sharples, 1995; Denton & Hupp, 2003; Efroymsen et al., 2004; Reed et al., 1989; Sharples et al., 1993). However, it is less clear how this effort has reached the public. It is the public, however, whose health and safety is impaired by injured resources.

METHODS

Under approved protocols from Rutgers University, people were interviewed in Barnegat Bay along the New Jersey shore, around the New Jersey/New York harbor, and on the north shore of Long Island from spring to winter 2007. Subjects were fishing, boating, walking or jogging, or engaged in other recreational activities. Places where individuals could congregate to fish, recreate, or just enjoy the shoreline and adjacent uplands were selected for sampling, and then each site was visited regularly on both weekdays and weekends, and all people encountered were interviewed. Interviewers identified themselves as from Rutgers University, all interviewees were assured that they were not going to be identified in any way, and the interviewees did not give their names. Several interviewers were required (including a Spanish-speaking person), and all individuals encountered were approached. Less than 8% refused to be interviewed, and these people were mainly leaving, busy fishing or recreating, or had small children they were attending to.

The questionnaire had four main sections: (1) demographics, (2) should wildlife and other resources be restored, (3) what resources should be restored, and (4) what direct restoration actions should be taken. The questions relating to NRDA were embedded within this questionnaire developed to examine fishing behavior, fish consumption, the importance of ecological resources, and what amenities or improvements individuals would like to see in coastal areas. The questionnaire took about 20 to 25 min to complete, although many interviews took longer because people wanted to talk about fish, recreation, or the general state of the water or ecosystems. Subjects were not rushed, and were allowed to talk about any issue they wished.

The questionnaire included questions such as: (1) Should wildlife and other resources be restored if they are damaged, and if so, who should restore them (on an open-ended question)? (2) Rate the importance of these agencies (on a scale of 1 [= lowest] to 5 [= highest]) to restore natural resources. (3) Rate how important it is to restore or replace these resources on the same scale. (4) Should the state pursue each of the following management options on a scale of 1 to 5 (increase fish habitat, remove pollution, adding boardwalks, add more police, restore natural resources, put up ecotourism signs, restore bird nesting habitat, and extract damages from polluters)? (5) Considering the following list of resources (birds, clams/crabs, cultural resources, endangered wildlife, endangered plants, mammals, seals/whales, and tribal sacred grounds), and rate them for restoration or replacement.

Interviewees were given the list to look at when answering the questions. Questions about NRDA were scattered throughout the survey to check for internal consistency, and those relating to NRDA included: Do you know what NRDA is (and subsequently were asked, if so, what)? At the end of the interview, demographic information was recorded, including gender, years of age, self-declared ethnicity, education, occupation, and household income. As an additional component to the questionnaire data, area newspapers for the three regions (Barnegat Bay, Newark Bay, Brookhaven) were examined for stories that mentioned resource injuries and NRDA over the past 8 years.

Nonparametric analysis of variance (Wilcoxon option in SAS NPARIWAY) yielding a chi-square statistic was used to examine differences among locations (Barnegat Bay, NY/NJ Harbor, Long Island) (SAS, 1995). Arithmetic means are given, and a probability level of .05 was accepted for significance. Regression models were used to determine whether other variables besides location contributed significantly to variations, but location was the primary factor (SAS, 1995).

RESULTS

Demographics

Overall, 84% of those interviewed were white, 5% were black, and 4% were Hispanic (Table 1). Only 18% were female, mainly because many more men were outdoors engaged in fishing and other recreational activities. Mean age was 46 years of age, 80% were high school graduates, and the mean household income was \$81,000. As might be expected, income increased with educational level (Table 1). Both education and income varied significantly by location (Table 2). A lower percentage of people graduated from college in the NY/NJ Harbor than elsewhere, and income was significantly lower in the harbor compared to elsewhere.

