Disaster, Litigation, and the Corrosive Community*

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Abstract

Disaster researchers have debated the utility of distinguishing "natural" from "technological" catastrophes. We suggest that litigation serves as a source of chronic stress for victims of human-caused disasters involved in court deliberations for damages. Data from the Exxon Valdez *oil spill are used to evaluate a social structural model of disaster impacts three and one-half years after the event. Results suggest that the status of litigant and litigation stress serve as prominent sources of perceived community damage and event-related psychological stress. We conclude that litigation is a critical characteristic of technological disasters that precludes timely community recovery and promotes chronic social and psychological impacts. Suggestions for alternatives to litigation are provided.*

As we enter the twenty-first century, it is increasingly clear that large-scale disasters will be pervasive features of social life. The impact of disasters, according to the 2002 *World Disasters Report*, has significantly changed since

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the early 1970s, as the number of those affected has increased and the number of deaths has decreased (IFRC/RCS 2002). People affected by disasters, by definition, require "immediate assistance during a period of emergency, i.e., requiring basic survival needs such as food, water, shelter, sanitation and immediate medical assistance" (IFRC/RCS 2002:181). Provision of such assistance is necessary in the short term, but long-term social and psychological consequences of disasters for individuals and communities are typically overlooked and outside the purview of emergency response efforts. Different types of disasters, including natural, technological, and mass violence, have caused severe psychological impairment (Norris et al. 2001). In a comprehensive review of articles examining the effects of 130 disasters, Norris et al. (2001) found that in the U.S. technological disasters were more psychologically stressful than natural disasters. Evidence indicates disasters also have impacts at the community level (Erikson 1994).

The term *corrosive community* (Freudenburg 1993, 1997, 2000; Freudenburg & Jones 1991) captures a set of debilitating processes first identified in seminal research on technological disasters (e.g., Erikson 1976; Kroll-Smith & Couch 1990; Levine 1982). As the term implies, negative effects of some disasters damage individuals and communities over a long period of time (Freudenburg 1997, 2000). Although many factors have been identified as contributing to the emergence and persistence of corrosive communities, we contend that none are as debilitating as litigation processes that typically ensue to redress environmental, economic, social, and psychological damages.[1] To our knowledge, no study systematically examines social and psychological affects of litigation on individuals and communities and the degree to which these effects impede timely postdisaster recovery.

The analytical framework presented in this article and the specification of the structural equation models are based on assumptions primarily derived from natural disaster studies (Bolin 1982; Clausen et al. 1978; Dynes 1974; Peacock & Ragsdale 2000) and our extension of these studies to include key variables identified in literature on technological disasters (Erikson 1994; Freudenburg 1997). The litigation hypothesis and analytical framework developed below will be operationalized and evaluated for the *Exxon Valdez* oil spill (EVOS), a major twentieth-century technological disaster. We examine the litigation hypothesis by presenting data from structural equation models of event-related psychological stress and perceived community damage. Longitudinal data are available, allowing for an assessment of long-term (3.5 years) impacts of the EVOS and subsequent litigation on residents of a small resource-dependent fishing community in Prince William Sound, Alaska.

Disasters

Although systematic studies of disaster impacts began in the 1940s (e.g., Lemons 1957), much of the sociological research on disasters occurred in the 1960s and 1970s and examined short-term, immediate social responses to natural disasters (Fritz 1961; Kreps 1985; Quarantelli & Dynes 1977). From a sociological perspective, these studies have emphasized that consequences of any "crisis situation" can be viewed in terms of ecological vulnerabilities and social definitions constructed by people, organizations, and communities (Kreps 1989, 1998; Quarantelli 1998). Disasters emerge as "nonroutine events in societies . . . that involve conjunctions of historical conditions and social definitions of physical harm and social disruption" (Kreps & Drabek 1996:133).

Disaster outcomes are based on preexisting social structures and the consequences of these structures for both organizational and individual responses (Dynes 1993; Kreps 1985, 1989; Oliver-Smith 1996). Disasters are "catalysts for collective action," but more important they are also "systemic" events that permeate community social structure, producing social responses that are both emergent and constraining (Dynes 1974; Kreps 1985, 1998). The response of disaster victims is most often viewed in terms of a socially constructed "definition of the situation." Most natural disasters have been found to produce only limited long-term cultural, social, economic, and psychological consequences for individuals and communities (Drabek 1986; Green 1996; Mileti, Drabek & Haas 1975; Quarantelli 1985). Emergency response efforts are designed to provide social, economic, and financial support that generates an emergent "therapeutic community" (Barton 1969; Fritz 1961). As such, natural disasters are viewed as a "consensus-type" crisis, where coordinated response efforts push for a timely recovery for victims (Quarantelli & Dynes 1976).

Disaster researchers have distinguished natural disasters as "acts of God" and technological disasters as "human caused" (Barkun 1974; Fritz 1961). With the emergence of large-scale, human-caused disasters in the late 1960s and 1970s, however, the social and psychological significance of this typology became a source of discussion and debate in the literature. Different response patterns by victims have led researchers to investigate two distinct types of disasters — natural and technological (Cuthbertson & Nigg 1987; Goldsteen & Schorr 1982). The empirical validity of this distinction, according to technological disaster researchers, is supported by evidence documenting that "technological disasters create a far more severe and long lasting pattern of social, economic, cultural and psychological impacts than do natural [disasters]" (Freudenburg 1997:26). However, a number of natural disaster researchers have argued that such a distinction is theoretically and practically specious (Alexander 1993; Quarantelli 1992, 1998). This discourse continues to pervade much of the literature on disasters.

Corrosive Communities

In the aftermath of a catastrophic technological failure or toxic contamination of the biophysical environment, the defining characteristic of the postdisaster phase is the emergence of a corrosive community — that is, a consistent pattern of chronic impacts to individuals and communities (Baum 1987; Baum & Fleming 1993; Brown & Mikkelsen [1990] 1997; Clarke & Short 1993; Couch & Kroll-Smith 1985; Cuthbertson & Nigg 1987; Edelstein 1988, 2004; Erikson 1976, 1994; Freudenburg 1993, 1997; Freudenburg & Jones 1991; Green 1996; Kroll-Smith & Couch 1993a; Picou & Gill 2000). Technological disasters have been described as "conflict prone" and "never ending," because they often distribute imperceptible contaminants into the environment, creating risks and uncertainties about personal and ecological exposure (Erikson 1994; Hallman & Wandersman 1992; Kroll-Smith & Couch 1993b; Vyner 1988). It is worth noting that unconstrained competition between organizations, agencies, and local community groups following natural disasters can also seriously impede community recovery (Peacock & Ragsdale 2000).

From a wealth of research on technological disasters, three particularly significant factors for understanding why corrosive communities emerge and persist have been identified (Marshall, Picou & Gill 2003). These factors are (1) the mental and physical health of victims (Arata et al. 2000; Baum & Fleming 1993; Freudenburg & Jones 1991; Green 1996; Picou & Gill 1996, 2000); (2) "recreancy," or perceptions of governmental or organizational failure (Couch 1996; Freudenburg 1993, 1997, 2000; Marshall 2004; Marshall, Picou & Gill 2003); and (3) protracted litigation (Gill & Picou 1991; Marshall, Picou & Schlichtmann 2004; Picou 1996a, 1996b; Picou & Rosebrook 1993). The latter two factors will be discussed in greater detail.

