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ECOLOGICAL DISASTER AS CONTEXTUAL TRANSFORMATION

Environmental Values in a Renewable Resource Community

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ABSTRACT: The biophysical context and contextual change have significant economic, cultural, social, and psychological consequences for individuals and communities. Although acknowledging the importance of the biophysical context for theoretical and conceptual issues, social science research typically is conducted as if context does not matter. The authors discuss the relevance of context and outline research that examines the effects of context through assumed contextual variation, subjective contextual variables, objective contextual variables, and temporal contextual variation. The authors hypothesize that an ecological disaster occurring in a community where people are connected to the biophysical environment and ecological processes will result in the adoption of a more ecological worldview. This hypothesis is tested by analyzing data collected in the renewable resource communities of Cordova and Petersburg, Alaska, in the aftermath of the 1989 Exxon Valdez oil spill. The authors find support for this hypothesis and provide suggestions for future research.

Keywords: *ecological disaster; contextual transformation; environmental values; oil spill*

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As water tables fall, rivers run dry, freshwater aquifers deplete, productive top soil blows away, deserts advance, temperatures rise, snow and ice masses in the mountains melt, and oceans rise, the modern world is becoming a "civilization in trouble" precariously living on a "planet under stress" (L. Brown, 2003). In addition, massive ecological disasters, which result from technological failure, the side effects of agricultural and industrial production and human error, also provide examples of localized degradation of the biophysical environment (Beck, 1992; Erikson, 1976; Perrow, 1984). Indisputably, the effects of environmental degradation are not evenly distributed with people in developing nations and poor people in developed nations often living in the trenches, bearing the frontal assault of a stressed planet (Marshall, 1999). Yet with the systematic spatial and temporal expanse of contemporary environmental problems, even the most affluent will be less able to protect themselves from these changes in environmental quality (Beck, 1992). As the biophysical environment deteriorates from both chronic and acute forms of contamination, the sociological significance of ecological processes and healthy ecosystems will become increasingly apparent. As such, this research focuses on the biophysical environment and environmental change, areas typically omitted from sociological analysis. These events are viewed as having significant economic, cultural, social, and psychological consequences for individuals and communities.

More specifically, this research addresses the following question: What are the consequences of an ecological disaster on the environmental values of residents living in an isolated, renewable resource community? We hypothesize that an ecological disaster occurring in a community where people are socially, culturally, and economically connected to the biophysical environment and ecological processes will result in the adoption of a more ecological

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worldview. This hypothesis is examined by analyzing data collected in the renewable resource communities of Cordova and Petersburg, Alaska, in the aftermath of the 1989 Exxon Valdez oil spill (EVOS).

ENVIRONMENTAL VALUES

Most of the quantitative research on environmental values, attitudes, and beliefs tends to focus on two different sets of causal antecedents: socio-demographic characteristics or social-psychological constructs (Dietz, Stern, & Guagnano, 1998). Research on the sociodemographic antecedents of environmentalism has been plagued by inconsistent findings mostly due to the ambiguous meaning of the term *environment* and the fact that this meaning has varied over time (Dunlap & Jones, 2002). Based on an exhaustive review of studies on gender and environmental concern, Davidson and Freudenburg (1996) found that women are more concerned about health and safety issues than are men. Thus, "If a survey measures environmental attitudes in ways that trigger risk perceptions, women will score higher in concern than men" (Bord & O'Connor, 1997, p. 832). Although some evidence indicates that environmental concern differs by race, the relationships are slight in magnitude and vary in direction (Mohai, 1990). Despite mixed results, studies consistently find that people who are younger, highly educated, and politically liberal are more concerned about the environment than are their respective counterparts (Jones & Dunlap, 1992; Klineberg, McKeever, & Rothenbach, 1998; Van Liere & Dunlap, 1980).

Many researchers have examined environmentalism from a social-psychological perspective (Dietz et al., 1998; McFarlane & Boxall, 2003; Poortinga, Steg, & Vlek, 2004; Stern, 2000; Stern, Dietz, & Guagnano, 1995). Stern et al. (1995) present a widely used framework they call a Schematic Causal Model of Environmental Concern (p. 727).¹ The framework consists of six tiers with the following levels specified from the top or deepest tier to the most concrete tier: position in the social structure; values; general beliefs, worldview, and folk ecological theory; specific beliefs and attitudes; behavioral commitments and intentions; and behavior. Causal linkages are stronger from top to bottom, but reverse linkages or feedbacks are hypothesized to exist. The causal relationship between adjacent tiers is strongest, although nonadjacent tiers may have direct causal linkages.

