

ALASKA LEGISLATURE SPECIAL COMMITTEE / SUBJECT FILE 8672
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entity ought to be the local government for several reasons: local government is most familiar with local resources; the logistics of personnel management in a disaster can be negotiated and incorporated into existing emergency management plans and reviewed periodically with staff and; it would be consistent with public policy that local governments should be at the center of any structure responding to a community-wide emergency. It should not be a financial hardship for local government personnel to continue in their capacities; financial incentives should be offered so it is not more lucrative to participate in spill cleanup than attending to the matters of local government and the provision of basic, necessary community services.

Not all people in small communities feel the local government is impartial. There is always factionalism to some degree. However, to encourage total representation (in anything such as hiring for the cleanup) and minimize factionalism in the event of a disaster emergency, it is recommended that a volunteer citizen's group be formed. This group would meet with the city council on a periodic basis to discuss emergency preparedness. If the citizen's group and the city council have similar expectations prior to an emergency, the problems of intracommunity factionalism could be avoided or lessened.

- Creation/Utilization of New/Unusual Entities. The emergence of new entities in dealing with a disaster is certain to occur. The important lesson to be learned from varying community responses to the *Exxon Valdez* oil spill is that these entities must be incorporated into the overall response effort -- they must not be put in opposition to it. Again, Seward's incorporation of all kinds of groups into the MAC group ensured that everyone's interests were represented in the unified response and that there would not be competing forces in the cleanup which would be to the detriment of all concerned.

Interactions with Extracommunity Institutions

- Behavior in Communities. This problem fell into two types. First, there was a physical lack of facilities for the onslaught of outsiders into the communities. In this regard, local governments should be prepared to acquire portable trailers or other makeshift structures to accommodate the temporary residents. This would substantially minimize disruption to local government operations.

The second type of problem in this category deals with general rudeness and misconduct by outsiders from the communities. The recommendation here is the same as that mentioned in Leadership Style above. Representatives of

outside agencies unfamiliar with small rural Alaskan communities ought to be briefed (perhaps by a local government representative early in the response effort) on the way of life in these communities. This would include providing information on the economic, social, and cultural history of the area. Perhaps with this information, representatives from outside agencies not familiar with Alaska would be sensitive to the concerns and behavior of locals.

- Corporate Versus Municipal Authority: Privatization of the Cleanup. Private entities involved in disaster response, as Exxon and VECO were, must be required to work within an emergency response structure that meaningfully incorporates local communities -- not use local governments as resources or treat them as competitors or potential liabilities. Response structures should be designated as "zones" or ecologically-based units that are founded on disaster areas parameters and include all jurisdictions within the zone. This allows for the effective marshalling of resources to bring them to bear on the problem. In this way communication effectiveness is maximized and redundant efforts are eliminated.
- Differential Treatment of Communities. The differential treatment of communities is a problem which can be avoided if communities are able to communicate with each other and "compare notes." The Oiled Mayors committee provided an ideal and effective forum for this type of sharing of information.

3.3.2 Recommendations to Avoid or Ameliorate Fiscal Impacts to Local Governments

A number of recommendations to ease the fiscal burdens on communities have come out of the fiscal data and interviews. These include:

- Government Reimbursements and the Privatization of the Cleanup. Private industry should not be placed in the position of prescreening government requests for reimbursements. An impartial entity should have decision-making authority over whether or not government expenses are spill-related, and mechanisms should be in place such that governments are financially able to meet emergency needs in a timely manner.
- Unreimbursed Costs. To lessen the chance of local governments not being reimbursed for costs incurred as the direct or indirect result of a disaster, it is recommended that all departments accurately document their costs and services. This is important to do on a continuous basis so that, in the event

of a disaster, increases or decreases in costs and services can be compared to pre-disaster levels. Departments or services which were especially hard hit following the oil spill were hospitals, mental health services, emergency medical services, police/public safety departments, and city administration. Adequate documentation of services was rare for many communities in many of these departments. Specific recommendations are set forth in section 5.5.

- Revenue and Expenditure Impacts. Governments should be compensated for all increases in expenditures attributable to disaster conditions; loss of anticipated revenues should be compensable as well. An independent entity, not the spilling party, should review such requests. Documentation and comparison to baseline conditions is essential in this analysis, especially when performed in conjunction with a "pre/post" event analysis.
- Cash Reserve and Budgetary Disruptions. The ability of a community to acquire cash up front, rather than justify every expense before reimbursement, helped tremendously in responding to the oil spill. In the event of a future disaster, mechanisms need to be in place which will provide communities with cash up front which they can account for at a later date. The money could be dispersed to local governments by boroughs or, if not part of a borough, given directly from the source to local or regional entities constituted to handle the emergency. (See section 3.3.3 below.)
- Continuing Fiscal Impacts. It should be recognized that fiscal impacts from such sources as deferred maintenance, hidden costs, opportunity costs, residual overtime, and so on will be ongoing. For example, increases in arrests during spill cleanup activity in Seward resulted in substantial increases in labor costs for police officers due to the necessity of increased court appearances months later. Other delayed appearances of costs are found in many other areas, including deferred maintenance. Mechanisms need to be in place to track these costs so that the books are not closed on costs prematurely.

3.3.3 Linking Operational and Fiscal Impact Avoidance

Ultimately, funding and organizational structures act hand-in-hand to lessen the effects of the spill on individual communities. Local governments and regional Native organizations exposed to the effects of the *Exxon Valdez* oil spill and cleanup had to rely on local resources to initiate and maintain a response. There were no contingency funds to assist with the costs of implementing a response nor were there uniform organizational resources to assist with the maintenance of essential government services when faced with such

overwhelming conditions. Also, in most communities, leadership as well as most other resources for spill response were overextended by the scope and duration of the event. Furthermore, communities did not have consistent means of acquiring information about the nature and progress of the spill. In these conditions, local communities generally had to innovate responses on their own, and the process of innovation consumed extensive time, personnel, and fiscal resources. The process of local innovation resulted in some important contributions to the cleanup such as the geotextile effort in Kodiak. However, the energy and attention required to innovate at the time of crisis, especially if the crisis is of immense proportions, means a drain away from the usual business of local government.

Where an integrating structure existed, communities had to innovate less and this allowed a more efficient use of local resources. Communities such as Seward that were fortunate enough to be near federal resources threatened by the event were able to participate in MAC groups which integrated local efforts with those of larger entities and buffered the effects of the event. They were able to participate in a planned response effort in which there was an organized decision-making process and the specification of a chain of command with well-defined authority in the response effort; and, through such a system Seward had access to a larger set of leadership and organizational resources that buffered the community from some of the more disorganizing consequences of the event in other communities. Representing the other extreme are some of the Native communities such as Port Graham, English Bay, and Karluk where the relatively few resources were dispersed by the privatized cleanup. In this situation some communities fared better than others, depending on their access to and control over extracommunity resources. Without buffering mechanisms to protect communities from being overwhelmed operationally and fiscally, communities did what they could with varying degrees of success.