Recreancy is a form of institutional malfeasance where an expert, or specialized organization, fails to carry out a responsibility that is expected of them (Freudenburg 1993, 1997, 2000). Evidence indicates recreancy is associated with heightened perceptions of risk (Freudenburg 1993; Marshall 1995), high levels of psychological distrust (Couch 1996), and perceived community damage. Mobilization of groups, organizations, and institutions should engender support and collective trust from disaster victims. The fact that litigation often exposes such experts, or specialized organizations, as irresponsible, incompetent, and untrustworthy contributes to a persistence of chronic disaster impacts through loss of trust in traditional institutional support systems (Freudenburg 1997, 2000). Thus, protracted litigation results in the loss of "trust and goodwill" in agencies and organizations established to protect the public (Edelstein 1988, 2004). Recreancy, another characteristic typical of technological disasters, contributes to a pattern of long-term psychological stress and perceived damage to the community.

Litigation

Compared to the legal systems of other economically advanced democratic nations, the U.S. system is uniquely adversarial and expensive (Kagan 2000). The litigation process itself can be a source of stress for litigants (Cohen & Vesper 2001; Lees-Haley 1988; Strasburger 1999). Indeed, "There is an inherent irony in the judicial system in that individuals who bring suit may endure injury from the very process through which they seek redress. The legal process itself is often a trauma" (Strasburger 1999:204). Limitations of an adversarial legal system are most revealed in multiparty cases that are factually and/or legally complex (Sward 1989). Litigation involving factual information that is scientifically complex necessitates the reliance, by both plaintiffs and defendants, on paid experts to collect and analyze data (Sward 1989). Without prior knowledge of the case or subject matter, judges face the arduous task of choosing between competing scientific claims presented by opposing experts (Sward 1989).

Lawsuits filed in the aftermath of large-scale technological disasters are typically complex because of the scientific nature of factual information and, in most cases, the involvement of multiple parties. In such cases, litigation is stressful due to the adversarial nature of the process itself and legal and scientific uncertainties regarding key aspects of the case. Human-caused disasters evoke a need to identify organizational and institutional entities that can be held accountable for reckless and wanton malfeasance. Yet, definitive identification of the "principal responsible party" is often confounded by inconclusive scientific findings, responsible party denial, and ineffective government response. As such, restoration of damage claims and community recovery are indefinitely deferred to the courts as litigants deal with complex and lengthy legal issues that originate from the "polluter pays" principle (Gill & Picou 1991; Picou 1996b; Picou & Rosebrook 1993). Although community responses to natural disasters may include legal claims by victims, technological disasters almost always result in class action and personal damage claims (Picou 1996b; Picou & Rosebrook 1993).

The significance and contribution of litigation to chronic disaster impacts are relatively unstudied in the sociological literature. Indeed, because of the very private nature of the "discovery" phase of litigation, as well as "sealed" legal settlements, systematic data on social and psychological consequences of litigation rarely have been collected and reported. Given this dearth of inquiry, we evaluate the hypothesis that communities damaged by disasters experience additional, significant impacts from litigation processes which, in turn, undermine a timely recovery process. These impacts include conflict over equitable damage payments, stress from protracted legal procedures, and uncertainty about litigation outcomes.

New Issues in Disaster Research

Recognizing contributions of earlier disaster research, we contend that an a priori classification of an event as either a "natural" or "technological" disaster is conceptually and analytically possible, but increasingly empirically difficult. We make this claim for two reasons. First, the dichotomy is problematic because disaster researchers are attempting to comprehend the impacts of a third type of large-scale disaster — terrorism (Marshall, Picou & Gill 2003; Waugh 1986; Webb 2002). On one hand, initial responses to the 9/11 attacks were similar to how people and communities typically respond to natural disasters (Webb 2002). On the other hand, factors identified in technological disaster research as causing community breakdown, rather than recovery, are beginning to surface (Marshall, Picou & Gill 2003). For instance, despite initial efforts by Congress and the Bush administration to forestall a "class action free-for-all," it now appears that litigation will be a central feature of post-9/11 long-term recovery. Attempting to fully understand the effects of the 9/11 attacks solely from disaster research literature belies the significance of disparate outcomes of the attacks, such as the "rally around the flag" effect, the number of fatalities, the simultaneous creation of a disaster and crime scene, and the degree of trauma experienced by those beyond "ground zero" (Marshall, Picou & Gill 2003).

Second, the severity and duration of disaster impacts may be ascribed to anthropogenic factors, even though a disaster itself may be perceived as an "act of nature" or "God." Two case studies lend credence to complexities arising from such a possibility. Erikson (1976) and other researchers, in the classic study of a dam collapse and subsequent massive flooding at Buffalo Creek, West Virginia, were puzzled that people seemed much more distressed than might be expected from a natural disaster. Researchers discovered that people did not consider the flood to be an "act of God," but rather, responsibility was attributed to a coal company for building an ineffective dam. Blocker and Sherkat (1992), examining the aftermath of a major urban flood, found that even though the flood was perceived to be a natural disaster, 65% of respondents assigned responsibility to government for not controlling nature.

If people begin to commit to a worldview in which all elements of the environment are befouled by the spoils of human endeavors, then all disaster events may be perceived as rooted in anthropogenic forces. Indeed, Beck (1992) argues that it is no longer viable to refer to the environment as "natural," since the sheer expanse of humanity and its by-products have extracted the "natural" from the environment. More than 40 years ago, Rachel Carson (1962) anticipated this perspective, asserting that everywhere on the planet there were measurable levels of DDT. In short, all disasters may be viewed as stemming from anthropogenic forces, with responsibility ascribed to industry or government for causing disasters, and to the latter for not enforcing regulations, anticipating disasters, or responding in a manner expected by victims.