As noted by Dietz et al. (1998),

Theory development has been hampered because studies on national or other broad samples that have substantial demographic variation lack adequate measures of a social psychological model, whereas data sets developed to test social psychological theories usually have limited demographic variation. (p. 451)

Overcoming past methodological weaknesses, some authors have integrated sociodemographic and social-psychological variables in multivariate analyses (Dietz et al., 1998; McFarlane & Boxall, 2003). Despite such advances, researchers focusing on sociodemographic characteristics and/or social-psychological constructs implicitly assume that values, attitudes, and beliefs regarding the environment are formed independent of the social and ecological context in which people are ultimately embedded. Environmental attitudes and values are typically examined as if context does not matter. On the contrary,

Values abstracted from context are relatively meaningless Environmental ideas and actions are responses on the part of people with particular aspirations and perceptions about their lives and surroundings. Analysis needs to understand how these aspirations and perceptions interact with changing environmental circumstances. (Lowe & Rudig, 1986, p. 520)

RELEVANCE OF THE BIOPHYSICAL CONTEXT

In this section, we briefly discuss the theoretical, conceptual, and empirical relevance of the biophysical context and change for the social sciences and social-psychological research. Evidence suggests that biophysical change does influence the attitudes and behaviors of individuals. For instance, environmental degradation has influenced the U.S. environmental movement with the preservation and conservation movements arising to thwart unchecked natural resource exploitation in the late 1800s and with the contemporary movement emerging in the 1960s to address the problems of industrial pollution (cf. Douglas & Wildavsky, 1982; Nash, 1989). The scope and enduring character of the environmental movement are evidence that a relatively small, but increasingly heterogeneous, portion of the U.S. population is sensitized to a broad range of environmental problems and is willing to act accordingly. For instance, membership in national environmental lobbying organizations (e.g., Sierra Club, Audubon Society, etc.) increased from

123,000 in 1960 to 3,865,000 in 2000 (Mertig, Dunlap, & Morrison, 2002). Thus, the potential explanatory power of biophysical context and change has increased considerably as we begin the 21st century.

THEORETICAL AND CONCEPTUAL DEVELOPMENT

Since the 1960s and 1970s, in response to more frequent and visible environmental problems and widespread environmental awareness, some social scientists have treated the biophysical environment as a core rather than peripheral concept in theorizing about social and cultural change. For example, theories of the dynamic relationship between social and ecological systems at the societal level (ecological modernization and risk society) and at the community level (ecological-symbolic management, resource-dependency management, and ecosystem management) have received much attention from politicians, bureaucrats, and academics in Europe and the United States (for a review of these theories, see Picou & Marshall, 2002). Relatedly, academic specializations within sociology and psychology emerged during this period in part to argue that biophysical context and change are potentially significant independent variables and should be included in analyses.

Within sociology, the defining distinction between sociology-of-the-environment research and the emergent specialization of environmental sociology is that the latter acknowledges biophysical change as a potential determinant of social change (Dunlap & Catton, 1979). The worldview of traditional sociology, the Human Exemptionalism Paradigm (HEP), assumes that humans are exempt from ecological processes and environmental constraints. In contrast, the worldview underpinning environmental sociology, the New Ecological Paradigm (NEP), views humans as embedded in ecosystems and affected by ecological processes. The HEP-NEP distinction has implications broader than those within sociology because there is evidence that lay people are beginning to adopt a more ecological worldview (Dunlap, Van Liere, Mertig, & Jones, 2000).

During the 1960s, a contextual revolution occurred in psychology, shifting the search for laws from "the self-contained individual to the natural milieu within which that individual was located" (Little, 1987, p. 211). This contextual perspective is based, in part, on the core assumption "that psychological phenomena should be viewed in relation to spatial, temporal, and sociocultural milieu in which they occur" (Stokols, 1987, p. 42). This perspective assumes that contexts are dynamic (Clitheroe, Stokols, & Zmuidzinas, 1998; Stokols, 1987). Environmental psychology matured as a sub-

field, resulting in two edited publications of the *Handbook of Environmental Psychology* (Bechtel & Churchman, 2002; Stokols & Altman, 1987).

It is relevant for this research to delineate between two types of contextual change: shifts and transformations. Contextual shifts, such as global warming, are defined as subtle, incremental changes that do not disrupt normal or routine ways of behaving (Clitheroe et al., 1998). In contrast, ecological disasters that produce sudden and dramatic contextual changes, resulting in fundamental behavior modification for those affected, are called contextual transformations (Clitheroe et al., 1998; Erikson, 1976). Both contextual shifts and transformations can have effects on individuals and communities, but the latter are more likely to set in motion the type of social-psychological change that is of interest to social scientists and is measurable by social scientific methods. We contend that ecological disasters represent one type of contextual transformation as they disrupt and reveal the taken-for-granted relationships that individuals and communities have with the local biophysical environment.