4.0 AN OVERVIEW OF PRIVATE SECTOR ECONOMIC IMPACTS

4.1 Introduction

Not only did the wreck of the *Exxon Valdez* damage communities socially and injure individuals psychologically, but it also resulted in substantial economic impacts to local businesses. In this section we focus on presenting findings from a mail survey of North Gulf Coast (NGC) businesses and commercial fishing permit holders concerning spill-related economic impacts. This survey, in addition to secondary data from VECO employment records and state of Alaska fisheries and employment data, form the basis for this discussion. The survey was intended to provide the following information about impacts to local businesses:

- A qualitative assessment of the direct and indirect gains and losses related to the spill and cleanup.
- Determination of how these gains and losses were distributed across industry sectors and communities.
- Determination of the extent and magnitude of cleanup involvement and spill-induced shifts in business planning and capital investment.

The study was not structured to quantify the exact losses or other impacts related to the oil spill. Rather, the business survey provides data for a qualitative assessment of the types and distributions of impacts experienced by NGC private businesses with some order of magnitude estimates of losses. This analysis of the business survey and examination of secondary information indicates that the quantification of economic impacts requires additional quantitative data and evaluation of different modeling approaches to fully measure private sector economic impacts.

A brief word is in order here about modeling approaches and this report. The second interim report issued for this study presented a preliminary analysis of secondary data using an export-base model. This model characterizes the economy of the region into "basic" and "support" sectors. Using this model, economic impacts are assessed by analyzing, among other things, the ratio of changes in employment between the two different sectors. One of the most obvious limitations of this model is that changes in income cannot necessarily be judged by changes in employment. Another limitation of the export-base model is that it is most useful for understanding short-run fluctuations in demand for exports (i.e., exports from the basic sector) but it ignores supply-side factors. Nevertheless, given the needs for relatively immediate information, this approach was useful for a preliminary perspective on

private sector economic impacts. The emphasis in this report is on findings from the business survey that can be used to describe the categories of impact so that additional consideration can be given to alternative models for assessing private sector economic impacts.

In this presentation of findings, the idea of "economic sectors" is used to organize the data for the description of impacts to different industries and businesses. Three different sector groupings are used:

- Basic Industry Sector that produces raw or semiprocessed materials (fish products, oil, timber) primarily for export from the region.
- Support Industry Sector that provides goods and services that are generally not exported from the region. These industries are created in support of, or induced from, the traditional export base.
- Government Industry Sector composed of local, state, and federal government employers.

Specification of these three different sectors is intended to simplify the presentation of business survey results. At the same time, it provides an overview of impacts within the sectors, although we concentrate on the basic and support industry sectors in this discussion.

4.2 Methodology for Determining Private Sector Economic Impacts

The primary methodology for determination of private sector economic impacts was a mail survey. A mailing list of all businesses in the affected region was constructed from four major information sources:

- Alaska business license holders.
- Commercial fishing permit holders.
- Seafood processors.
- Large firms headquartered outside of study area.

From these information sources, a list of 7,031 businesses in the study's 24 communities was generated. The survey, which contained approximately 40 questions, was mailed on April 18, 1990 and a week later a postcard, including the phone number of the Impact Assessment, Inc. (IAI) Anchorage office, followed to remind recipients to return the

instrument or call with questions. IAI received approximately 100 phone inquiries. After a preliminary analysis, a number of businesses were removed from the list of potential respondents in the study region due to factors such as not being in business at the time of the spill or moving to an area outside the study region. Ultimately, about 6,535 actual businesses were identified as the population for this study. On May 7, approximately 6,200 additional surveys were sent to those businesses from which IAI had not yet received a completed survey. By the end of July, approximately 1,400 questionnaires were returned and these formed the basis for analysis of survey results.

4.3 Business Survey Findings

To remain consistent with the content of the survey itself, the following section summarizes the analysis according to the following topics:

- Industry composition of the respondent.
- Direct participation in spill cleanup.
- Overall business performance.
- Business plans before and after the spill.
- Financial gains and losses from the spill.

The following discussion summarizes the findings regarding these topics (additional information about methodology is included in Appendix 2).

4.3.1 Industry Composition

The Oiled Mayor's study area covers spill-affected communities in Alaska's NGC region. It covers many hundreds of miles of coastline stretching from Cordova to the Chignik, including communities in the Kenai Peninsula Borough and the Kodiak Island Borough. This study area encompasses 26 local government jurisdictions and 6,535 small and large business firms. The basic and support sector businesses included in the survey are listed in Table 4.1 below. It should be noted that in the classifications listed, the support sector accounts for approximately two-thirds of the total number of NGC business firms. Commercial fishermen and seafood processors account for the majority of the remaining one-third.

Table 4.1 Industry and Business Sectors Included in the Survey		
Basic Sector	Support Sector	Government Sector
Commercial Fishing Fish Processing Tourism Oil Spill & Cleanup Other: Manufacturing (non-fish) Construction (public) Mining Agriculture & Forestry Military	Manufacturing (local) Construction (private) Trans., Utilities, Trade Trade Finance, Ins., Real Estate Services: Personal Business Auto & Miscellaneous Repair Amusement & Rec. Health Professional Miscellaneous Agric. & Forest (local)	Federal Government State Government Local Government

Other tables in this section use the same Group A and Group B community designations as specified in section 3.2, Fiscal Impacts to Local Governments. However, the Group B community designation in these tables also includes businesses in the Village category used in section 3.2. Table 4.2 indicates the percentages of survey responses by sector used for analysis. The overall response rate was approximately 20%, a highly acceptable rate for this type of survey. As can be seen in Table 4.2, responses are distributed evenly across major industry sectors and across communities. Figure 4.1 indicates the number of business firms by community in the study area. Figure 4.2 shows the industry composition within the study region and Figure 4.3 shows the industry composition by community, with all Group B communities lumped into one category.

