Public Perceptions of Natural Resource Damage Assessment and the Resources that Require Restoration - 10054

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ABSTRACT

Natural Resource Damage Assessment (NRDA) is one of the key aspects of managing degraded ecosystems, particularly those impacted by hazardous wastes. To manage ecosystem structure and function, we need to remove contamination and restore the damages resulting from past activities of chemical and nuclear facilities, among others. For NRDA to receive the support needed, the public must be aware of NRDA, options, and costs. Yet it is unclear whether the general public is aware of its implications for environmental management. We examined the perceptions of the public residing in three coastal areas of NY/ NJ about NRDA. People were interviewed along the NJ shore in the NY/NJ harbor estuary, and on the north shore of Long Island. We expected that people near Brookhaven would be more aware of the meaning of NRDA than those from elsewhere. We found that 2 % of respondents knew what NRDA stood for and 11% had knowledge of "NRDA", although most of those answering "yes" could not give a definition. Over 98 % felt that wildlife and other resources should be restored if they are damaged by contaminants; more (40 %) thought the government should restore them, rather than the responsible party (23 %).

INTRODUCTION

Governmental agencies (both state and federal), the private sector, conservation organization, and the public are interested in preserving, restoring, and managing ecosystems and their associated species. One type of land requiring environmental management, including remediation and restoration, is that contaminated by toxic chemicals and/or radionuclides. Cleanup and remediation of contaminated sites is a national priority [12], with the goal of maintaining healthy ecosystems that protect human health and the environment, although there is little agreement on the strategy for cleanup and restoration [10].

In the early 1980s managers believed that contaminated sites should (and could) be cleaned up to residential standards and returned to productive uses. In some cases, people wished the sites to be cleaned up to pristine conditions [37], a difficult concept to define or implement. A decade later public policy makers and managers realized that not all land must (should or could) be cleaned up to residential standards [5,9,14,29,36]. With this realization came the recognition that a residual from the remediation process may be natural resource damages that have not been restored or replaced. This led to the process of Natural Resource Damage Assessment (NRDA). NRDA is used to determine whether there have been injuries to natural resources and to calculate the costs necessary to restore (or replace) those resources [17,22]. Natural resources, under CERCLA (section 101 [16]), 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 resource services due to releases, after 1980 [18,34]. The federal government has uniform rules and procedures for assessing economic losses and injuries developed by the U.S. Department of the Interior for CERCLA, and the U.S. Department of Commerce for OPA [15,30].

While several government agencies, as well as the private sector, engage in NRDA activities, it is less clear whether the general public is aware of NRDA, and could therefore support its activities. In this paper we discuss NRDA in light of the Department of Energy (DOE), how NRDA could be incorporated into DOE's remediation and restoration activities, explore ways to determine public perceptions of NRDA, and give a short case study of how the public along coastal New York and New Jersey views NRDA. We also suggest that restoration to reduce total NRDA liability should occur during the remediation phase, and should include considerations of both injury and benefits that accrued from DOE releases and activities, not solely with environmental degradation. Since in some cases the cost of conducting research to demonstrate injuries may exceed the expected value of the damages [11,35], it may be prudent for responsible parties and natural resource trustees to work amicably to restore the resources during remediation with the final land use in mind [11].

BACKGROUND ON DOE LANDS AND THEIR NATURAL RESOURCES.

During and after World War II DOE, including its antecedents, obtained lands in many states for the purpose of developing, manufacturing, and testing nuclear weapons. The ecological conditions on these lands varied, and included farming villages and towns, farmlands, grazing lands, open and unclaimed lands, and intact relatively pristine ecosystems. The haste of establishing the DOE complex distracted the public and regulatory agencies from attending to environmental quality issues, and the secrecy of DOE activities resulted in a climate where there could be 1) extensive releases of contaminants and radionuclides, 2) habitat loss and fragmentation, and 3) storage of chemical and radioactive wastes. With a general increase in public awareness of contamination and environmental degradation in the Nation, came a public push for attention to the contamination on DOE lands [23]. In the early 1980's, the DOE entered into a series of 'Tri-

Party' compliance agreements with the U.S. Environmental Protection Agency (EPA) and State agencies to cleanup contamination, in the absence of adequate data on the magnitude of contamination or the costs of cleanup. DOE established an Office of Environmental Management (EM) to deal with the remediation tasks on their facilities [13,33].