EMPIRICAL INCLUSION

Despite much needed theoretical and conceptual development by environmental sociologists and psychologists, there is a paucity of research that includes biophysical contextual variables as predictors of sociological and psychological dependent variables. Indeed, we agree with Lowe and Rudig's (1986) claim that "the relation between environmental problems and environmental attitudes is . . . one of the major research topics which has not been adequately addressed" (p. 518). At the risk of oversimplification, empirical research has operationalized, or at least addressed, biophysical variation through four different approaches: assumed contextual variation, subjective contextual variables, objective contextual variables, and temporal contextual variation. It should be noted that the approaches used by researchers are often due to financial and/or methodological constraints rather than a priori ontological and epistemological positions. Our discussion of each approach, the accompanying methodological issues, and examples of relevant research is meant to be illustrative, not exhaustive, of studies examining the effects of biophysical change on attitudes and human behavior.

Using the first approach, assumed contextual variation, researchers typically collect cross-sectional data from individuals who recently experienced a contextual transformation or who live in a particular biophysical context that is assumed to be unique from other contexts. Although certain contextual characteristics may have prompted the research, contextual variables are typ-

ically not included in the analysis. Also, population parameters are defined within a particular geographical area, and it is assumed that people living in this area have been exposed to the same contextual characteristics or transformation equally. At a minimum, it is implicitly assumed that the observed relationships are in part related to the contextual change that has already occurred or the characteristics of the unique context. The most important methodological caveat for such studies is the lack of pretransformation data, or data collected from a control population. Thus, researchers are often unable to examine the degree to which the community has changed over time or even whether or not change is definitively caused by the disaster. Most disaster research takes this approach (Drabek, 1986). Reviews of disaster research indicate that people respond very differently to natural disasters than to technological disasters (Freudenburg, 1997), suggesting that characteristics of the contextual transformation have consequences for individual and community responses.

The second approach, subjective contextual variables, is used (without attempting to objectively measure contextual shifts, transformations, or contextual characteristics) to assess respondents' attitudes regarding context or contextual change. For instance, studies on the concepts sense of place and place attachment reflect this approach and form a burgeoning area of research. As defined by B. B. Brown and Perkins (1992), "Place attachment involves positively experienced bonds, sometimes occurring without awareness, that are developed over time from the behavioral, affective, and cognitive ties between individuals and/or groups and their sociophysical environment" (p. 284). These attachments influence how people perceive, experience, and value the environment (Cheng, Kruger, & Daniels, 2003). After experiencing a contextual transformation, people may become aware of the extent to which they were emotionally attached to place (B. B. Brown & Perkins, 1992; Vorkinn & Riese, 2001). Although early work in this area defines place as the confluence of social and cultural meanings, social political processes, and biophysical attributes and processes (Canter, 1977; Relph, 1976), most empirical research from this perspective omits the inclusion of the latter (Stedman, 2003). Thus, variables measuring the objective context or contextual change are typically not included in the analyses.

The third approach includes studies that specify objective contextual variables as predictors of social and psychological variables. The ability to operationalize objective contextual variables and to include these variables in social scientific analyses has increased exponentially with advances in geographic information systems (GIS) technology, satellite imagery, remote sensing, and statistical analysis. Few studies, however, utilize these new techniques. In the area of environmental health, some researchers have developed

complex models estimating objective human exposure to harmful chemicals (Bevc, Marshall, & Picou, 2003; J. G. Brody et al., 2002; Swartz, Rudel, Kachajian, & Brody, 2003; Ward et al., 2000). Essentially, these researchers focus on assessing the relationship between estimated toxic exposure and subsequent mental and physical health problems. Similarly, cross-national studies of public concern for the environment have employed indicators of objective environmental conditions measured at the national level (Inglehart, 1995).

Next, we will briefly discuss two articles that examine the hypothesized relationships between objective contextual variables and attitudes regarding local bodies of water. First, S. D. Brody, Highfield, and Alston (2004) hypothesize that knowledge of and concern for natural features are influenced by the distance one lives from these features. To test this hypothesis, the authors conducted a survey of residents living relatively close to natural features (two creeks) in San Antonio, Texas. Using GIS techniques to measure driving distance to the creeks, the authors find that proximity “not only influences environmental perceptions and general sense of place but also is associated with more accurate information on the health of the surrounding natural environment” (p. 244).

Second, Stedman (2003) found six of the seven lake attribute properties—shoreline development (number of structures per mile within 100 meters from shore), number of public access spots, lake size, color, chlorophyll levels, and turbidity—to be significantly related to a property owner’s satisfaction with their lake. In a multivariate analysis, the author found shoreline development to be directly related to place satisfaction and indirectly related to place attachment. The author concludes that “landscape characteristics *matter*; they underpin both place attachment and satisfaction, but in very different ways” (p. 682).