Figure 4.1
Location of North Gulf Coast Industries
Number of Business Firms by Community

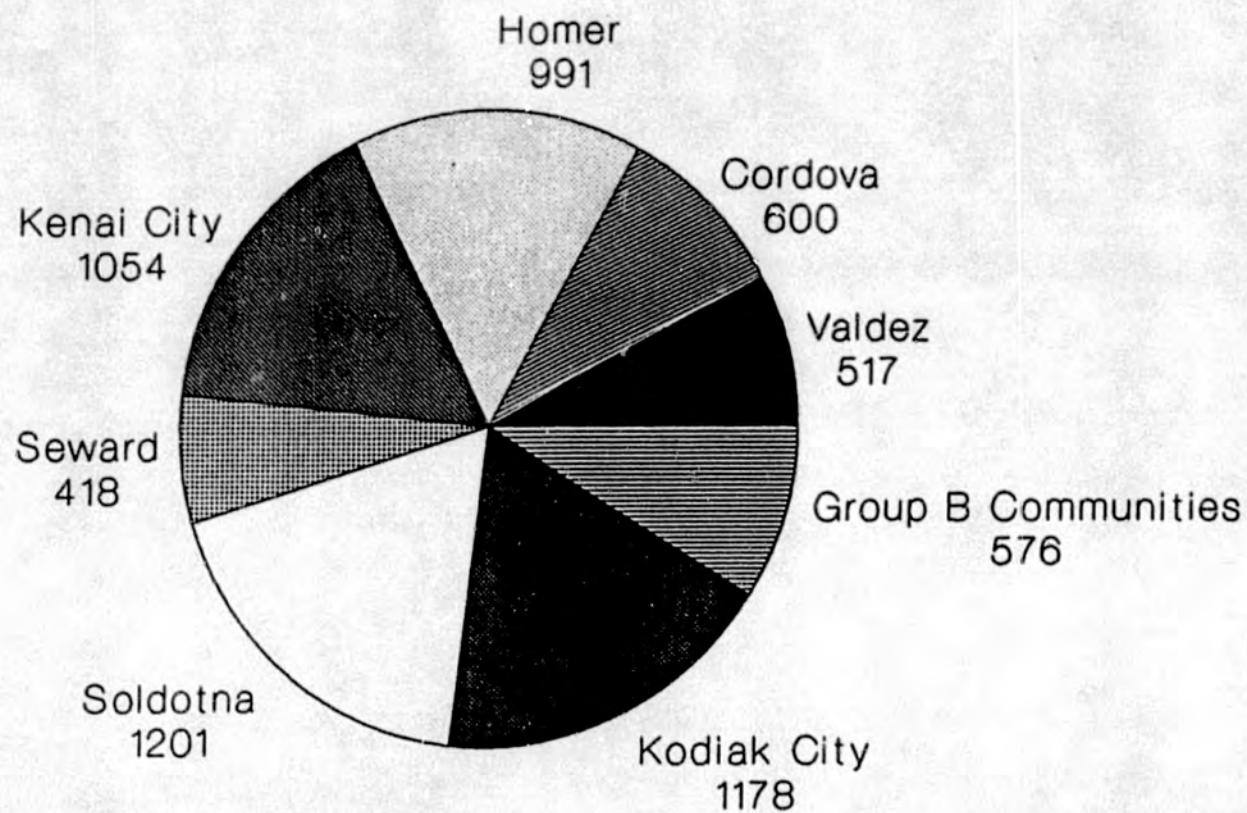
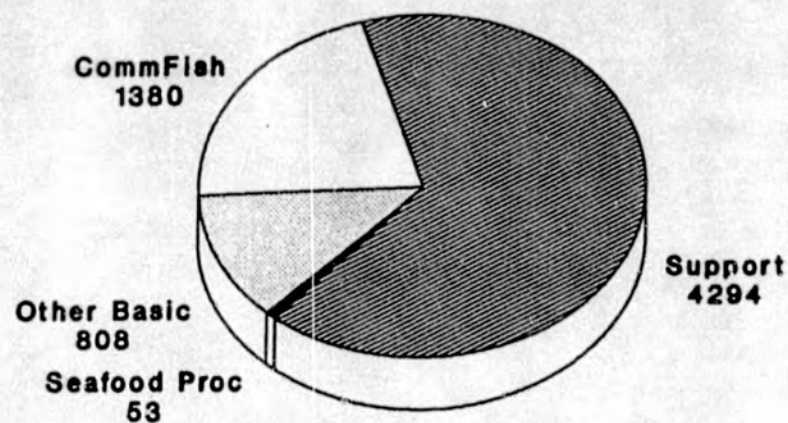
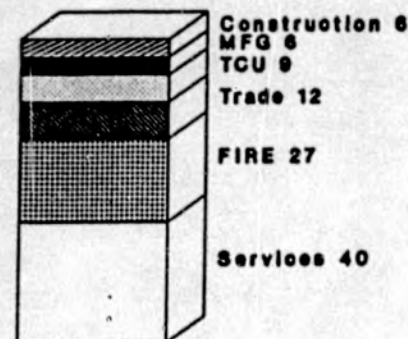


Figure 4.2
Industry Composition
of Oiled Mayors' Study Area



All Industries
(Number of Firms)



Support Sector Industries
(Percent of Firms)