Restoration of resources

When asked whether wildlife and other resources should be restored if they are damaged by chemical discharges, 98% said yes (Table 3). Thus, it seems that individuals feel that resources should be restored. When asked an open-ended question of who should restore resources, the answers varied widely, and they varied by study site (Table 3). Most responded that government (37%) should, and many specifically targeted state government. Another 23% felt that whoever was responsible for the damage should repair the resources. Attitudes about who should repair the resources varied significantly by region: Fewer people in the NY/NJ harbor (20%) felt that the responsible parties should repair them than people from elsewhere (over 39%), and fewer people from Long Island (23%) felt the government should repair the damages than people from New Jersey (over 37%).

Ratings for agencies to restore resources, and importance of restoring particular resources

The attitudes and perceptions mentioned in the preceding subsection were derived from open-ended questions, where people simply gave their response. Categories were derived from their wording. After the open-ended questions, respondents were asked to rate on a

scale of 1 (lowest value) to 5 (highest value) two issues: (1) the importance of having particular parties restore natural resources, and (2) the importance of restoring or replacing particular resources (Table 4). For all three study sites, people felt that the relevant state Department of Environmental Protection (NJ DEP or NY DEC) was the most responsible for restoring resources, with the federal Environmental Protection Agency (U.S. EPA) a close second. There were locational differences in mean ratings for both responsibility for restoring resources and the importance of restoring particular resources (Table 4).

Resources to be restored and management options

There were significant differences in the ratings of which resources should be restored overall, and there were differences in the ratings for each resource by location (Table 4). Overall, people rated restoring endangered wildlife and fish the highest, and restoring cultural sites and Tribal Sacred grounds the lowest. The greatest locational differences were for restoring clams/crabs, restoring endangered plants, and restoring cultural sites (Table 4): Subjects from the NY/NJ Harbor rated restoring clams/crabs, endangered plants, and cultural sites lower than others did.

Respondents were also asked to rate the importance of the state pursuing or performing several measures (Table 4, bottom). All three locations rated removing pollution the highest, followed by extracting damages from polluters. Adding more police and adding boardwalks were rated the lowest by people interviewed in all areas. The greatest locational differences were in restoring bird nesting habitat and in adding more police. Respondents from Barnegat Bay did not rate restoring bird habitat nearly as high as did subjects from elsewhere, and respondents from Long Island rated adding police much higher than individuals from elsewhere (Table 4).

Understanding of NRDA and destruction of resources

About 12% of the study population knew what natural resource damage assessment was, but even fewer recognized the acronym NRDA (Table 3). Even people who believed they knew what natural resource damage assessment was could not easily define the term. That is, they felt they had heard of the term, but could not define it. Definitions given by respondents are instructive, mainly because of their lack of understanding of the term (Table 3).

Mention of resource degradation and NRDA in the press

A number of daily and weekly newspapers serve each of the three study areas. For Barnegat Bay there are three daily newspapers (*Asbury Park Press*, *Home News*, *Atlantic City Press*) and five weekly newspapers. For Newark Bay there are four daily newspapers (*Newark Star Ledger*, *Bergen Record*, *Jersey City Journal*, *Courier News*) and five weekly newspapers. For Brookhaven, there is one main daily (*Newsday*) and there are four weekly newspapers. In addition, the region is served by the *New York Times*. Newspaper coverage of resource degradation and NRDA is low in all areas, with Barnegat Bay receiving the most coverage. For example, from 1998 to the present, there were 13 articles about NRDA in the Barnegat Bay region, 2 in the Newark Bay region, and none in the Brookhaven region. While numerous articles mention damages to natural resources from one stressor or another (often biological, or oil spills), they do not normally mention the term “NRDA” or “natural

resource damage assessment.” Similarly, environmental issues and contamination are mentioned often in the *New York Times*, but articles that mention NRDA are rare.