The fourth approach, temporal contextual variation, is utilized when researchers collect data before and after the contextual transformation. This approach is rarely used in contextual studies because researchers would have the arduous task of identifying the location of an anticipated contextual transformation, collecting data from those expected to be affected at Time 1, waiting for the transformation, and then collecting new data from the same individuals at Time 2. Although we assume that Arcury and Christianson (1990) did not use this methodological approach by design, they were opportunistic.

The authors implemented the same survey in Kentucky in 1984 and 1988. In 1988, Kentucky experienced a widespread drought, with some counties imposing water restrictions. The authors hypothesized that because a worldview is a deeper orientation, it would be impervious to biophysical change

such as a drought. Against expectations, they found that residents in counties with water restrictions developed a more ecological worldview (as measured by the NEP Scale) from 1984 to 1988, whereas the worldview of residents of counties where water restrictions were unnecessary did not change over the two periods. In this study, living in a county with water restrictions served as a proxy measure for experiencing contextual change. The authors conclude that when faced with severe environmental limits such as a drought, individuals will adopt a more ecological worldview, at least in the short run (Arcury & Christianson, 1990).

The design used in this research is a combination of a modified version of the temporal contextual variation approach and the objective contextual variables approach. To reiterate, we hypothesize that an ecological disaster occurring in a community where people are socially, culturally, and economically connected to the biophysical environment and ecological processes will result in the adoption of a more ecological worldview. This hypothesis is examined by analyzing data collected in the renewable resource communities of Cordova and Petersburg, Alaska, in the aftermath of the 1989 EVOS (Spies, Rice, Wolfe, & Wright, 1996).

RENEWABLE RESOURCE COMMUNITIES

A renewable resource community (RRC) is defined as a "population of individuals who live within a bounded area and whose primary cultural, social, and economic existences are based on the harvest and use of renewable natural resources" (Picou & Gill, 1996, p. 881). Individuals living in an RRC are directly connected to the biophysical environment through harvest exchange relationships, and the collective interpretation of these relationships is vital for community well-being. Culturally based community subsistence activities coevolve with seasonal ecosystem cycles. Given the significance of multifaceted, direct exchange relationships with the environment, we suggest (but do not empirically test) that sense of place and place attachment among individuals comprising an RRC would be especially strong. As a result, a transformation of the biophysical context due to an ecological disaster should be especially disruptive to individuals residing in RRCs. Furthermore, we contend that such a contextual transformation would alter how those affected view the human-environment relationship.

We evaluate this hypothesis by examining the effect of an ecological disaster, the EVOS, on the ecological worldview of people living in two com-

munities: Cordova, the impact RRC, and Petersburg, the control RRC. On March 24, 1989, the tanker Exxon Valdez ran aground on Bligh Reef in Prince William Sound (PWS), Alaska, releasing over 42 million liters of oil. Given the spill's location in highly productive fishing grounds and the occurrence of the accident at the beginning of the most biologically active season, the EVOS had a devastating effect on the environment and on individuals and communities in PWS (Picou & Gill, 1996). The initial and likely long-term effects of the spill were heightened due to an inadequate and delayed administrative response (Picou, Gill, Dyer, & Curry, 1992). Research also indicates significant financial losses for commercial fishermen (Cohen, 1995, 1997), disrupted subsistence harvests by Alaska Natives (Fall & Field, 1996), and elevated mental health problems among PWS residents (Arata, Picou, Johnson, & McNally, 2000; Palinkas, Patterson, Russell, & Downs, 1993).

Evidence of objective resource depletion in PWS was manifested in declines of pink salmon and pacific herring (Ott, 1992). The loss of birds and marine mammals in PWS was immediate and palpable as estimates 6 months after the spill indicated a death toll of more than 33,000 birds, 980 sea otters, 30 harbor seals, 17 gray whales, and 14 sea lions (Nichols, 1989). Long-term ecological monitoring indicates that only 6 species out of 30 had recovered by 2002 (Exxon Valdez Oil Spill Trustee Council, 2002).

CORDOVA: IMPACT RRC

Cordova, located in the southeastern edge of PWS, serves as the impact community because it has historically been economically dependent on commercial fishing and has a cultural heritage of subsistence. Since the 1964 Alaska earthquake, Cordova has been an isolated community with no roads connecting it to outside Alaskan communities. Approximately half of Cordova's labor force is employed in fisheries harvest and processing occupations (Fried, 1994). The base population of 2,500 typically increases to more than 3,500 during the summer commercial fishing season. Subsistence activities (harvesting and giving or receiving fish, moose, deer, berries, etc.) occur in 9 out of 10 of the households in Cordova (Stratton, 1989). Despite not being directly oiled by the spill, many of Cordova's primary fishing areas were initially contaminated and closed, severely disrupting the 1989 fishing season. As such, the spill had significant social, economic, and cultural effects on the community (Picou et al., 1992; Picou & Gill, 1996, 2000). These data suggest that people living in Cordova directly experienced the EVOS as a contextual transformation.