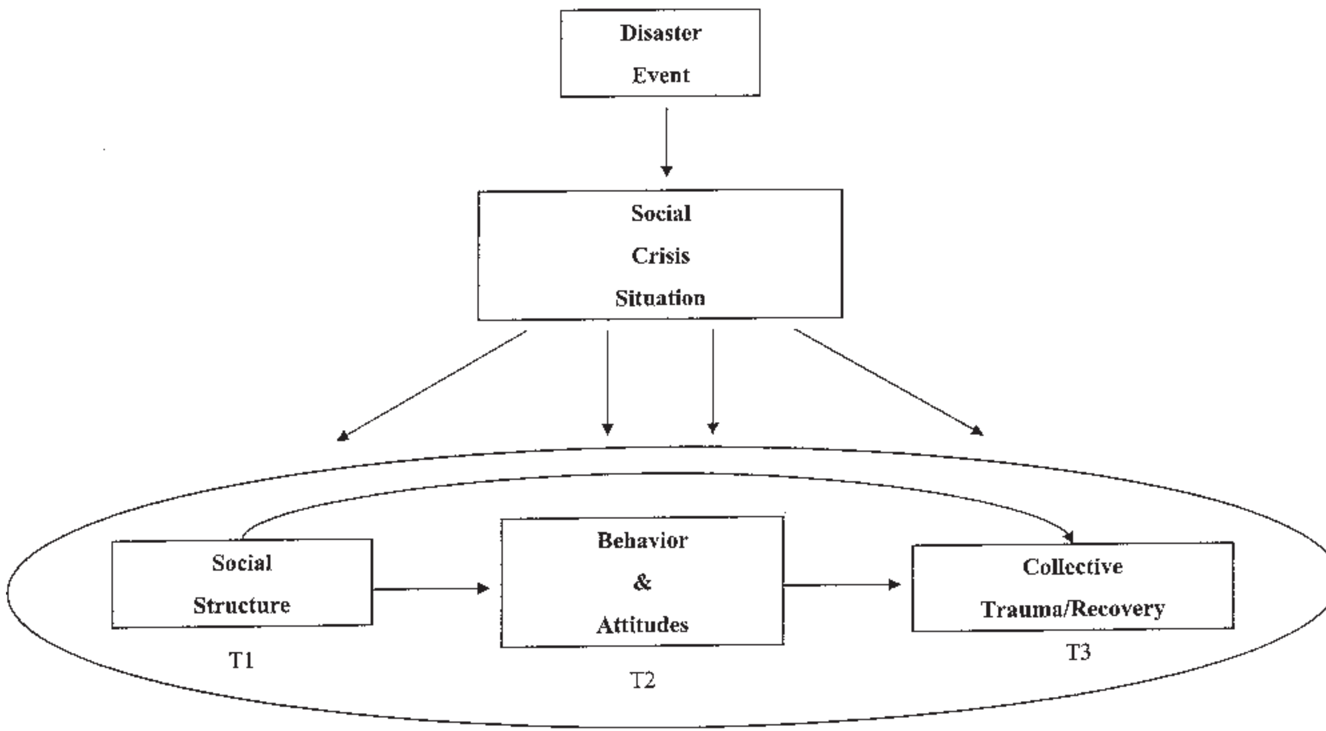
The model presented in Figure 1 provides a general interpretive framework enabling a study of disaster events without prematurely classifying an event as "natural" or "technological." The task for researchers is to identify variables explaining impacts of a disaster event on communities and individuals, some of which may be more characteristic of natural disasters (i.e., damage to the built and modified environments) and others more characteristic of technological disasters (i.e., damage to the biophysical environment). According to the model, all disasters lead to "social crisis situations" (Kreps 1985; Quarantelli 1985, 1998). In turn, the socially constructed "crisis situation" has an impact, albeit not monolithic, on existing community social structures. The severity of impacts is based on predisaster levels of structural and cultural vulnerability for different victimized groups (Bates & Peacock 1993; Bolin 1982; Dynes 1998; Morrow & Enarson 1996; Oliver-Smith 1996).

Over time, the social crisis context affects social structural characteristics, which, in turn, has consequences for the behaviors and attitudes of those most vulnerable to the impacts of a disaster event. We assume certain social structural characteristics facilitate effective coping and adaptation for some groups, whereas others may be disadvantaged by social structural location or resource characteristics (Arata et al. 2000; Bolin 1982). Outcomes of this model include either long-term collective trauma or collective recovery. Over time, the socially constructed disaster event continues to contribute to the cognitive, behavioral, and adaptive responses of victims.

The *Exxon Valdez* Oil Spill

The *Exxon Valdez* oil spill was the largest and most ecologically damaging spill in North American history. This event created a social crisis situation for numerous resource-dependent communities in the spill area. The spill occurred on March 24, 1989, in Prince William Sound, Alaska, and was followed by a response failure to the catastrophic release of 42 million liters of oil. By June 1989, oil had contaminated more than 1,900 kilometers of Alaskan coastline. Because the EVOS occurred during the season of greatest biological activity, it also had severe impacts on both the natural environment and resource-dependent communities in Prince William Sound (Lord 1997; National Response Team 1989; Spies et al. 1996). Long-term monitoring of ecological damages reveals that only six species (bald eagle, river otter, black oystercatcher, common murre, pink salmon, and sockeye salmon) had recovered by 2002 and that damage continues to plague many species of marine mammals, birds, and fish (*Exxon Valdez* Oil Spill Trustee Council 2002). Repeated failures

FIGURE 1: Conceptual Model for Chronic Disaster Impacts



of herring and salmon fisheries in Prince William Sound have resulted in declines in subsistence harvests, as well as negative economic impacts on local fishing communities and Alaska Native villages (Cohen 1995, 1997; Fall & Field 1996; Picou, Gill & Cohen 1997). Oil still remains in Prince William Sound, as demonstrated by a beach cleanup conducted eight years after the spill that located and retrieved substantial amounts of toxic *Exxon Valdez* oil (Heintz, Short & Rice 1999). Marine scientists have determined that severe declines in herring and pink salmon fisheries appear to be related to chronic contamination of spawning areas in Prince William Sound (Carls, Rice & Hose 1999; Heintz, Short & Rice 1999).

The EVOS also resulted in hundreds of civil and criminal law suits. By all standards, the EVOS resulted in "high stakes" litigation (Picou 1996b). With billions of dollars on the line, legal deliberations on this event will continue well into the future (Hirsch 1997). By 1990, many local fishermen, business owners, and Alaska Natives in Prince William Sound were involved in the most complex and protracted court case regarding environmental contamination in the history of maritime law. As of 2003, no substantive damage payments have been made, despite a $5.3 billion jury verdict rendered in September 1994 (Hirsch 1997).

Previous litigation in 1989 found the state of Alaska filing civil lawsuits against Exxon for compensation of damages. Exxon countersued, claiming that the state of Alaska did not allow the company to effectively and properly respond to the spill. In 1990, the U.S. Department of Justice filed criminal charges against Exxon, and, in 1991, Exxon came to agreement on criminal charges and civil damages (Piper 1997). A $1 billion settlement ensued, with funds earmarked only for restoration of natural resources, with no money available to compensate individuals or communities for damages.

Research reveals severe initial and chronic psychosocial impacts of this disaster for Alaska Natives (Gill & Picou 2001; Palinkas et al. 1992, 1993). Studies have also identified high levels of social disruption and psychological stress for commercial fishermen in Prince William Sound, when contrasted with commercial fishermen in communities of Southeast Alaska not affected by the spill (Picou & Gill 1996, 2000; Picou et al. 1992).[2] Research has also provided descriptive information documenting typical long-term corrosive patterns observed for the EVOS and other technological disasters (Arata et al. 2000; Gill & Picou 1998). The present research expands this specific line of inquiry by evaluating a causal model of chronic disaster impacts from data collected in 1991 and 1992. Given our analytical framework, we suggest that disasters alter social structure on a systemic level and, in turn, that social structural change affects existing levels of vulnerability, resulting in disruptive and stressful social experiences. Together, social structural change and continuing social conflict and uncertainty result in chronic community damage and event-related psychological stress.

Methodology

Research Design

Data were collected as part of a longitudinal study of social and economic impacts attributed to the EVOS (Cohen 1995; Gill 1994; Picou & Gill 1996; Picou et al. 1992). Data collection originated in Cordova, Alaska, in 1989 and continued through 1992.[3] Cordova was selected as an "impact" community because it is economically dependent on commercial fishing and characterized by culturally prescribed subsistence behaviors. Cordova is a "renewable resource community," that is, a community with a resource-based economy and a blending of traditional and Alaska Native cultural values that link human behavior to the biophysical environment (Gill 1994; Gill & Picou 2001; Picou & Gill 1996; Picou, Gill & Cohen 1997). Cordova is located in southeastern Prince William Sound, is geographically isolated, and has a population that varies from 3,500 residents during the summer fishing season to fewer than 2,000 during the winter.