Although the regulatory regimes differed among sites, DOE's EM mandates were largely driven by compliance with the Comprehensive Environmental Response and Liability Act (CERCLA), the Resource Conservation and Recovery Act (RCRA), and the triparty compliance agreements, which dictated the most extensive cleanup possible. Initial efforts largely dealt with containing the risk from radionuclides and chemicals, followed by attempts to incorporate NRDA liability with remediation and restoration under CERCLA [17,22,31]. Protecting ecological resources or ecosystem health was not initially part of the remediation process, even though DOE lands were extensive and ecologically valuable [5,9,14,19,20]. Very large buffer zones were preserved around some of the largest industrial facilities. At some of the large DOE sites, 80-90 % of the land is largely uncontaminated, even though it is adjacent to highly contaminated land [9]. The buffers created around DOE and DOD sites have provided long-term habitat protection for many rare plants and animals, as well as preserving large, intact ecosystems [5,9,14,28].

DOE'S REMEDIATION/RESTORATION TASK

DOE is faced not only with remediation of its numerous sites to reduce risk to human health and the environment, but to restoring these sites to some agreed-upon final land use condition (e.g. residential, industrial). Cost estimates for cleanup were astronomical [21,25], worker health and safety risks were great, and suitable technologies for safe, permanent, and cost-effective remediation were not available. DOE sites have highly toxic, and long-lived radiological wastes, both in storage facilities and as surface and groundwater contamination. This results in limitations on the types of remediation that are possible, high remediation costs, and long-term care of wastes where remediation costs are prohibitive, transportation is difficult, or technology does not currently exist to remediate. The presence of highly toxic and long-lived radionuclides and other chemicals limits both the restoration possible, and enhances the possible resource damages (Fig. 1).