PETERSBURG: CONTROL RRC

Petersburg serves as a control community because it shares many economic, demographic, and geographical characteristics with Cordova. Petersburg is located approximately 532 miles southeast of the EVOS impact region and Cordova, is geographically isolated with no road connections outside of Mikoff Island, has a population of approximately 3,200 residents, and has an economic base that relies heavily on commercial fishing. Petersburg residents engage in subsistence activities at a rate similar to Cordova residents (Smythe, 1988; Stratton, 1989). Petersburg also has a distinct Norwegian heritage, whereas Cordova consists of an amalgamation of several European heritages. Economically, Petersburg is primarily linked to Juneau, Alaska, and Seattle, Washington, whereas Cordova is primarily linked to Anchorage, Alaska. The most important distinction between these two communities, however, is that Petersburg experienced minor direct effects from the EVOS. The fishing grounds used by the vast majority of Petersburg's fishing fleet were not contaminated by the spill. Compared to Cordova, only a small minority of Petersburg fishers leased their boats during the cleanup, and a limited number hold fishing permits in PWS (Picou & Gill, 1996). Although the residents of Petersburg were aware of the spill and we assume recognized that there might be long-term ecological ramifications, they did not directly experience the EVOS as a contextual transformation.

DATA COLLECTION AND RESEARCH DESIGN

Data used in this analysis were collected in late-August to mid-December 1989 in Cordova and Petersburg. In Cordova, residents from 118 households were interviewed via personal and telephone interviews and were drawn from a geographically stratified, random sample of the population. Based on a random sample of the population of Petersburg, residents from 73 households were interviewed in a telephone survey conducted by the Survey Research Unit of the Social Science Research Center at Mississippi State University (Picou et al., 1992). As mentioned earlier, the selection of Cordova as the impact community and Petersburg as the control community was driven by research design objectives. We should note a caveat regarding sampling and data collection, both of which were due to financial constraints and the research design objective of collecting data as soon after the spill as possible. Given the population of both communities and the small sample sizes, the confidence intervals are larger than ideal, and thus the analyses are

vulnerable to Type II errors (failing to find relationships that exist in the population).²

An ideal experimental research design, one that strengthens causal claims, requires the random assignment of respondents to treatment and control groups and the direct manipulation of treatment conditions by the researcher (Campbell & Stanley, 1963). However, contextual transformations cannot be manipulated directly, for ethical reasons, by researchers, and random assignment of participants to treatment and control groups is not possible (Drabek, 1970). In this case, group differences and, albeit weaker, causal relationships must be examined a posteriori through a quasi-experimental design. The design used in this research is a combination of a modified version of the temporal contextual variation approach and the objective contextual variables approach, sometimes referred to as an *ex post facto* design (Campbell & Stanley, 1963; Picou & Gill, 1996; Spector, 1981).

As a test of our contextual transformation hypothesis, we assess a hypothesized pattern of temporal variation in the target phenomenon, ecological worldview, by comparing Petersburg and Cordova survey data. Essentially, postspill Petersburg data serve as a crude proxy for prespill Cordova data. Although we cannot definitively claim that the observed differences between the control and treatment communities are due to the EVOS and cannot rule out the potential problem of spuriousness, we do address these caveats through sampling and statistical procedures. First, the control community was selected to match the treatment community on potentially confounding variables such as the degree of community isolation, cultural connectedness to the biophysical environment, economic dependence on renewable resources and commercial fishing, and the beauty of the local biophysical environment. Second, through the use of multivariate statistical procedures, we control for known sociodemographic predictors of an ecological worldview and thus the potential differences in community composition.

OPERATIONALIZATION

In the 1990s, a number of empirical constructs that reflect an ecological worldview had been developed by social scientists (for a review, see Dunlap et al., 2000). Despite this proliferation, the most frequently used construct is the NEP. The original NEP Scale (revised in Dunlap et al., 2000) consisted of three sets of four questions that measure the following beliefs: humanity's ability to upset the balance of nature; the existence of limits to growth for

human societies; and humanity's right to rule over the rest of nature (Dunlap & Van Liere, 1978). Over the years, research employing the NEP Scale has variously treated the construct as a measure of environmental concern, attitudes, beliefs, and values (Dunlap et al., 2000). Thus, based on Stern et al.'s (1995) Schematic Causal Model of Environment Concern discussed earlier, the NEP scale has been specified as occupying different hierarchical levels that constitute belief systems. Noting this substantive ambiguity and drawing on the work of Rokeach (1973), Dunlap et al. (2000) suggest that the appropriate view of the NEP Scale is as a measure of primitive beliefs regarding human's relationship with the environment, which constitutes the inner core of an individual's ecological belief system. Contrary to Arcury and Christianson's (1990) expectations but in accordance with their findings, we contend that ecological disasters can be sufficiently transformative to cause people to develop a more ecologically sensitive worldview.