Figure 4.3
Industry Composition
Business Survey Responses by Community

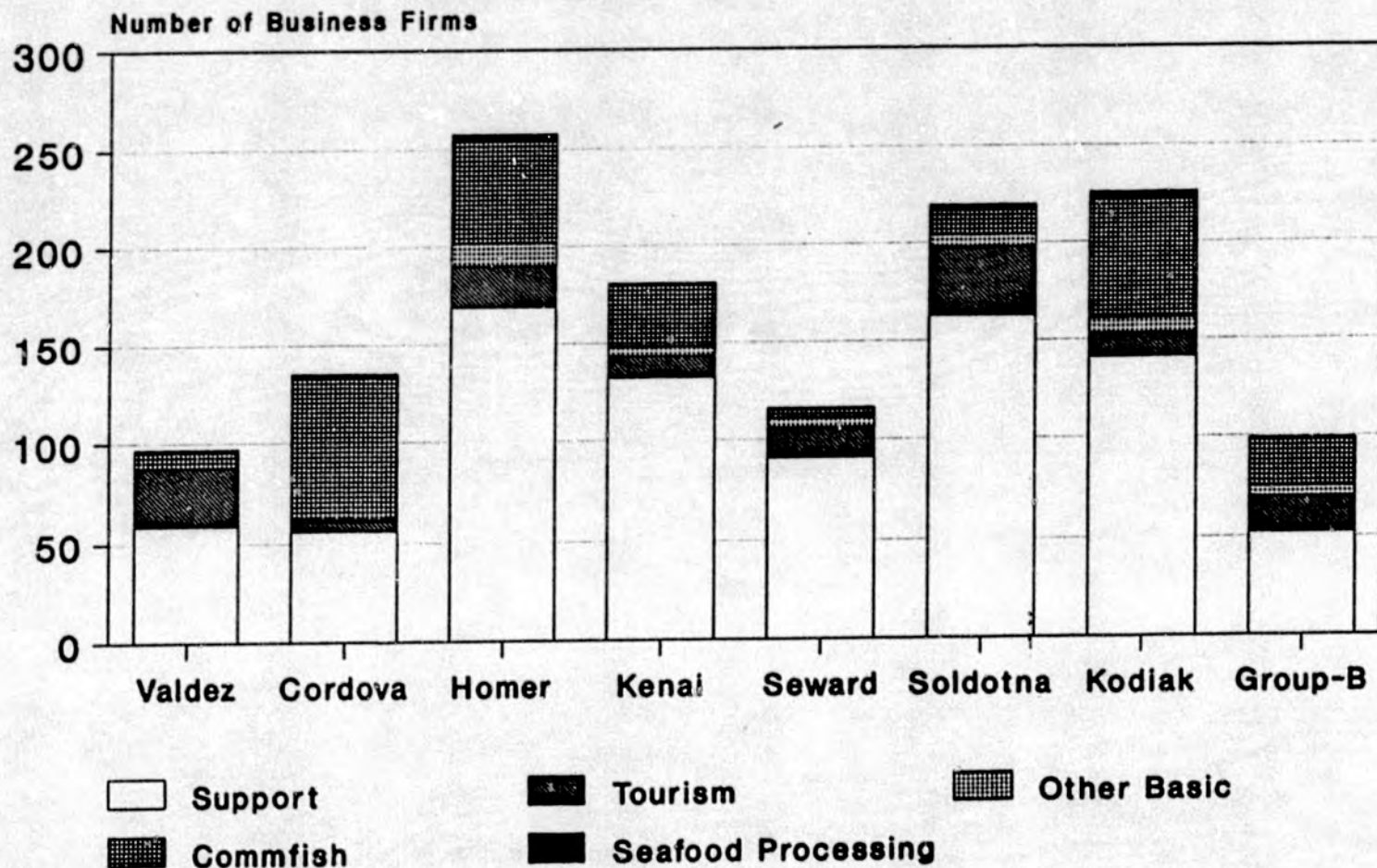


Table 4.2
Summary of Business Survey Response Rates
by Sector and Community

Sector	Group A Cities							Group A Total	Group B Total	Grand Total
	Valdez	Cordova	Homer	Kenai	Seward	Soldotna	Kodiak			
Commercial Fishing	16%	22%	45%	16%	8%	12%	19%	20%	12%	19%
Seafood Processing	20%	40%	57%	14%	25%	33%	20%	29%	25%	28%
Other Basic	19%	24%	26%	18%	37%	22%	20%	23%	32%	23%
Support Sector	19%	23%	23%	18%	29%	18%	19%	20%	17%	20%
Total Cases	19%	23%	26%	17%	28%	18%	19%	21%	17%	20%
Avg. No. Yrs. in Business	9	14	10	10	11	8	12	10	12	11

4.3.2 Participation in the Oil Spill Cleanup

Describing what happened as a result of the oil spill requires some appraisal of local business participation in the cleanup effort. The business survey directly assessed this issue by asking questions about the type of participation in the cleanup, if any, and if a business was created in response to the cleanup. Findings from questions about type of participation in the cleanup are summarized in Table 4.3, including how businesses responded when asked to choose from among ten oil spill response and cleanup activities ranging from contracting services to working crew. Tables 4.4 and 4.5 show these results by sector and community. Significant findings are as follows:

- The highest occurrence of cleanup participation was among commercial fishermen, tourism operators, and service businesses.
- Contracting services, such as leasing and operating vessels, constituted the highest proportion of the total respondent participation in spill cleanup.
- Overall, 38% of NGC businesses participated in oil spill response and cleanup activities.
- Valdez businesses registered the highest participation rates (62%). Soldotna businesses registered the lowest at 15%.
- As a group, commercial fishermen exhibited the highest incidence of spill cleanup participation (55%) compared with other industry sectors.

Businesses that did participate in the cleanup were asked a series of follow up questions regarding whether or not the business was created in response to the spill; business income; percentage of income derived from the cleanup; and changes in the cost of business operations between 1988 and 1989. Among the noteworthy findings are:

- 10% of the respondent businesses that participated in cleanup activities were created in response to the spill. This would translate to nearly 650 businesses region-wide (10% x 6,535 businesses).
- Only 5% of respondents that participated in 1989 cleanup activities gave high marks for cleanup success in restoring the environment in their area.

Table 4.3
Percentage of Businesses Participating in Spill Cleanup
by Industry and Type of Cleanup Activity

Industry	Contracted Services	Leased Land	Leased Facilities	Leased Equipment	Leased Vehicles	Leased Aircraft	Lease & Op. Vessel	Leased Vessel	Worked Crew	Other
Commercial Fishing	28%		9%	32%	40%		69%	57%	47%	15%
Seafood Processing	1%	20%	3%	2%	7%		3%	1%		1%
Tourism	22%	20%	38%	13%	27%		12%	22%	17%	17%
Oil Spill & Cleanup	1%								2%	
Mining	1%								2%	
Logging/Lumber	2%			4%						1%
Construct.	4%	20%	6%	9%			2%	3%	2%	5%
Agri/Forest			3%	2%				1%		1%
Manufact.	1%						1%			1%
TCU	4%		9%	6%	13%	100%	5%	4%	4%	2%
Trade	10%		6%	11%	13%		3%		9%	15%
Services	24%	40%	19%	20%			5%	10%	17%	41%
Other	3%		6%	2%			1%	1%		2%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Total Cases	118	5	32	54	15	1	129	72	47	144
% of Total Bus. Partic. in Cleanup Activity	10%	0.4%	3%	5%	1%	0.1%	11%	6%	4%	14%

- Nearly two-thirds of those that participated gave a poor evaluation ("hardly successful" and "not at all successful"). As a whole, participating Group A respondents were more critical of cleanup success than were Group B respondents.

Table 4.4 Business Participation by Sector in 1989		
Sector	Did Not Participate	Did Participate
Commercial Fishing	45.3%	54.7%
Seafood Processing	60.0%	40.0%
Other Basic	56.1%	43.9%
Support Sector	68.9%	31.1%
Total	62.3%	37.7%
Missing Cases = 6		

Table 4.5 Business Participation by Community in 1989		
Community	Did Not Participate	Did Participate
Valdez	37.8%	62.2%
Cordova	44.1%	55.9%
Homer	62.8%	37.2%
Kenai	75.3%	24.7%
Seward	50.9%	49.1%
Soldotna	84.6%	15.4%
Kodiak City	58.6%	41.4%
Group B	58.6%	41.1%
Total	62.3%	37.7%
Missing Cases = 4		

4.3.3 Overall Business Performance

Overall business performance addresses the following topics:

- Gross income.
- Changes in business performance and operating conditions from 1988 to 1989.
- Workforce issues.