DISCUSSION

Protecting the environment to provide for human health and safety involves environmental management, including selecting the ecosystem to be restored to provide ecosystem goods and services (Baird, 2005; Clewell & Rieger, 1997; Hobbs & Harris, 2001; Prach, 2004; Thom et al., 2005; White & Walker, 1997). Decisions about restoration of ecosystems to provide goods and services that protect human health must take into consideration ecological, economic, demographic, ethical, and aesthetic issues that are often difficult to resolve. Although practical issues clearly affect these decisions since there are limits to the kinds of ecosystems that can be restored on contaminated or degraded lands (Ehrenfeld & Toth, 1997; Cairns, 1995), it is often the ethical and aesthetic issues that are more difficult to resolve (Egan & Howell, 2001).

Perceptions of restoration of natural resources

In general, individuals believed that restoration of resources should be accomplished by the government or whoever was responsible. Interestingly, 16% felt that whoever could restore them should (leaving open the question of who that was), and few listed conservation organizations as the entities to restore resources. This latter finding differed from their rating when given the entities to rate; conservation agencies were rated higher than the company that destroyed the resources. Surprisingly, few people mentioned the U.S Fish and Wildlife Service as the responsible agency, and no one mentioned the National Oceanographic and Atmospheric Administration—the agencies that have some responsibility for NRDA.

There were locational differences in their understanding of who should restore them, and the importance of restoring different resources. When rating who should restore resources, people in Barnegat Bay rated the company that destroyed them the highest, people from NY/NJ Harbor rated the U.S. EPA the highest, and subjects from Long Island rated NY DEC and conservation organizations the highest. Fewer people interviewed in the NY/NJ Harbor felt that responsible parties should restore natural resources than did individuals from elsewhere.

The relative closeness of the mean ratings for who should restore resources injured by contaminants is another indication of divided opinions over who is responsible for restoring or replacing natural resources destroyed by chemical discharges. Usually a Likert scale results in a wider dispersion of values, with subjects rating some in the 2–5 range. In this study, however, most of the means were in the 4–5 range. The relative closeness of the values indicated that the respondents did not have a firm understanding of who is responsible for restoring resources, and felt that all natural resources should be restored.

The relatively high rating for government as the entity that should restore resources may reflect a true belief that it is the government’s responsibility, a disagreement over who must versus who should restore resources, or a failing in the form of the question. That is, perhaps the question should have been “who should pay for the restoring of natural resources?”

rather than “who should be responsible for restoring natural resources?” Future questionnaires should more clearly distinguish the monetary responsibility (who pays) from the mechanical responsibility (who actually does the restoration work).

Resources to be restored and management options

Overall, the ratings for restoring particular resources were high (means all above 4.4), compared to management options (means as low as 3.4). Restoring endangered wildlife and fish was rated the highest, followed by a second group (mammals, clams/crabs, seals/whales, endangered plants, birds), and by a lower group (the rest). The relatively low rating for restoring cultural sites and Tribal sacred grounds may reflect either a lack of (1) cultural sites in the region, (2) commitment to restoring cultural sites, or (3) understanding of their role in human health. All three locations rated restoring cultural sites and Tribal sacred grounds the lowest. However, it should be noted that all three sites are far from Tribal reservations or clearly identified Tribes. It is reasonable to expect a different rating in regions where tribal members need access to fish and wildlife for food and fiber.

For all resources, individuals from the NY/NJ Harbor rated restoration lower for each resource than did people from either Barnegat Bay or Long Island. While the data do not provide any explanation for this difference, it may be that since the harbor is more highly industrialized and urbanized compared to Long Island or the bay, subjects are concerned about the feasibility or viability of restoring resources. People from the NY/NJ Harbor were generally less well educated and had lower incomes than those from the other regions. The biggest locational difference in ratings, however, was that individuals in Barnegat Bay rated restoring Tribal sacred grounds much higher than people from elsewhere, and they rated them higher than restoring cultural sites.