Data collection in Cordova in 1991 was designed as a geographically stratified, random household sample that incorporated and expanded an initial stratified, random sample selected in 1989 (Picou & Gill 1996; Picou et al. 1992). Surveys in 1991 were conducted by personal interviews and resulted in a sample size of 228 respondents. In July 1992, a follow-up mail survey was conducted in Cordova. This survey employed a modified version of Dillman's mail survey protocol (Dillman 1978). A small number of surveys were also administered in the field. The final sample size for the 1992 Cordova household follow-up survey was 163 respondents.[4]

Indicators and Measures

The variables utilized in this study were derived from data available from 1991 and 1992 household surveys administered in Cordova. Social structural characteristics of respondents were determined by 1991 data on gender (0 = female; 1 = male), marital status (0 = unmarried; 1 = married), occupation (0 = nonfisherman; 1 = fisherman), and involvement in oil spill litigation (0 = nonlitigant; 1 = litigant). The measurement scales used were constructed from data collected in 1992 and include work disruption, litigation stress, recreancy, oil spill risk, community attachment, community damage, and intrusive stress. Scales range from three to seven items and, unless otherwise noted, the response set for items is a five-point Likert scale (strongly agree, agree, neutral, disagree, strongly disagree).

Work Disruption

This scale was constructed in terms of three items measuring disruptive changes in “future plans of respondents,” “future plans of family members,” and “changes at work.” Responses for each item were coded “0” for no work disruption and “1” for work disruption. The final scale was composed by summing the scores for all items. The Cronbach’s alpha coefficient for this scale was .67.

Community Attachment

This scale consisted of four items measuring appropriateness of the Cordova community for “raising children,” “meeting needs,” “being a great place to live,” and “being unaffected by the spill.” The Cronbach’s alpha coefficient for this scale was .75.

Recreancy

This institutional trust scale was constructed from five items measuring the trust respondents had in actions and policies of organizations and institutions responding to the EVOS. These items measured feelings that specific institutions and organizations (i.e., federal government, Alaska government, Exxon, Alyeska Pipeline Corporation, and VECO — the cleanup contractor) honestly responded to spill-related issues. The alpha coefficient for this scale was .92.

Litigation Stress

This scale consisted of three items that operationalized litigation stress through “time spent with attorneys,” “demands made by litigation,” and “unpleasant memories from the litigation experience.” The alpha coefficient for this scale was .81.

Oil Spill Risk

This scale was developed from responses to items that measured “being upset by tankers operating in Prince William Sound,” “feeling that another big oil spill would probably never occur,” and “feeling that environmental damages from the EVOS would eventually be gone.” The alpha coefficient for this scale was .62.

Community Damage

This scale was operationalized by summing four items measuring the degree to which people in the community “had changed,” “were stressed,” “had financial problems,” and “had suffered more problems since the spill.” The alpha coefficient for this scale was .82.

Intrusive Stress

This variable was measured by the intrusive stress component of the Impact of Event Scale (IES) (e.g., see Horowitz 1976; Horowitz, Wilner & Alvarez 1979). This seven-item scale measures event-related intrusive recollections and is a standardized indicator utilized in mental health research. The IES has also been found to be correlated with clinical diagnoses of posttraumatic stress disorder and other stress-related illness (Baum & Fleming 1993). For each question, respondents indicated if, during the "past seven days," a specific intrusive recollection occurred "not at all," "rarely," "sometimes," or "often." The alpha coefficient for this scale of EVOS-related psychological stress was .91.

Statistical Analysis

Structural equation modeling (SEM) combines factor analysis and multiple regression. SEM differs from principal components analysis and exploratory factor analysis in that it takes a confirmatory approach to multivariate data analysis; that is, the pattern of interrelationships among the constructs is specified a priori and grounded in established theory. SEM is more versatile than most other multivariate techniques — such as multiple regression, MANOVA (multiple analysis of variance), discriminant, and canonical analyses — because it allows for simultaneous estimation of all coefficients in the model. The ability to simultaneously treat variables as both independent and dependent constructs allows estimation of direct and indirect effects. One of the most important strengths of SEM is its ability to correct for measurement error. Other multivariate analytical tools are limited by the assumption of error-free relations among variables.

Two types of variables are used in SEM. Latent variables are unobserved latent constructs. Manifest variables are observed measures associated with each latent variable. The estimation method used in AMOS is maximum likelihood (generalized least squares).[5] We used the two-step modeling procedure (e.g., see Anderson & Gerbing 1988; Kline 1998). The measurement model is specified in the first step. This model is similar to confirmatory factor analysis in that the unobserved latent constructs (factors) are posited as underlying causes of observed manifest variables (indicators). If the overall fit of the measurement model is poor, then the researcher must locate the source of poor model fit before moving to the next step. Given an acceptable measurement model, the second step is to specify the structural model. The structural model, similar to path analysis, identifies relationships (directional or bidirectional) between latent constructs. The two-step procedure is recommended because it allows researchers to better pinpoint the source of poor model fit (Kline 1998).

Goodness-of-fit indices used to evaluate structural equation models are numerous and a source of considerable discussion among researchers (e.g., see Bollen & Long 1993; MacCallum 1990; Mulaik et al. 1989). Although differing opinions abound regarding particular fit indices, most agree that the chi-square statistic is problematic and thus a model should not automatically be rejected if chi-square is large and significant (the traditional null hypothesis is reversed for SEM — the model is supported by failing to reject the null hypothesis).

The following indices are reported: chi-square, relative chi-square, goodness-of fit (GFI), comparative fit (CFI), and root mean square error of approximation (RMSEA). Relative χ^2 in AMOS is labeled CMIN/DF, which is the χ^2-fit index divided by the degrees of freedom, thus making it less dependent on sample size. Some researchers suggest CMIN/DF values as large as 5 indicate an adequate fit, but we use Kline's (1998) more restrictive criteria of 3 or less. GFI varies from 0 to 1 and, by convention, should be equal to or greater than .90 to accept the model. CFI varies from 0 to 1, with a value close to 1 indicating a very good fit and a value above .90 indicating an acceptable fit (Bentler 1990). The CFI is considered to be a good general purpose index that is consistent across varied sample sizes (Gerbing & Anderson 1993; Quintana & Maxwell 1999).

RMSEA is recommended because it uses a confidence interval, rather than a point estimate (Quintana & Maxwell 1999). A poor-fitting model can be rejected if the 90% confidence interval for RMSEA falls below the somewhat arbitrary value of .10 (MacCallum, Browne & Sugawara 1996). The conventional interpretation of RMSEA values is as follows: 0 = exact fit, < .05 = close fit, .05–.08 = fair fit, .08-.10 = mediocre fit, and > .10 = poor fit (MacCallum, Browne & Sugawara 1996; Quintana & Maxwell 1999). RMSEA assesses degree of fit between the data and hypothesized model.