Several questions on business performance were asked without specific reference to oil spill impacts. Others specifically concern changes in business conditions arising from the oil spill and cleanup. Findings regarding both those businesses that did and did not participate in the cleanup are indicated below.

Gross Business Income

- Gross business income (i.e. total revenue) for all respondents collectively declined 5% from 1988 to 1989 despite income gains of about 13% attributable to 1989 oil spill cleanup earnings.
- Support sector firms were the only industry category to show an income gain from 1988 to 1989.
- Although seafood processors and firms in other basic industries had gains of 12% and 20% respectively attributable to the oil spill, these industries registered a 10% drop in gross business income from 1988 to 1989.
- Businesses that participated in the cleanup exhibited higher income levels in 1989 than those that did not participate.
- Among cleanup participants, about one-third of all business income earned in 1989 was from work on the cleanup itself.
- Firms that did not participate in the 1989 spill cleanup earned significantly more in the previous year (1988) than those that did participate.
- Firms that did not participate in the cleanup exhibited lower income levels in 1989 than those that did participate.

Changes in Business Performance

- In comparing 1989 with 1988, a greater percentage of respondents indicated decreases in the average price and quantity of products sold even though the costs of doing business increased. This was true regardless of participation in cleanup.
- Participating businesses tended to increase the number of employees and size of their payroll while non participating businesses decreased the number of employees and the size of their payroll.
- Although businesses that participated in the cleanup had higher incomes, they were forced to turn away more customers than the non-participants.
- Businesses that did participate in the cleanup showed more net income increases (46%) than decreases (30%). Businesses that did not participate showed more decreases (36%) than increases (20%) in profit.

Changes in Business Conditions

- Business respondents that participated in the cleanup tended to be more critical than non-participating businesses of what the effects of the oil spill will be over the next three to five years.
 - 48% of respondents indicated a small or large negative effect, as compared to 40% negative for non-participants.
 - As a whole, business respondents indicating negative effects outnumbered those indicating positive effects two-and-two-thirds to one.
- Businesses are experiencing uncertainty about the future business climate and the potential to resume "business as usual."
 - One-third of all business respondents indicated that business conditions were not back to normal.
 - Over 20% of all respondents anticipated problems adjusting to post-spill business conditions.

Workforce Impacts

- Workforce availability was a problem for about 16% of business respondents. Most of these were forced to curtail operations because they could not find available labor for hire.
- 4% of total respondents indicated that "business virtually shut down due to serious hiring problems and worker turnover."
- Seafood processors, the largest employers among businesses surveyed, experienced a 35% decline in the number of employees from 1988 to 1989.
- Seafood processors indicated the greatest occurrence of problems with workforce availability.
- Commercial fishermen and other basic industry business firms also showed a decline in the average number of jobs (or crew members) from 1988 to 1989.
- Support sector businesses were the only group to register any gains in the average number of jobs.

Table 4.6
Change in Business Performance 1988 - 1989

Business Operations	For Businesses that Operated Before 1989						Total
	Large Decrease	Small Decrease	No Change	Small Increase	Large Increase	Not Available	
Businesses that Did Participate in the Spill Cleanup							
Quantity Sold of Products	32%	7%	17%	18%	15%	11%	100%
Average Price of Products Sold	27%	5%	37%	12%	2%	7%	100%
No. of Customers Turned Away	5%	2%	34%	8%	9%	43%	100%
Net Income (profit)	22%	8%	19%	26%	20%	6%	100%
Number of Employees	7%	5%	48%	14%	8%	18%	100%
Payroll	14%	5%	33%	14%	16%	18%	100%
Cost of Goods Sold	8%	2%	33%	16%	5%	36%	100%
Fuel/Energy Costs	7%	8%	36%	25%	7%	18%	100%
Amount of Debt	5%	8%	46%	10%	11%	20%	100%
Rent/Lease Costs	1%	1%	51%	10%	6%	31%	100%
Other Costs of Doing Business	4%	2%	36%	15%	12%	32%	100%
Businesses That Did Not Participate in Spill Cleanup							
Quantity Sold of Products	22%	12%	27%	18%	5%	17%	100%
Average Price of Products Sold	14%	5%	50%	9%	1%	21%	100%
No. of Customers Turned Away	5%	4%	41%	6%	3%	43%	100%
Net Income (profit)	22%	14%	32%	17%	3%	13%	100%
Number of Employees	6%	5%	51%	6%	1%	31%	100%
Payroll	12%	5%	39%	10%	2%	31%	100%
Cost of Goods Sold	5%	3%	43%	16%	2%	31%	100%
Fuel/Energy Costs	3%	3%	41%	25%	3%	24%	100%
Amount of Debt	1%	5%	48%	11%	7%	28%	100%
Rent/Lease Costs	1%	1%	54%	8%	3%	34%	100%
Other Costs of Doing Business	1%	1%	48%	11%	6%	35%	100%

Total Number of Cases = 1,190

Note: Number of Businesses Not in Operation Before 1989 = 151

Number of Businesses Not in Operation as a Percentage of 1,341 Completed Questionnaires = 11%

Table 4.7
Changes in Workforce Availability by Sector in 1989

Sector	No Change		Changes Did Not Interfere		Business Curtailed		Serious Hiring Problem		Other		Total	
	Cases	%	Cases	%	Cases	%	Cases	%	Cases	%	Cases	%
Commercial Fishing	69	28%	87	35%	37	15%	11	4%	44	18%	248	100%
Seafood Processing			1	8%	5	42%	4	33%	2	17%	12	100%
Other Basic	38	23%	65	40%	22	13%	10	6%	29	18%	164	100%
Support Sector	225	31%	263	36%	78	11%	26	4%	134	19%	726	100%
Total	332	29%	419	36%	142	12%	51	4%	209	18%	1150	100%

Missing Cases = 190

4.3.4 Changes in Business Plans

The direct costs of the oil spill and cleanup are of obvious concern to affected communities. Less obvious, yet also important, are changes in business plans that can result in further economic impacts. Consequently, the business survey asked a series of questions regarding business managers' plans to change business operations with respect to purchasing and selling equipment or property, capital investment, employment, and other aspects of strategic planning. These questions assessed the relationships of plans and activities to the oil spill and cleanup by comparing aspects of business planning before and after the oil spill. The findings from this section of the survey are complex, but we attempt here to summarize the significant points. Further analysis is needed regarding how changes in business plans may temporarily or permanently alter the economic structure in NGC communities.