Another important measurement issue is whether the NEP Scale measures one dimension or multiple dimensions. Beliefs or attitudes toward a complex issue domain such as the environment are not likely to be unidimensional (Gray, 1985), and several studies have provided evidence suggesting that there are discernable dimensions of a ecological worldview as measured by the NEP Scale (for a review, see Dunlap et al., 2000).

Based on the prior review of demographic predictors of environmental attitudes and beliefs, we include gender, age, and education as control variables in the hierarchical multiple regression (HMR) analysis. We hypothesize that women, younger people, and more educated people will exhibit a stronger ecological worldview than will their respective counterparts. We also hypothesize that people in fishing-related occupations (e.g., commercial fishing, cannery packing, net mending, electronics repair, and boat repair) will have a stronger ecological worldview than will respondents who are not in fishing-related occupations.

RESULTS

In Table 1, respondents from Cordova and Petersburg are compared on selected variables. Over half of the respondents from both communities were women, with a slightly higher percentage in Petersburg (56.2%) than in Cordova (51.7%). Mean age differences between respondents for the two communities were negligible, with an average age of 40 in Cordova and 42 in Petersburg. The 1988 household income differences are minimal at the extremes and greatest in the middle-income levels. Of respondents in

TABLE 1
Comparison of Cordova and Petersburg and Selected Variables

<i>Variables</i>	<i>Cordova</i>	<i>Petersburg</i>	<i>Significance</i>
Gender (% female)	51.7	56.2	<i>ns</i>
Age (<i>M</i>)	40.2	42.0	<i>ns</i>
1988 household income (%)			<i>ns</i>
\$0-29,000	23.0	26.0	
\$30,000-49,000	23.0	34.2	
\$50,00-79,000	33.6	19.2	
> \$80,000	20.4	20.5	
Education (<i>M</i> no. of years)	13.4	13.4	<i>ns</i>
Occupation (% fish related)	41.5	27.4	<i>p</i> < .05

Cordova, 23% earned \$30,000 to \$49,000, and 34% earned \$50,000 to \$79,000, whereas the percentages in these categories for Petersburg are 34% and 19%, respectively. Thus, Cordova respondents were slightly more affluent than those in Petersburg. Educational differences are nonexistent with a mean of 13.4 years of education (some college) in both communities. Gender, age, income, and educational differences between the two communities are not statistically significant. However, the percentage of respondents in fishing-related occupations is higher for Cordova (41.5%) than for Petersburg (27.4%), and this difference is statistically significant. Due to the significant occupational difference between the two communities, we will include fishing-related occupations along with the four sociodemographic variables as control variables in the HMR analysis.

In Table 2, data from an assessment of the dimensionality and internal consistency of eight questions from the original NEP Scale included in our survey (see the appendix for question wording) are presented. We employ a principal components factor analysis with varimax rotation to create orthogonal dimensions. The eigenvalues (2.9, 1.1) and the factor loadings indicate two underlying dimensions with the first dimension explaining 31.3% and the second explaining 14.0% of the total variance. Six items—the three measuring limits to growth and the three measuring balance of nature—load heavily (.546 to .778) on the first factor. The two items measuring man over nature load heavily (.823, .818) on the second factor. Two dependent variables, simple additive scales created for each NEP dimension, will be regressed on the independent variables in separate equations.

The results from bivariate analyses presented in Table 3 determine whether or not ecological values vary by community. Based on mean differences for all eight variables (estimated via general linear model univariate analyses), respondents from Cordova endorse more of an ecological world-

TABLE 2
Principal Components Analysis of New Ecological Paradigm (NEP) Questions
With Varimax Rotation and Kaiser Normalization

NEP Questions ^a	Component ^b	
	1	2
1. Population limits	.664	.089
2. Balance of nature	.546	.309
3. Plants and animals exist for humans	.110	.823
4. Limits to industrial growth	.552	.206
5. Humans' right to modify environment	.183	.818
6. Humans must live in harmony	.621	.213
7. Interfering with nature disastrous	.599	.113
8. Earth is like a spaceship	.788	-.031
Eigenvalue	2.9	1.1
% variance	36.1	14.0

a. For unabridged question wording, see the appendix.

b. Factor loadings $\geq .40$ are in bold.

view than do respondents from Petersburg. All of the mean differences are in the hypothesized direction, and six of the eight differences are statistically significant. These differences may stem from the fact that compared to Petersburg, a higher percentage of respondents in Cordova are in fishing-related occupations.