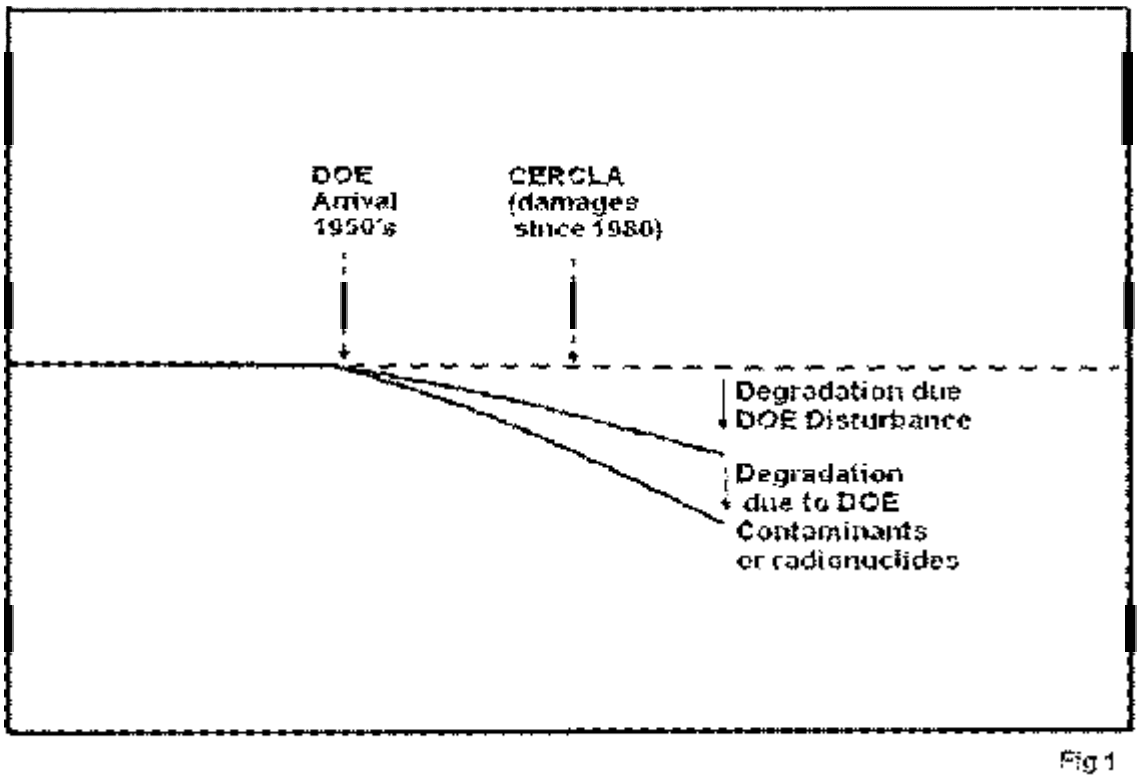

Fig. 1. Effects of DOE occupation and resultant resource damages

Thorny issues resulting from the DOE Cold War legacy include determining levels, methods, and time frames for remediation and restoration, assessing natural resource damages from DOE's activities, and determining future land use(s) within the framework of what is legally, logistically, and economically feasible. Additionally the preferences of stakeholders are a critical factor for decision-making [6,32].

NRDA at DOE sites normally includes injuries to natural resources that occurred as a result of their activities [17]. There is a wide range of possibilities for resource damages following disruption due to occupation by DOE. If the site had been forests, then the degradations would be largely negative, but if the ecosystem had been farmland, then the ecosystem following DOE occupation might have been improved because of the cessation of human activities and disturbances on most of the DOE lands, which has allowed succession. Thus, we have argued that the resource damages due to chemical/radiological releases occurred on top of ecosystem enhancement [7]. We advocated a landscape approach: integrating natural resource restoration during the remediation/restoration phase, taking into account both the positive and negative effects of DOE activities in light of pre- and post-DOE occupation [7,8]. There are landscape metrics for examining some of these larger aspects of ecosystem damage and recovery [4,24,27]. In many cases, once DOE arrived and developed security and buffer zones, previously-degraded ecosystems underwent natural succession to forest or grassland ecosystems. Landscape metrics can thus be used to show large-scale, landscape benefits of DOE occupation.

ASSESSING THE PUBLIC'S PERCEPTIONS OF NRDA

While DOE, other governmental agencies, and resource trustees (such as tribal nations) recognize the importance of NRDA to the process of remediation, restoration, and long-term stewardship on degraded lands, it is not clear that the public is aware of the term or its application. We suggest that it is important to begin to understand how the public views the term NRDA, the concept of NRDA, resource recovery and restoration, and how the public values restoration of particular resources. We suggest that it is likely that the public is aware of the concepts that are central to NRDA, but do not necessarily recognize or relate to the term NRDA, nor understand who is (or legally is) responsible for restoring injured resources.

We propose that there are several questions to be addressed, including: 1) what is the definition of NRDA, 2) should resources be restored if they are damaged, 3) who should restore these resources, and 4) what resources should be restored. Each of these questions has both a biological basis (and in some cases, a legal basis) and a perception basis. That is, should resources be restored depends not only on whether they can be restored biologically (is the seed bank present, are the soil conditions still appropriate, is the prey present, etc), but do people believe the resource is sufficiently important (needed, desired) to expend time and money in restoration. Failure to recognize the importance of public perceptions and stakeholder input into the restoration decisions is critical. Further, it should be noted that although the public may not understand the meaning of the term NRDA, it does not mean they are unaware or uncommitted to the goal of resource recovery and restoration.

Table I presents a brief template for assessing perceptions about NRDA and resource recovery and restoration. The specific questions (e.g. in the section on resources to be restored) should be site-specific. That is, marine mammals are clearly less important to people residing in the interior US than to those living along the coasts. Similarly, neotropical migrants (birds that use forests) will be less important to people living in desert or grassland habitats than those living in the eastern deciduous forests. Such questionnaires should be designed by both local ecologists and social scientists interested in public perceptions.