As in other sections above, we distinguish between the differences in findings from businesses that did and those that did not participate in the cleanup. This distinction is particularly important in regard to changes in business plans because it is assumed that businesses that participated in the cleanup were operating and making decisions under a different set of circumstances than businesses that did not participate in the cleanup. Of particular interest in this study is how the spill may have influenced business investment.

Following is a summary of survey findings regarding changes in business plans:

- Before the spill, NGC region-wide net investment of over \$80 million was indicated for business property (i.e., land, buildings, equipment, etc.). Post-spill plans for such investment are for slightly less than \$3.6 million.
- Businesses that participated in the cleanup tended to have more plans to buy and sell business property compared to firms that did not participate in the cleanup. For example, 43% of participating respondents indicated that they had pre-spill plans to buy or sell business property. This compares with only 30% for nonparticipating respondents.
- Business respondents that did participate in cleanup accounted for about half the pre-spill planned net investment.
- Commercial fishermen, representing the greatest amount of pre-spill planned net investment regardless of cleanup involvement, cut back their 3- to 5-year plans by about two-fifths after the spill. These changes translate to reduced region-wide business investment of about \$42 million over a 3- to 5-year period.

- The distinction between cleanup participation and no participation widens when looking at actual purchases and sales of business property since the spill. Businesses that participated in the cleanup had actual net investment, that is more purchases than sales of business assets, of \$16 million. Firms that did not participate in the cleanup sold more business property than they purchased, resulting in a region-wide net disinvestment of \$3.6 million.
- Roughly 25% of all respondents indicated plans to hire employees over the next 3 to 5 years. Firms that participated in the cleanup generally carried out these plans, but only about 14% of those that did not participate indicated that they actually hired employees.

In summary, these findings show that businesses that participated in spill cleanup accounted for most of business net capital investment during 1989. Businesses that did not participate in the oil spill cleanup sold more assets than they purchased. Regardless of the degree of cleanup participation among business firms, the value of planned investment in business property and equipment over the medium term was significantly reduced after the spill as compared to pre-spill levels of planned investment. Figure 4.4 presents summary information of respondents net investment in businesses within the study area as broken down by economic sector. Figure 4.5 presents a summary of oil impacts by sector within the study area.

The long-term business outlook may be further clouded to the extent that business participation in spill cleanup (or lack of it) was fortuitous and not tied to business management skills or judgement. For example, new business investment driven largely by cleanup participants may create over-capacity in some industries. Furthermore, increased indebtedness among businesses most hurt by the spill, such as commercial fishermen, may reduce capacity and further jeopardize the long-term prospects for business survival.

Finally, along with direct wealth and profit impacts, the oil spill and cleanup has given rise to potentially unstable redistributions in productive capacity among different sectors and groups. An observed shift toward more conservative business investment practices suggests that the business managers perceive greater uncertainty with respect to the medium-term economic outlook. These factors tend to place the economy in a more vulnerable position in terms of lost opportunity and sensitivity to recessionary forces brought about by related or unrelated events.

Figure 4.4
 Respondents' Net Investment in Business
 Oiled Mayors' Study Area by Sector