When three types of management options were presented (removing pollution and collecting damages, restoration, and adding amenities [boardwalks, police]), respondents clearly rated removing pollution and collecting damages the highest. These data indicate that the respondents clearly recognize the importance of removing the pollution and holding the polluters responsible. This supports the notion that there needs to be a clearer distinction in the media between collecting monetary damages from polluters, and having resource agencies and trustees responsible for the actual restoration replace or restore natural resources. Finally, it was surprising that adding more police was rated so low (except on Long Island), particularly for the NY/NJ Harbor area where economic conditions are more depressed (see household income of respondents, Table 2), there is more industrialization, and there is less open space. In many inner-city areas, such as the harbor, there is a higher crime rate, and it was expected that people would rate adding more police quite high.

Overall understanding of NRDA

While scientists, managers, and the public often focus on the continuum from remediation to restoration, managers, lawyers, and the courts often focus on NRDA for two reasons: (1) It may provide the money for adequate restoration (or replacement of lost resources), and (2) it may affect the course of remediation. In the latter case, the integration of remediation with NRDA might result in restoration of natural resources during the cleanup process, rather

than later, thereby saving time and money (Burger et al., 2007b). While many agencies recognize the need for stakeholders to be involved in remediation and restoration decisions, few have included stakeholders in the NRDA process. Instead, the NRDA process has often taken a legal route through the courts, rather than as an integral part of remediation and restoration. In many situations, NRDA claims were settled, and then restoration was undertaken (e.g., the Exxon *Valdez* oil spill in Prince William Sound, Alaska, or the Exxon spill in the Arthur Kill in New Jersey; Burger, 1994, Shaw & Bader, 1996). A first step to including stakeholders in NRDA considerations is to understand whether the public is aware of the term and its meaning, and second steps involve raising awareness of issues connected with NRDA in general and with a specific situation or regional problem. A third step is understanding what goods and services the public and health professionals feel should be restored. This study partly addressed the first step.

The people, mainly outdoor recreationists, interviewed in this study were from three different locations in the New York Bight (Barnegat Bay along the Jersey shore, NY/NJ Harbor estuary, and Long Island) and could neither identify the term NRDA nor define the meaning of natural resource damage assessment. However, individuals did understand ecological injury and the need for restoration of natural resources, and nearly everyone felt that resources should be restored. Further, local newspapers do not regularly use either the term NRDA or natural resource damage assessment in their stories. There were no locational differences in the low proportion of subjects who knew what NRDA meant, could define natural resource damage assessment, or who felt that destroyed resources should be restored.

It seems there is a disconnect between what governmental agencies are thinking about in terms of holding parties responsible for injuries to natural resources, and what is communicated to the community at large. Further, the connection between restoring ecosystems and human health and safety is not always clear to the public or to public officials. In both New York and New Jersey, companies have been held liable and/or have pending legal actions for damages because of injuries to natural resources produced by chemical discharges. Data suggest that awareness could be increased if governmental personnel consciously used the terms NRDA and natural resource damage assessment in communications with the press. Although there is clearly confusion on the part of the people interviewed in this study about what NRDA means, and who should be responsible for restoring natural resources, there is no legal confusion (Helvey, 1991; Sheehy & Vik, 2003). That is, the law requires that the party (government agency, company, or industry) that discharged the contaminants is responsible for restoring or replacing natural resources that have been injured by chemical discharges.

The distinction for restoring or replacing natural resources injured by chemicals versus resources injured by other means (such as habitat destruction or human disturbance) is another issue that needs clarification in the minds of the public (Figure 1). While companies are responsible for restoring or replacing resources destroyed by discharges, they are not responsible for nonchemical habitat destruction, unless the chemical discharge contributed to that destruction. Thus, the perception that state agencies and conservation organizations should restore resources would apply to species whose populations have declined because of habitat destruction or human disturbance. In any case, the U.S. EPA never restores

resources, although it can be a party to the legal dispute concerning a monetary settlement for compensation of resources injured by chemical discharges.