Results

The hypothesized community damage and intrusive stress models are specified as fully saturated models, with casual paths from each social structural variable (commercial fisherman, litigant, gender, and marital status) to each intermediate construct (work disruption, litigation stress, recreancy, oil spill risk, and community attachment), and from each intermediate construct to the endogenous dependent variables (community damage and intrusive stress). The social structural variables were allowed to covary.

In AMOS, the significance of a specific path coefficient is evaluated by a *t*-test labeled "C.R." (critical ratio). If the critical ratio is greater than or equal to 1.96, then the coefficient is significant at the .05 level. All factor loadings in the measurement models (community damage and intrusive stress) were statistically significant. Overall, most factor loadings (standardized regression coefficients) were fairly large for each of the six latent constructs — litigation stress (range of .709–.861), recreancy (.708–.890), oil spill risk (.505–.674), community attachment (.715–.797), community damage (.471–.799), and intrusive stress (.648–.813). Twenty of the 27 factor loadings were larger than .700.

The community damage and intrusive stress measurement models met the requirements for identification. The number of observations was greater than the number of free parameters, and each latent construct was measured by at least two manifest variables (Kline 1998). Based on the fitted covariance matrices and the modification indices, a second measurement model identical to the initial analysis was calculated, with two exceptions. The residual variances of the indicators measured by two latent constructs (specifically, the recreancy construct in the community damage model and the intrusive stress construct in the intrusive stress model) were allowed to covary. These respective modifications improved the goodness of fit of the community damage and intrusive stress measurement models. The goodness-of-fit indices and path coefficients presented below were drawn from the modified measurement model.

Community Damage Model

As shown in Table 1, the χ^2 value for the measurement model is 211.3 (df = 139), indicating there was not an exact fit to the data. Values of other fit indices (χ^2/df = 1.52; GFI = .88; CFI = .96), however, reveal that the measurement model adequately fits the data. Finally, the 90% confidence interval for the RMSEA was .04 to .07 for these data, suggesting a fair fit with the data. Given the limitations of the χ^2 statistic, the values of the other fit indices, and the significance and size of the factor loadings, we proceeded to the second step of the two-stage process.

The χ^2 value for the structural model is 431.0 (df = 223), indicating there was not an exact fit to the data. Values for other fit indices (χ^2/df = 1.93; GFI = .81; CFI = .89) indicate that the structural model adequately fits the data. The RMSEA interval (.07–.09) indicates a fair fit to the data. The fit indices for the structural model are not as strong as those for the measurement model. Loss of fit may stem from increased complexity of the structural model coupled with the caveats of using SEM with a small sample size (N = 163).

Table 2 presents unstandardized regression coefficients, standard of error, critical ratios, and standardized regression coefficients for each path in the structural model. Each nonsignificant path (C.R. $\geq$ 1.96) was omitted from Figure 2 only for presentation purposes — model trimming was not used to respecify the model. As such, the goodness-of-fit indices (above) and the path coefficients (below) were derived from the initial model.

The parsimonious community damage model is presented in Figure 2. Notably, the squared multiple correlation of .73 was very strong, indicating that the five manifest and four latent variables accounted for 73% of the variance

TABLE 1: Goodness-of-Fit Indices for Community Damage and Intrusive Stress Models

	N	df	χ^2	p	χ^2/df	GFI	CFI	RMSEA
Community Damage								
Measurement	163	139	211.3	.000	1.52	.88	.96	.04–.07
Structural	163	223	431.0	.000	1.93	.81	.89	.07–.09
Intrusive Stress								
Measurement	163	170	252.4	.000	1.49	.88	.96	.04–.07
Structural	163	264	510.5	.000	1.93	.81	.89	.07–.09

of community damage. The path coefficients in Figure 2 are standardized regression coefficients. The mediating variables of work disruption, litigation stress, recreancy, oil spill risk, and community attachment all had significant direct effects on community damage. Relatively speaking, litigation stress had the strongest effect ($\beta = .44$) on community damage, followed in order by oil spill risk (.33), recreancy (.30), community attachment (.24), and work disruption (.18).

AMOS also provides the standardized indirect effect of each variable on community damage (not presented in Figure 2). Of the four manifest social structural variables in the model, litigant status had the strongest standardized indirect effect ($\beta = .48$) on community damage through its significant direct effects on four of the five mediating variables — work disruption, litigation stress, recreancy, and oil spill risk. The standardized total indirect effect of litigant status is more than double the indirect effect of the next-strongest variable. The standardized indirect effect of commercial fisherman on community damage was found to be .23 through the mediating variables work disruption, recreancy, and community attachment. The standardized indirect effects of gender (via oil spill risk and community attachment) and marital status (via community attachment) were –.21 and –.08, respectively.

In summary, perceptions of chronic community damage were primarily predicted by variables associated with the litigation process. Being a litigant predicted work disruption, stress from litigation, a lack of trust in institutions (recreancy), and perceptions of increased risk for future spills (oil spill risk). All of these characteristics predicted perceptions of chronic community damage, with litigation stress manifesting the strongest direct effect. Compared to men, women were more likely to fear future spills and more attached to the Cordova community. Married respondents were more attached to the community than nonmarried respondents. Commercial fishermen had their work disrupted more often, became less trusting of institutions, and were more attached to the community than those in nonfishing occupations. Impacts of litigation and

TABLE 2: Unstandardized and Standardized Regression Coefficients for Paths in the Community Damage Model