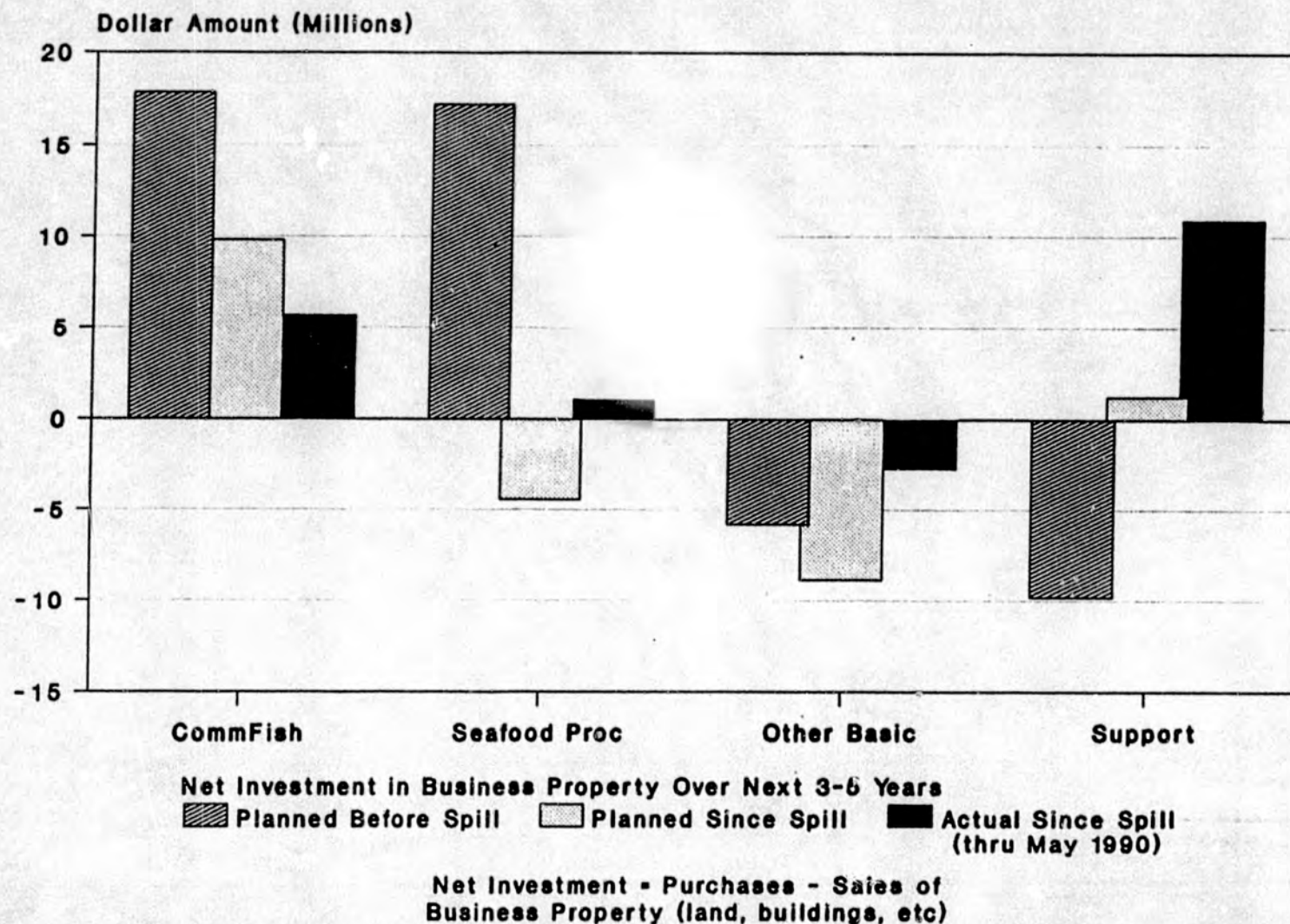
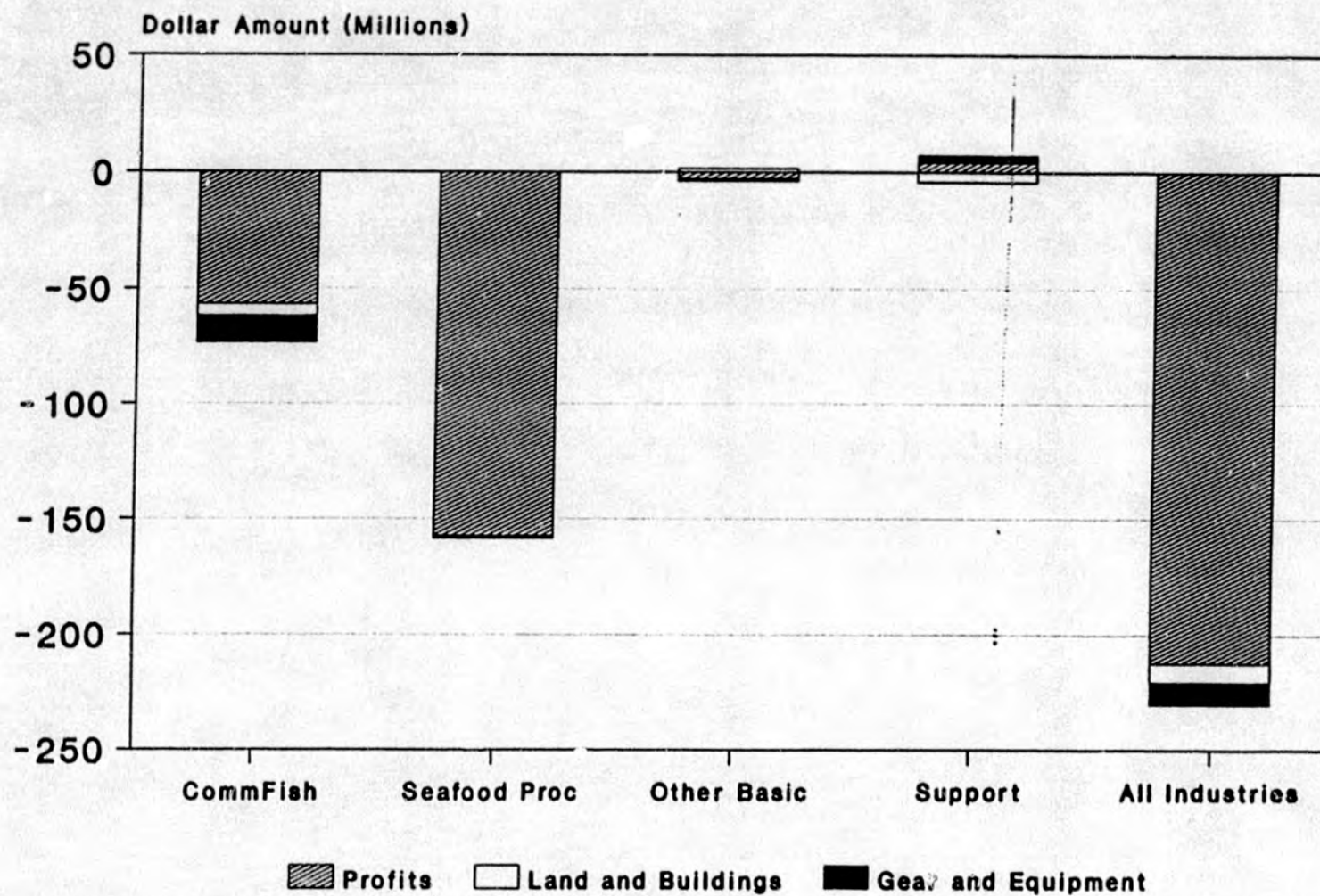


Figure 4.5
Summary of Oil Spill Impacts on
Oiled Mayors' Study Area by Sector



4.3.5 Business Gains and Losses

Exact profits and losses are not the subject of this study, however a qualitative understanding of losses and gains is an important indicator of how the spill affected local economies. Overall findings indicate that losses exceed gains in all three categories assessed (profit, property, equipment) regardless of the respondents industry type and spill cleanup involvement. Total region-wide losses arising from the oil spill, the overwhelming majority of which are accounted for by losses of business profits, exceed spill-induced gains by a three-to-one margin.

In regard to those who did and did not participant in the spill cleanup, several findings are significant:

- Business respondents in support industries and other (nonfishing) basic industries registered net gains in some but not all value categories (i.e. profits, equipment, and business property).
- Commercial fishermen and seafood processors reported losses of profits, equipment, and business property.
- Businesses that participated in the cleanup tended to lose less and gain more, as compared to those that did not participate.

Among the business firms that may have experienced losses as a consequence of the oil spill the following findings are noteworthy:

- About 61% of businesses agreed or strongly agreed with the statement: "My business suffered due to fishing closures caused by oil spill."
- About 55% of the firms that may have experienced losses agreed or strongly agreed with the statement: "Demand for my services or products fell as a result of spill damage to the environment."

- About 36% of these businesses agreed or strongly agreed that "Costs of doing business increased as a result of the oil spill and cleanup."
- The incidence of damage to commercial fishing areas and of commercial fishing closures was highest among fishermen in Cordova, Homer, and Kodiak City.

The following findings emerge about losses and claims for assistance from businesses:

- About 42% of those that may have realized losses submitted claims to Exxon.
- About 68% of all commercial fishermen petitioned Exxon for spill-related losses.
- The incidence of commercial fishing losses was second only to seafood processors, of which 80% petitioned Exxon for claims against losses.
- The overwhelming majority of these losses occurred in the form of negative profits.
- Among those surveyed who submitted claims, the average proportion of claims covered by Exxon was 36% of total losses.

In sum, these findings show that in the first year alone, the value of total losses exceeded gains by a margin of three-to-one. Fewer businesses participated in spill cleanup (i.e., winners) than those that did not directly participate (losers). The occurrence of spill-related losses in terms of 1989 business profits and asset value was highest among commercial fishermen as a group.