A planned effort needs to be made to define and distinguish the following, particularly for the general public: (1) the connection between NRDA, restoration, and human health, (2) NRDA, natural resource damage assessment, remediation, and restoration (which is usually part of an NRDA settlement), (3) resources destroyed by chemical discharges versus those destroyed or injured (population declines) because of habitat destruction, human disturbance, or other anthropogenic factors, (4) the parties responsible for restoring injured resources, (5) legal and monetary responsibility for restoring resources versus ability and expertise to restore them, which may fall to environmental conservation or endangered/nongame species programs, conservationists, or consulting firms, and (6) how important particular resources are to local residents for food, fiber, or medicines.

The lack of an informed public must be addressed by state and federal resource agencies that have both the information and the responsibility for assessing damages to resources, and restoring them. This can be accomplished by having a directed public relations campaign that provides information to the media, and through a series of well-publicized Web-based information sources. Young people, who will be involved in future decision making, are increasingly turning to the Web (news, industry, and governmental sites) for their information, and governmental agencies should develop data-informed sites.

Summary

Data presented clearly indicate that the public involved in recreational activities along this coastal region feels strongly that ecological resources should be restored, that governmental agencies and responsible parties should restore them, and that some resources (endangered wildlife, fish) should have higher priority for restoration than other resources. The resources that people rated highest for restoration were those that they directly use for food (fish and shellfish) or for recreation (viewing wildlife). While the law clearly makes the parties that discharged the chemicals responsible for restoring or replacing natural resources, this distinction was not clear in the minds of the respondents of this study.

Interestingly, when presented with a list of potential management options (bottom of Table 4), subjects rated removing pollution and extracting damages from polluters the highest, indicating that when actually presented with these options, they clearly think they are very important. Restoring natural resources was rated the third highest choice for all three regions, making it clear that the public interviewed in this study wants to see the natural habitat restored and improved. Only by restoring the environment can the ecosystem provide goods and services, such as clean air and clean water. Data suggest, however, that the public is unaware of the relationship between management conducting NRDA and assessing damages, and how to restore the goods and services provided by ecosystems that lead directly to their health and well-being.

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FIGURE 1.

Schematic of the relationship between types of factors that might result in injury to natural resources, which factors fall under natural resource damage assessment (NRDA), and what agency or organization restores injured resources. The U.S. EPA and state agencies are responsible for dealing with chemical discharges, and state conservation or endangered and nongame programs are responsible for plant, fish, and wildlife populations.

Demographics of Study Population in New Jersey and New York (2007), With Means $\pm$ Standard Error and Range for Age and Income ($n = 329$)

TABLE 1

	Percent	Income (thousands of dollars)	Age	Gender (% women)	Ethnicity (% white)
Overall		80.9 $\pm$ 3.5, 0–500	46.0 $\pm$ 0.9, 13–90	18%	84%
Education					
Less than high school	20%	61.6 ^a $\pm$ 8.7, 25–100	48.9 $\pm$ 2.3, 13–87	12%	88%
High school graduate	24%	61.2 $\pm$ 4.3, 0–150	46.8 $\pm$ 2.0, 15–90	16%	73%
Some college	17%	77.5 $\pm$ 5.2, 30–150	47.2 $\pm$ 2.2, 20–74	33%	87%
College graduate	30%	87.8 $\pm$ 4.6, 20–250	43.5 $\pm$ 1.6, 19–75	14%	88%
Graduate level education	9%	109 $\pm$ 17.0, 0–500	43.5 $\pm$ 2.0, 21–60	19%	84%
χ^2		19.4 (.0007)	5.5 (NS)	8.6 (NS)	1.7 (NS)

^a only 10 of 65 responded.