HMR analyses were conducted to predict worldviews measured by the limits or balance and man over nature dimensions of the NEP scale for the two samples combined ($N = 191$). In Step 1, each dependent variable was regressed on gender, age, income, education, and fishing-related occupation. In Step 2, the contextual transformation or treatment variable (living Cordova or not) was added to the model to evaluate whether being directly affected by the EVOS is a predictor of an ecological worldview over and above the control variables entered in Step 1. The change in R^2 and the statistical significance of this change enable an assessment of the net explanatory power of the contextual transformation. Unstandardized regression coefficients and standardized regression coefficients are presented in Table 4.

Overall, the limits or balance and the human domination value models are quite weak, with explained variances of 9.2% and 7.5%, respectively. The selected sociodemographic variables were not significant predictors of environmental values, with the sole exception that females are less likely than males to feel that humans have the right to dominate nature. After controlling for the sociodemographic variables, however, the contextual transformation variable is a statistically significant predictor of an ecological worldview,

TABLE 3
Mean New Ecological Paradigm (NEP) Differences Between
Residents of Treatment and Control Cities

<i>NEP Questions^a</i>	<i>City</i>		<i>M Difference</i>
	<i>Cordova</i>	<i>Petersburg</i>	
1. Population limits	3.43	2.96	.47**
2. Balance of nature	4.25	3.68	.57***
3. Plants and animals exist for humans	3.55	3.32	.23
4. Limits to industrial growth	3.69	3.6	.09
5. Humans' right to modify environment	3.56	3.27	.29*
6. Humans must live in harmony	4.36	4.14	.22*
7. Interfering with nature disastrous	4.14	3.78	.36**
8. Earth is like a spaceship	3.93	3.62	.31*

a. For unabridged question wording, see the appendix.

* $p < .05$. ** $p < .01$. *** $p < .001$.

improving the explanatory power of the limits or balance model by 6.6% and the human domination model by 3.6%.

DISCUSSION

The characteristics of the EVOS as a contextual transformation and Cordova as an RRC are unique. As such, the main contribution of this research is not the empirical generalizability of the findings but rather an examination of the social-psychological relevance of the biophysical context and contextual change and the methodological challenges of including contextual variables in environmental sociology and psychological research. The findings of this research will be discussed in an effort to revisit some of the conceptual and methodological issues raised earlier and to provide suggestions for future research.

With the exception of significant gender differences in the human domination model, the sociodemographic variables were not significant predictors of an ecological worldview. In contrast to prior research and against our expectations, the ecological worldview of younger people, the more educated, and those in fishing-related occupations were not significantly different than their respective counterparts. These findings pose interesting questions. Why is there attitudinal homogeneity across sociodemographic groups in Cordova and Petersburg? What is it about living in a small, isolated resource-dependent community, located in a pristine location, that reduces attitudinal variation regarding the NEP? People living in RRCs, compared to

TABLE 4
New Ecological Paradigm Scale Dimensions Hierarchically Regressed on
Sociodemographic, Occupation, and Contextual Transformation Variables

Independent Variables	<i>Limits or Balance</i>				<i>Man Over Nature</i>			
	Step 1		Step 2		Step 1		Step 2	
	Un-standardized	Standardized	Un-standardized	Standardized	Un-standardized	Standardized	Un-standardized	Standardized
Gender (0 = male, 1 = female)	.02	.03	.16	.03	.74	.20	.73	.20*
Age (years)	.02	.08	.02	.10	.00	.01	.00	.39
Income	.02	.01	-.02	-.01	-.07	-.07	-.10	-.10
Education	.32	.11	.31	.11	.10	.06	.10	.06
Occupation (0 = not fishing related, 1 = fishing related)	.74	.12	.51	.08	.26	.07	.18	.05
Contextual transformation (0 = Petersburg, 1 = Cordova)	—	—	1.62	.26***	—	—	.72	.19**
R^2	.026		.092*		.039		.075*	
ΔR^2	—		.066***		—		.036**	
n	169		169		177		177	

* $p < .05$. ** $p < .01$. *** $p < .001$.

other rural and especially urban contexts, are more likely to have, either directly or indirectly, similar relationships to the environment—an environmental orientation of reverence and dependence. As an ecological disaster pushes itself into the consciousness of individuals, encouraging reflection, pondering, or theorizing, people may become more aware of ecological processes and their taken-for-granted relationship to the environment (B. B. Brown & Perkins, 1992).