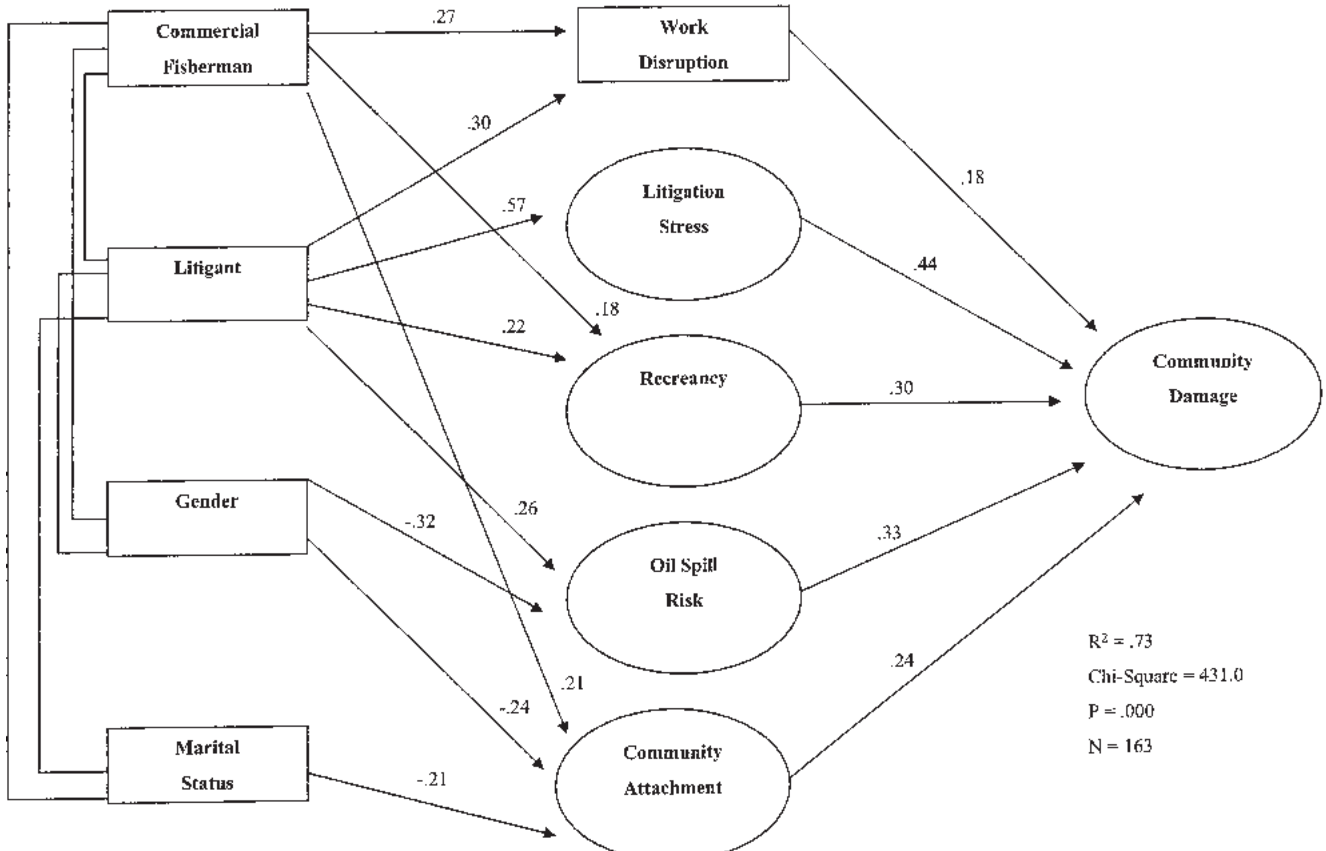
Regression Weights	Estimate	SE	Critical Ratio	Standardized Coefficient
Work Disruption				
Fisherman	.601	.179	3.357	.266
Litigant	.648	.167	3.873	.295
Gender	–.246	.161	–1.525	–.111
Marital status	–.118	.207	–.571	–.040
Litigation Stress				
Fisherman	.252	.193	1.301	.104
Litigant	1.342	.188	7.132	.571
Gender	–.184	.174	–1.059	–.078
Marital status	.156	.224	.697	.049
Recreancy				
Fisherman	.345	.170	2.024	.177
Litigant	.423	.160	2.653	.224
Gender	.017	.153	.110	.009
Marital status	–.054	.197	–.275	–.021
Oil Spill Risk				
Fisherman	.209	.171	1.219	.126
Litigant	.422	.165	2.560	.262
Gender	–.519	.161	–3.219	–.321
Marital status	–.227	.198	–1.146	–.105
Community Attachment				
Fisherman	.306	.139	2.205	.208
Litigant	.146	.129	1.133	.102
Gender	–.342	.125	–2.729	–.238
Marital status	–.400	.161	–2.482	–.208
Community Damage				
Work disruption	.151	.053	2.826	.180
Litigation stress	.343	.061	5.613	.437
Recreancy	.289	.065	4.423	.296
Oil spill risk	.374	.103	3.635	.326
Community attachment	.303	.091	3.312	.235

recreancy on perceptions of chronic community damage are apparent in Figure 2.

Intrusive Stress Model

As presented in Table 1, the χ^2 is 252.4 (df = 170) for the measurement model, indicating there was not an exact fit to the data. Values for other fit indices (χ^2/df = 1.49; GFI = .88; CFI = .96; RMSEA = .04-.07) indicate that the measurement model adequately fits the data. In the second step of the two-stage

FIGURE 2: Parsimonious Causal Model for Community Damage



process, the results (χ^2 = 510.5, df = 264) indicate that there was not an exact fit to the data for the structural model. Values for the other fit indices (χ^2/df = 1.93; GFI = .81; CFI = .89), however, indicate that the structural model adequately fits the data. The RMSEA interval (.07-.09) suggests a fair to mediocre fit to the data. As with the community damage model, the fit indices for the structural model are not as strong as those for the measurement model.

Table 3 includes unstandardized regression coefficients, standard of error, critical ratios, and standardized regression coefficients for each path in the structural model. For presentation purposes, nonsignificant paths (C.R. ≥ 1.96) are not included in Figure 3. It should be noted that the path coefficients (standardized regression coefficients) are derived from the initial structural model.

The parsimonious intrusive stress model is presented in Figure 3. The squared multiple correlation of .47 is fairly strong. The mediating variables of work disruption, litigation stress, and oil spill risk have a significant direct effect on intrusive stress. The direct effects of recreancy and community attachment on intrusive stress were not statistically significant. Litigation stress had the strongest direct effect (β = .44) on intrusive stress, followed by oil spill risk (.31) and work disruption (.18). Similar to the community damage model, litigant status had the strongest standardized total indirect effect (.39) on intrusive stress. This indirect effect was mediated through the work disruption, litigation stress, recreancy, and oil spill risk variables. The total indirect effects of commercial fisherman and gender on intrusive stress were .17 (via work disruption and community attachment) and –.12 (via oil spill risk and community attachment), respectively.

In summary, as with perceptions of chronic community damage, levels of spill-related psychological stress were predicted by characteristics (work disruption, litigation stress, and oil spill risk) of the litigation process. Recreancy and community attachment were significant intervening predictors of community damage but, contrary to expectations, not of intrusive stress. One possible explanation is that since recreancy and community attachment tap more cognitive, community-level assessments, they are significant predictors of community damage but not of intrusive recollections, which are more emotive, individual-level responses. Being involved in litigation produced stress related to the original trauma of the oil spill. Commercial fishermen were characterized by higher levels of psychological stress due to disruption of their fishing activities. Compared to men, women were more fearful of future spills, which, in turn, raised their levels of intrusive stress.