TABLE 2

Demographics of Study Population in New Jersey and New York (2007), With Means $\pm$ Standard Error for Age and Income

	Overall <i>n</i> = 329	Barnegat Bay <i>n</i> = 123	NY, NJ Harbor <i>n</i> = 103	Long Island <i>n</i> = 103	χ^2
Education					18.3 (.001)
Less than high school	20%	26%	24%	8%	
High school graduate	24%	16%	25%	33%	
College graduate	56%	58%	51%	59%	
Ethnicity					10.5 (NS)
White	84%	88%	77%	84%	
Black	5%	4%	8%	2%	
Hispanic	4%	2%	8%	4%	
Other/unidentified	7%	6%	7%	10%	
Age	46.0 $\pm$ 0.9	45.0 $\pm$ 1.5	45.8 $\pm$ 1.7	47.1 $\pm$ 1.6	1.3 (NS)
Income (thousands of dollars)	80.9 $\pm$ 3.5	86.5 $\pm$ 6.2	65.7 $\pm$ 5.9	88.9 $\pm$ 5.4	17.4 (.0002)
Gender (% female)	18%	16%	14%	25%	

TABLE 3
Knowledge of Natural Resource Damage Assessment of People in New York and New Jersey

	Overall <i>n</i> = 329	Barnegat Bay <i>n</i> = 123	NY, NJ Harbor <i>n</i> = 103	Long Island <i>n</i> = 103	χ^2
Should wildlife and other resources be restored if they are damaged by chemicals? (% responding yes)	98.2%	99.2%	96.1%	99.0%	0.03 (NS)
Who should restore natural resources?					57.4 (.004)
Whoever is responsible for damage	22.9%	23.6%	14.6%	30.1%	
Government					
General	20.7%	30.1%	20.4%	9.7%	
Local	1.2%	1.6%		1.9%	
State	10.6%	6.5%	15.5%	10.7%	
Federal	4.3%	2.4%	7.8%	2.9%	
U.S. Fish & Wildlife	2.1%	0.8%	2.9%	2.9%	
EPA	0.3%			1.0%	
Whoever can restore them	15.5%	20.3%	6.8%	18.5%	
Don't know	10.6%	7.5%	17.5%	8.7%	
Everyone	8.8%	5.7%	12.6%	8.7%	
Fishermen/sportsmen	1.5%	2.4%	1.0%	1.0%	
Conservationists	1.2%		1.0%	2.9%	
Regulatory body	0.3%			1.0%	
Do you know what NRDA is? (% responding yes)	1.8%	2.4%	1.9%	1.0%	0.69 (NS)
Do you know what Natural Resource Damage Assessment is? (% responding yes)	11.6%	10.6%	15.5%	8.7%	2.6 (NS)
What is Natural Resource Damage Assessment? (Answers for those responding yes)					18.3 (NS)
Heard of it	3.3%	1.6%	4.9%	3.9%	
Damage	1.5%	0.8%	1.9%	2.0%	
Damage to natural resources	1.5%	3.3%	1.0%		
Damage to ocean	0.6%	0.8%	1.0%		
Cleanups	0.3%	0.8%			
Damage to ecosystems	0.3%	0.8%			
Information gathering agency	0.3%	0.8%			
Preserving natural resources	0.3%	0.8%			
State department that monitors damage	0.3%			1.0%	

	Overall <i>n</i> = 329	Barnegat Bay <i>n</i> = 123	NY, NJ Harbor <i>n</i> = 103	Long Island <i>n</i> = 103	χ^2
Something with fish population	0.3%		1.0%		

Note. In this questionnaire NRDA refers to injuries caused by chemical discharges. These questions were open-ended.