Table I Brief template for the kinds of questions to ask about NRDA. Other questions can be added of local interest.

Question	Type of Question
What is Natural Resource Damage Assessment?	Open-ended
Should natural resources be damaged if they are destroyed?	Open-ended
Who should natural resources damaged resources if they are destroyed?	Open-ended

Who should natural resources damaged resources if they are destroyed by companies?	Open-ended
What plants or wildlife should be restored?	Open-ended
Who should restore natural resources if they are destroyed? State government Federal government USEPA USDOE US Fish & Wildlife Service Responsible party Conservation Organizations Private Individuals Others of local interest	Rate on a scale of 1 (least important) to 5 (most important). Give them a card with choices on it.
Rate the importance of restoring specific natural resources Fish Mammals Birds Endangered Wildlife Plants Cultural Sites Tribal sacred grounds Others of local interest	Rate on a scale of 1 to 5. Give them a card with choices on it.
Rate the importance of pursuing the following Restoring natural resources Increasing fish habitat Increasing bird nesting habitat Extracting damages from polluters Adding more police Removing pollution Adding boardwalks and ecotourism signs	Rate on a scale of 1 to 5. Give them a card with choices on it.

CASE STUDY: NEW JERSEY/NEW YORK COASTAL REGIONS

For the public to be supportive of NRDA it must understand what NRDA means, be aware of who should bear the cost of NRDA, and have some thoughts on the relative importance of which resources should be assessed (and subsequently restored). In this case study we examined some of these questions for people living along the coasts of New Jersey and Long Island (New York). We selected three geographical areas: coastal

New Jersey, the New York/New Jersey harbor area, and the northern coast of Long Island (near Brookhaven National Laboratory, BNL). We chose these areas because: 1) there are restoration activities on BNL, 2) there are some restoration and NRDA claims in the NY/NJ harbor estuary, and 3) there are no high-profile restoration or NRDA claims along the central New Jersey shore. We thus expected differences in perceptions of NRDA.

Overall Protocol

Our overall methods were to interview people along the coast at fishing sites, recreational sites, and parks. We approached everyone we encountered, identified ourselves as from Rutgers University, and asked if we could ask them some questions about ecological resources. In general people were interested in or work, readily answered the questions, and often had many questions of their own (which we answered only after we finished the survey). Our questionnaire had two types of questions: open-ended, and those requesting a rating of 1-5 (a likert scale where 1 = disagree, and 5 means strongly agree, or 1 = least important and 5 = most important, depending upon the nature of the question). Where similar information is being solicited, the open-ended questions are always asked first to avoid biasing their answer or providing alternatives (although the two types of question often do not follow one another). For example, if you ask people to rate the importance of different agencies in restoring resources (and thus list the federal government, EPA, state governments, conservation organizations), and later ask them on an open-ended question to list who they thought should restore resources, respondents may simply give you the list you previously provided. Our methods were approved by the Rutgers University Review Board (Protocol # E96-108).

Results

Only about 12 % of the study population knew what natural resource damage assessment was, but even fewer recognized the acronym NRDA. Most people who believed they knew what natural resource damage assessment was could not define the term. However, 98 % said “yes” when asked whether wildlife and other resources should be restored if they are damaged by chemical discharges. When asked on an open-ended question who should restore resources, 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 (Table I). Overall, people rated restoring endangered wildlife and fish the highest, and restoring cultural sites and Tribal Sacred grounds the lowest.

Table II. Who should restore resources if they are injured or destroyed? This was an open-ended question, and not everyone answered.

	Overall	Near Brookhaven	NY/NJ Harbor	Coastal NJ and Barnegat Bay
Responsible party	23	30	25	24

Government				
General	20	10	20	30
State	11	11	16	7
Federal	4	3	8	2
Other	2	9	3	2
Whoever can	16	18	7	20
Everyone	9	9	13	6

However, when given particularly agencies, and asked to rate their importance to restoring injured resources, state departments of environmental protection rated the highest (rating of 4.3), followed by USEPA (4.15) and conservation organizations (4.15), and then the companies that destroyed them (4.08) and private individuals (3.52).