Discussion and Conclusions

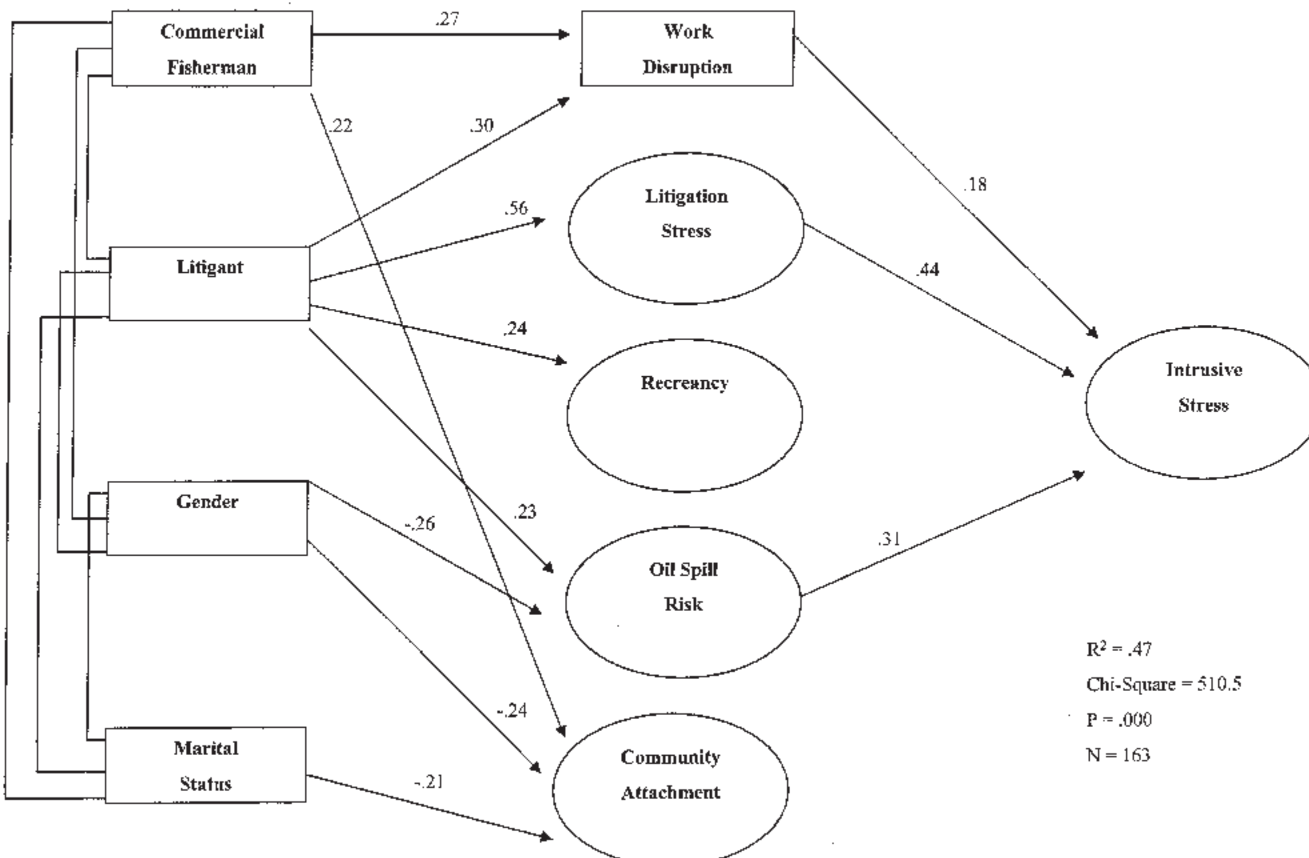
Extensive discourse in the sociological study of disasters has been preoccupied with the theoretical utility of classifying such events as either "natural" or

TABLE 3: Unstandardized and Standardized Regression Coefficients for Paths in the Intrusive Stress Model

Regression Weights	Estimate	SE	Critical Ratio	Standardized Coefficient
Work Disruption				
Fisherman	.601	.179	3.357	.266
Litigant	.648	.167	3.873	.295
Gender	–.246	.161	–1.571	–.111
Marital status	–.118	.207	–.571	–.040
Litigation Stress				
Fisherman	.305	.194	1.570	.126
Litigant	1.316	.188	6.985	.560
Gender	–.160	.174	–.916	–.068
Marital status	.085	.224	.379	.027
Recreancy				
Fisherman	.310	.168	1.848	.163
Litigant	.435	.157	2.763	.235
Gender	.052	.150	.346	.028
Marital status	–.078	.194	–.405	–.032
Oil Spill Risk				
Fisherman	.278	.157	1.769	.187
Litigant	.334	.150	2.235	.232
Gender	–.377	.146	–2.588	–.261
Marital status	–.304	.181	–1.679	–.157
Community Attachment				
Fisherman	.320	.140	2.289	.216
Litigant	.157	.130	1.211	.109
Gender	–.341	.126	–2.705	–.236
Marital status	–.402	.162	–2.480	–.208
Intrusive Stress				
Work disruption	.214	.085	2.512	.180
Litigation stress	.491	.096	5.115	.441
Recreancy	.145	.103	1.407	.102
Oil spill risk	.554	.178	3.119	.305
Community attachment	–.042	.139	–.303	–.023

"technological" in origin (Drabek 1994; Erikson 1994; Freudenburg 1997; Quarantelli 1998). In an attempt to move beyond this impasse, we have presented an analytical model of chronic disaster impacts that incorporate variables central to studies of both natural and technological disasters. The significance of social structural impacts has been established by decades of research on natural disasters (e.g., see Bolin 1982; Kreps 1989; Quarantelli 1998), while the importance of litigation and recreancy were derived from more recent research on technological disasters (Erikson 1994; Freudenburg

FIGURE 3: Parsimonious Causal Model for Intrusive Stress



1993). We contend that communities may be uniquely vulnerable to disaster-induced changes in social structure, which, in turn, has continuing consequences for chronic social and psychological impacts.

Longitudinal data collected in a resource-dependent fishing community affected by the EVOS were used to evaluate the utility of this framework. Using SEM techniques, results for the community damage and intrusive stress models support the analytical framework in terms of model fit and explanatory power. Most important for the focus of this research, the mediating variables — work disruption, litigation stress, recreancy, risk of future spills, and community attachment — were predicted by exogenous social structural characteristics. The indirect effects of social structure on event-related psychological stress and perceived community damage empirically verify our proposed theoretical relationships for understanding the dynamics of chronic disaster impacts previously documented by ethnographic studies (Drabek 1994; Edelstein 1988, 2004; Erikson 1994).

The contamination of Prince William Sound by oil from the *Exxon Valdez* represented, at once, an immediate and long-term threat to commercial herring, salmon, and halibut fisheries. Commercial fishing was immediately closed in many areas in 1989, and fishing seasons fell below expectations in 1991 and 1992 (Gill 1994). Commercial fishing provides the primary basis for occupational structures for renewable resource communities such as Cordova. The spill, cleanup, and subsequent work disruption affected not only commercial fishermen and their families but also many residents in fishing-related occupations (e.g., deckhands, net menders, electricians, etc.). The *Exxon Valdez* disaster amplified and exacerbated basic distinctions between fishing and nonfishing occupations in Cordova's social structure.

Initially, commercial fishermen were affected by the spill in terms of complete disruption of their harvest activities in 1989. Furthermore, this occupational group experienced relatively high levels of recreancy, or loss of trust in the institutions and organizations responsible for the spill and subsequent cleanup activities. Commercial fishermen were also found to have relatively strong positive feelings about their community in terms of "being a good place to live" and "raise children" and of "meeting family needs." In short, the EVOS directly affected the social structure of a renewable resource community (Cordova) by disrupting commercial fishing harvests. In turn, work disruption, loss of institutional trust, and community attachment were all intervening variables predicted by occupational status and subsequently predicted perceptions of community damage three and one-half years after the EVOS. Psychological stress was also indirectly affected by impacts to the occupational structure through the intervening variables of work disruption and community attachment.