Ratings of Respondents ($n = 329$) About Who Should Restore Resources Injured by Chemical Discharges, What Should Be Restored, and What Other Things Should Be Implemented, With Rating Scale: 1 = Least Important and 5 = Most Important

TABLE 4

	Overall	Barnegat Bay	NY, NJ Harbor	Long Island	χ^2
Rate the importance of these agencies restoring resources damaged by contaminants.					
State DEP	4.32 ± 0.06	4.49 ± 0.09	3.99 ± 0.11	4.44 ± 0.1	20.1 (<.0001)
US EPA	4.15 ± 0.06	4.08 ± 0.10	4.00 ± 0.13	4.37 ± 0.1	6.2 (.05)
Conservation organization	4.15 ± 0.06	4.11 ± 0.11	3.93 ± 0.11	4.43 ± 0.09	12.8 (.002)
Company that destroyed them	4.08 ± 0.08	4.51 ± 0.09	3.81 ± 0.16	3.84 ± 0.16	13.3 (.001)
Private individuals	3.52 ± 0.08	4.05 ± 0.11	3.23 ± 0.13	3.18 ± 0.14	29.7 (<.0001)
χ^2	81.6 (<.0001)	30.0 (<.0001)	27.4 (<.0001)	61.9 (<.0001)	
Rate how important it is to restore or replace.					
Endangered wildlife	4.87 ± 0.03	4.91 ± 0.03	4.76 ± 0.07	4.92 ± 0.04	7.5 (.02)
Fish	4.80 ± 0.03	4.85 ± 0.04	4.68 ± 0.08	4.86 ± 0.06	5.9 (.05)
Mammals	4.73 ± 0.04	4.82 ± 0.04	4.59 ± 0.08	4.76 ± 0.08	8.7 (.01)
Clams/crabs	4.71 ± 0.04	4.82 ± 0.04	4.44 ± 0.1	4.85 ± 0.06	21.4 (<.0001)
Seals, whales	4.71 ± 0.04	4.80 ± 0.05	4.56 ± 0.09	4.74 ± 0.08	9.1 (.01)
Endangered plants	4.71 ± 0.04	4.89 ± 0.03	4.46 ± 0.09	4.74 ± 0.08	22.4 (<.0001)
Birds	4.70 ± 0.04	4.78 ± 0.05	4.51 ± 0.1	4.81 ± 0.07	8.3 (.02)
Plants	4.63 ± 0.05	4.71 ± 0.06	4.43 ± 0.1	4.75 ± 0.07	10.7 (.005)
Cultural sites	4.49 ± 0.05	4.62 ± 0.07	4.24 ± 0.1	4.57 ± 0.08	12.1 (.002)
Tribal sacred grounds	4.41 ± 0.06	4.65 ± 0.07	4.16 ± 0.12	4.37 ± 0.11	10.5 (.005)
χ^2	97.6 (<.0001)	28.0 (.001)	36.6 (<.0001)	52.4 (<.0001)	
Rate the importance of the state pursue the following.					
Removing pollution	4.94 ± 0.02	4.91 ± 0.04	4.93 ± 0.03	4.99 ± 0.01	3.6 (NS)
Extracting damages from polluters	4.84 ± 0.03	4.72 ± 0.06	4.91 ± 0.03	4.92 ± 0.03	10.9 (.004)
Restoring natural resources	4.79 ± 0.03	4.79 ± 0.05	4.68 ± 0.07	4.91 ± 0.05	12.8 (.002)
Increasing fish habitat	4.74 ± 0.04	4.79 ± 0.06	4.64 ± 0.07	4.78 ± 0.08	12.1 (.002)
Restoring bird nesting habitat	4.35 ± 0.06	3.98 ± 0.12	4.37 ± 0.1	4.76 ± 0.07	31.1 (<.0001)
Putting up ecotourism signs	3.85 ± 0.07	3.48 ± 0.13	3.98 ± 0.12	4.18 ± 0.11	14.7 (.0006)
Adding more police	3.69 ± 0.08	3.4 ± 0.12	3.26 ± 0.15	4.47 ± 0.1	54.6 (<.0001)

	Overall	Barnegat Bay	NY, NJ Harbor	Long Island	χ^2
Adding boardwalks	3.43 $\pm$ 0.08	3.39 $\pm$ 0.13	3.09 $\pm$ 0.14	3.82 $\pm$ 0.13	13.9 (.001)
χ^2	662 (<.0001)	310 (<.0001)	251 (<.0001)	169 (<.0001)	