CONCLUSIONS

Overwhelmingly, people in this sample believed that resources that are damaged by chemical and radiological releases should be restored, although they differ on what resources are most important. However, almost none of the people interviewed could give a clear definition of NRDA. In general, people believed either that the government or the responsible party should restore the damages.

IMPLICATIONS

This study found that people do not recognize the term NRDA, nor do they understand its meaning. But they clearly believe that resources should be restored. This suggests that the DOE, and other similar agencies, needs to involve the public in the discourse about NRDA, including what it means, who is responsible for the NRDA work, how the NRDA should proceed, and what it means for local and regional natural resources.

CONCLUSIONS

NRDA is an important component of remediation, restoration, and long-term stewardship. While governmental agencies, policy-makers, and resource trustees (such as tribal nations) are aware of the meaning and importance of NRDA, the public is not necessarily aware of the term itself, its legal implications, or the mechanics of how it should occur. Part of long-term management and stewardship on public lands is to understand the status and trends of natural resource populations.

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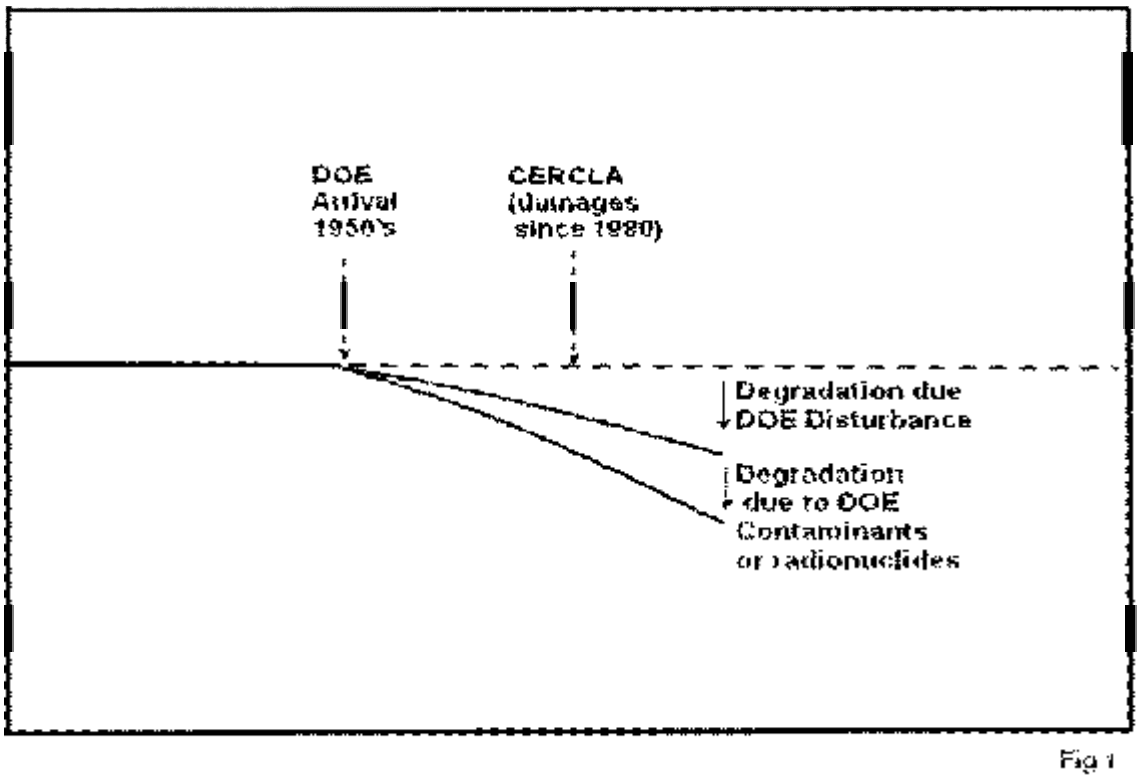

Fig. 1. Effects of DOE occupation and resultant resource damages