Broadening this conjecture to theories of social structure, we would expect greater attitudinal homogeneity regarding the human-environment relationship in communities bound by mechanical solidarity than in those bound by organic solidarity (Durkheim, 1893/1984). Put differently, as the division of labor increases and collective consciousness dissipates, we are likely to witness a greater differentiation of belief systems and a more varied understanding of the human-environment relationship. As such, the effects of an ecological disaster on the environmental attitudes of a majority of the population may be negligible and other variables such as age, gender, education, political orientation, and recreational activity may serve as significant predictors of an ecological worldview. Conversely, an ecological disaster is more likely to affect most individuals living in RRCs, independent of sociodemographic or occupational variation, due to the community-level, cultural understanding of the human-environment relationship and, in the case of Cordova, the obvious damage to the biophysical environment. The effect of an ecological disaster on a person living in a more complex, differentiated community will be contingent on the characteristics of the disaster (e.g., chronic or acute, natural or technological) and the factors that determine that person's environmental orientation.

We found support for our central hypothesis. Residents of Cordova, a community directly affected by the ecological disaster, had a significantly more ecological worldview than did the residents of Petersburg, a demographically similar community but not directly affected by the ecological disaster. Without longitudinal data (pre- and post-EVOS) collected in Cordova, which would allow for a more rigorous test of our hypothesis, and with relatively weak multivariate models, we certainly recognize the empirical limitations of this finding. Yet considering that the collection of pre- and postcontextual transformation data in future research is unlikely and the limited number of extant social science studies that include measures of contextual variables, we suggest that the quasi-experimental design used in this research is a worthy methodological effort to address past errors of omission. We caution against the common practice of acknowledging the importance of context and contextual change on theoretical and conceptual levels but then conducting research as if context does not matter. Narrowly identifying

sociodemographic variables and/or social-psychological constructs as the only causal antecedents of environmentalism potentially results in under-specified models of environmentalism.

More importantly, researchers must employ methodologically innovative techniques to overcome the operational challenge of including contextual variables in the analysis of environmental values, attitudes, beliefs, or behaviors. Although all four approaches—assumed contextual variation, subjective contextual variables, objective contextual variables, and temporal contextual variation—to operationalizing contextual variation and change provide potentially useful information, the latter two approaches are particularly rigorous and warrant further development. Granted, it is virtually impossible to collect pre- and post-transformation data without being able to anticipate the contextual transformation. However, biophysical and social science data could be collected at multiple points in time in populated places where it is clear contextual shifts, such as the effects of rising sea levels on communities in low-lying coastal areas or on islands, are occurring. The utilization of GIS technology and remote sensing to operationalize objective contextual variables is particularly promising. Future use of this approach would have the added benefit of promoting interdisciplinarity and collaboration between social and biophysical scientists. By combining a modified version of the temporal contextual variation approach and the objective contextual variables approach, we have focused on the (potentially short-term) effects of an ecological disaster on environmental attitudes. Future work should examine the short- and long-term effects of contextual shifts and other types of contextual transformations on a wide range of attitudinal and behavioral outcomes.

APPENDIX

New Ecological Paradigm Questions

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1. We are approaching the limit of the number of people the earth can support. [limits to growth]
 2. The balance of nature is very delicate and easily upset. [balance of nature]
 3. Plants and animals exist primarily to be used by humans. [human domination]
 4. There are natural limits to growth beyond which our industrialized society cannot expand. [limits to growth]
 5. Humans have the right to modify the natural environment to suit their needs. [human domination]
 6. Humans must live in harmony with nature in order to survive. [balance of nature]

7. When humans interfere with nature it often produces disastrous consequences. [balance of nature]
8. The earth is like a spaceship with only limited room and resources. [limits to growth]

NOTE: The response set used is a 5-point Likert-type scale: 1 = *strongly agree*, 2 = *agree*, 3 = *unsure*, 4 = *disagree*, and 5 = *strongly disagree*.

NOTES

1. Vaske and Donnelly (1999) present the Cognitive Hierarchy Model of Human Behavior that is structurally and conceptually similar to Stern, Dietz, and Guagnano's (1995) framework. Their model includes five tiers: values, value orientations, attitudes and norms, behavioral intentions, and behaviors. Although the authors do not situate the New Ecological Paradigm in their model, they do consider a biocentric/anthropocentric value continuum to be a value orientation.

2. Approximately 20% and 18% of those residing in Petersburg and Cordova, respectively, are Alaska Natives. The Alaska Natives live in villages outside of both cities. For Cordova, with a non-Alaska Native population of 2,050 and a sample size of 118, the confidence interval is 8.76% at the confidence level of 95%. For Petersburg, with a non-Alaskan Native population of 2,560 and a sample size of 73, the confidence interval is 11.31% at the confidence level of 95%. Also, because Cordova is included in the Valdez-Cordova census area (federal information processing standards, FIPS, code 261) and Petersburg is included in the Wrangell-Petersburg census area (FIPS code 280), we are unable to compare sample characteristics to census data for each community.

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