According to our data analysis, however, the most important social structural characteristic was being a plaintiff in the civil litigation. In fact, one could argue that the EVOS generated a new and problematic social structural characteristic in Cordova, that is, the status of litigant. In turn, litigants became vulnerable to a secondary source of trauma, litigation stress, which resulted from time spent with lawyers, trying to understand complex litigation issues, and recurrent unpleasant memories of the spill. Litigants were similar to nonlitigants in our sample, with two exceptions.[6] First, more litigants (58%) were employed in commercial fishing than nonlitigants (19%), and second, average household income was considerably higher for litigants ($105,000) than nonlitigants ($55,000). These differences are not surprising given dependence on commercial fishing in this renewable resource community. Litigants also exhibited higher levels of intrusive stress and perceived more community damage than nonlitigants. Specifically, intrusive stress was higher for litigants, in part because they experienced more work disruption, were more stressed from litigation processes, and had heightened fears of future oil spills. Litigants perceived more community damage than nonlitigants for the same reasons outlined above, but also because they had a stronger attachment to the Cordova community and manifested a greater loss of trust in organizations and institutions responsible for spill prevention and response.

Stress and uncertainty generated by contamination of the biophysical environment and failure of a technology guaranteed by experts to be infallible seem to be extended and exacerbated by participation in litigation. Certainly, a lack of a resolution to damage claims produces economic stress, as well as increased personal and collective attention to adversarial discourses characteristic of "high stakes" litigation (Picou 1996a, 1996b). Economic damages to local fisheries in 1989 and 1990 attributed to the EVOS totaled more than $154 million (Cohen 1995, 1997), reflecting the economic significance of litigation for victims in the Cordova community. Perhaps equally important, but more difficult to quantify, is the cultural and spiritual significance of damage to the biophysical environment and community. Furthermore, negative consequences of these damages may be significant long after lawsuits are settled and the economy has recovered.

We conclude by posing a question that should serve as a guide for future disaster research. How do we mitigate social and psychological impacts of adversarial litigation, thus facilitating timely recovery for victims? The first answer, in postdisaster situations where protracted litigation is unavoidable, is implementation of a long-term clinical intervention program, one that simultaneously enables therapeutic processes and disables corrosive processes (Couch 1996, 1999; Marshall, Picou & Gill 2003; Picou 2000; Picou, Johnson & Gill 2001; PWSRCAC 1999). Evidence regarding a clinical intervention program administered after the EVOS disaster (from January 1996 to February 1997) indicates modest short-term reduction in event-related intrusive stress, but long-term recovery remains elusive due, in part, to ongoing litigation (Marshall, Picou & Schlichtmann 2004; Picou 2000; Picou, Gill & Cohen 1997; PWSRCAC 1999). For instance, intrusive stress levels for litigants were higher in 2000, eleven years after the spill, than in 1991 (Marshall, Picou & Schlichtmann 2004). What is more, evidence from multiple regression analyses indicates that being involved in oil spill litigation became a relatively stronger predictor of intrusive stress over time (1992 to 2000), whereas being in a fishing-related occupation was a significant predictor of intrusive stress in 1992 but not in 2000 (Marshall, Picou & Schlichtmann 2004). Most important, our results suggest that intervention strategies for reducing chronic social and psychological impacts of disasters may be severely limited due to the adversarial nature of our legal system, the legal policy of the "polluter pays" principle, and the "burdens of proof" required of disaster victims. It is more than ironic, in fact tragic, that the very process of bringing closure to the EVOS — that is, litigation — is in and of itself a source of chronic psychological stress and community damage.

The second answer is to circumvent chronic effects of adversarial litigation altogether by employing nonadversarial legal means of adjudication. Alternative dispute resolution (ADR) mechanisms include arbitration, negotiation, minitrials, mediation, and use of independent court-appointed experts (Sward 1989). Examples of effective applications of ADR mechanisms include the standstill agreement and negotiated settlement in the contaminated drinking water case in Toms River, New Jersey; the negotiated partnership in a contaminated water case in Groton, Massachusetts; and the court-ordered research in a train derailment case in Livingston, Louisiana (for a review of these cases, see Marshall, Picou & Schlichtmann 2004). By usurping protracted litigation, ADR mechanisms in each of these cases may have averted what otherwise could have been a source of secondary trauma to victims of the initial disaster.

As one theorist contends, "The legacy of industrial society's faith in progress is that the legal system assumes that industrial production will be benign unless demonstrated otherwise" (Goldblatt 1996:166-67). Our findings suggest that the legal system itself can become a secondary disaster, exacerbating and prolonging psychological stress and perceived community damage. Indeed, as technological disasters increase and as natural disasters increasingly are viewed as human caused, the legal system in an already litigious society will play an even more prominent role in postdisaster damage awards. Given our findings and the fact that the *Exxon Valdez* litigation has yet to be resolved, future research needs to examine long-term consequences of litigation and its subsequent correlates for individuals and communities characterized by various forms of collective trauma. More important, we also need to assess what types of postdisaster scenarios would prove most effective for ADR strategies and what incentives are necessary to entice all parties involved to engage in such nonadversarial resolutions for future technological disasters.

Notes

1. Litigation is neither a "universal" nor "culturally specified" characteristic of technological disasters. It is, however, a defining characteristic of most technological disasters in the U.S. (e.g., see Erikson 1994; Picou 1996b; Picou & Rosebrook 1993) and, to a lesser degree, characterizes such events in Europe. Litigation was a part of restitution for the Bhopal chemical disaster and the *Amaco Cadiz* oil spill. Nonetheless, litigation does not characterize technological disasters in China, Russia, Somalia, and many developing countries. With increased environmental consciousness and human rights recognition, however, litigation may become a global characteristic of such events in the future.

2. Although there are several women who fish commercially, most prefer to be called commercial fishermen rather than commercial fishers or some other gender-neutral label. Thus, we use the term "commercial fishermen" to denote all individuals engaged in commercial fishing.

3. The original research design included a demographically matched control community located in Southeast Alaska. Data from the control community (Petersburg) are not included in the present study (for more information, see Picou & Gill 1996; Picou et al. 1992).

4. In 1991, 228 respondents completed the survey. Of these respondents, 163 completed the follow-up survey in 1992. Thus, 65 of the 1991 respondents did not participate in 1992. We compared the 1992 respondents with those who did not respond in 1992. We can make this comparison only for variables in our model that were collected in the 1991 survey. Cross-tabulation procedures and independent sample t-tests were used to identify statistically significant ($p < .05$) group differences between 1992 participants and nonparticipants. The comparison included the variables measured by the intrusive stress, oil spill risk, and work disruption scales. Differences between the 1992 participants and nonparticipants were not statistically significant for any of the three attitudinal constructs. Of the four social structural variables in the model (gender, marital status, occupation, and oil spill litigant), only marital status differences were statistically significant. More participants (83.4%) were married than nonparticipants (67.1%); thus, married people were slightly overrepresented in the 1992 survey.

5. AMOS is a statistical package with the name based on an acronym for "analysis of moment structures."

6. In order to better characterize the litigants in Cordova, we compared litigants and nonlitigants on a number of different characteristics. Given that 46% of the respondents were male, litigants were somewhat disproportionately male (51%) compared to nonlitigants (41% male). Minimal differences exist regarding marital status, with 85% of litigants married and 82% of nonlitigants married. Similarly, litigants (13.1) and nonlitigants (14.1) had roughly the same number of years of education. On average, litigants were 42 years old and had lived in the community for 20 years; nonlitigants

were slightly older (45) and had lived in the community for about the same number of years (19). It should be noted that none of the above differences between litigants and nonlitigants were statistically significant.

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