4.4 Recommendations

Two straightforward groups of recommendations emerge from this preliminary study of private sector economic impacts:

- Existing losses should be mitigated by programs that aid businesses to recover the losses experienced.
 - Policymakers and business organizations can help to mitigate economic impacts by introducing programs which will aid businesses in recovering losses.
 - Temporary assistance should be provided to businesses that suffered losses by introducing mechanisms that permit debt refinancing, loan forgiveness, and tax relief.
 - Local policymakers could consider programs that shift the immediate burden of losses and compensatory claims away from private businesses to the public sector.
- Additional studies need to be undertaken that can determine the full extent of business losses and the directions of change in the structure and performance of NGC economies.
 - Quantification of the full extent of business losses requires a focused study by economic sector of the actual losses incurred by private businesses.
 - The oil spill and cleanup produced a complex post-spill economic environment in which there were "winners" and "losers" and new forces affecting the structure and performance of local economies. Additional studies need to determine the nature of these changes and their implications for the economic well-being of the affected communities.

5.0 PREPAREDNESS NEEDS FOR THE FUTURE

One of the primary interests of the Oiled Mayors in conducting data gathering following the oil spill and initial cleanup was to learn from the experience in the variety of communities subjected to impacts. This section will address some of the lessons learned from the *Exxon Valdez* spill and cleanup event from the perspective of preparedness needs for the future. Obviously, many of the lessons learned are contained throughout the body of this report. In this section, however, a summary of preparedness issues is intended. These issues can be categorized as follows:

- Complete understanding of the risk factors.
- Organizational structures to assist with response.
- Plans for response.
- Access to resources.
- Information documentation needs.
- Communication.
- Legislation and advocacy.
- Resolution of continuing impacts.

In the section "Complete Understanding of the Risk Factors," the limitations of using the *Exxon Valdez* experience as a guide for the unfolding of events surrounding future disasters of any type are explored. The section on "Organizational Structures to Assist with Response" discusses the experience of some communities with emergency management structures in attempting to respond to the spill. The utility of emergency preparedness plans in responding to the *Exxon Valdez* disaster is discussed under "Plans for Response."

The difficulties of obtaining appropriate tools for spill response are discussed under "Access to Resources," the need to document events is discussed in the section on "Information Documentation Needs," and the importance of communication and the timely dissemination of information is covered under "Communication." The section "Legislation and Advocacy," provides some suggestions on how communities can be proactive in preparing for disaster events in the future, while the final section "Resolution of Continuing Impacts" provides some recommendations for the mitigation of impacts still being experienced.

5.1 Complete Understanding of the Risk Factors

It is important to note that when discussing preparedness needs for the future, using the experience of the *Exxon Valdez* oil spill as a guide will not suffice to give a complete

understanding of risk factors associated with potential oil spills. The following are a number of caveats to consider in using the *Exxon Valdez* spill as a model for future coastal disasters:

- It could have been worse. As large as the *Exxon Valdez* spill was, it is by no means the largest spill possible using the present transportation technology. Indeed, the *Exxon Valdez* spill itself could have been larger if the vessel capsized, sank, or otherwise incurred further cargo loss. It is difficult to anticipate what additional or varied types of qualitative impacts would result from a quantitative difference in the amount of oil spilled.
- It could have been a different spiller/cleanup entity. Another caveat for using the *Exxon Valdez* experience as a benchmark for future spills is that the primary company involved (as both the spiller and the cleanup entity) chose a particular course of action out of many available to it. The shape of exposure to the cleanup process was predicated, to a large extent, on the actions taken by Exxon and its subcontractors. In future accidents other companies (and perhaps even Exxon) may choose a different type of response.
- It could have been a different economic and political context. The *Exxon Valdez* spill occurred in a particular economic and political context. Changes in the regulatory or political environment, which themselves are predicated on events that cannot be anticipated, such as fluctuations in the world economy, will shape responses to accidents which may occur in the future.
- There could be a different range of exposures. The *Exxon Valdez* accident should not be taken as a standard for the range of exposure to coastal communities from maritime shipping. Exposure is a function of both the communities that are exposed and the agent of exposure. The communities in the area in which the spill occurred feature a particular mix of economics, demographics, community organization, etc. The particular form of impacts in any one community was predicated upon, among other things, proximity to the spill, facilities and physical features that determined response capabilities, political organization, economic organization, and timing. A different mix of communities exposed to a similar event would result in different patterns of exposure. In addition, the time of year in which exposure occurs (timing in the sense of seasonal patterns of economics and population fluctuation) results in varying patterns of exposure. Agents of exposure also vary between communities. That is to say, for many coastal communities there is a variety of shipping cargoes that pass by in addition to oil. Those cargoes obviously vary in their behavior in seawater; what may make sense in terms of

emergency preparedness for one type of cargo may not for another. An analysis of the types of traffic that pass particular coastlines would perhaps be in order, with an attempt to cross-reference with contingency planning.

5.2 Organizational Structures to Assist with Response

Organizational structures were important to spill response from both the community and Exxon sides of the equation.

- Community organizational structures varied between communities, and the type of structures extant in the communities influenced response abilities. Communities within boroughs, for example, had resources to draw upon that other communities did not. For example, Exxon gave the Kenai Peninsula Borough (KPB) \$2 million for oil spill relief. The borough was able to dispense this money to communities within its jurisdiction without prior justification to Exxon. This system proved to be highly beneficial to communities within the KPB for two reasons. First, they did not have to front the money for resources to assist in spill cleanup. Secondly, they did not have to worry about Exxon eventually reimbursing for expenses incurred as a result of the oil spill -- the money was already under the control of the borough, and the borough had the freedom to handle the details of the disbursement after the fact. With the need for immediate justification gone, and dollars at their disposal, incorporated communities within the KPB were more able to direct their full attention to cleanup activities. Consequently, their efficiency in the cleanup was maximized.

But boroughs were not the only umbrella organizational structure which could prove beneficial to communities. Whether a community was incorporated or unincorporated had implications for its ability to rally resources from boroughs. For example, while located within the KPB, Port Graham and English Bay had more difficulty accessing Exxon-originated cleanup monies from the KPB due to their status as unincorporated communities. While these communities had access to KPB funding in theory (if they worked through the nearest incorporated community which was Seldovia), there were a number of reasons they did not receive any money. Primary among these were cultural differences between the smaller Native communities and the larger, ethnically plural community of Seldovia. In order to receive assistance these communities were forced to go through institutions with whom they have had problematic relations in the past rather than through the regional service delivery entities with whom they had established relations but who

were themselves without resources. Opening the smaller communities to outsiders to intervene in what were considered private affairs was not considered an acceptable option. Consequently, needs were unmet in those communities.

- Exxon's (and its subcontractors') organizational structure also influenced the response in the communities. There were severe limitations on what could and could not be done based on the difficulties surrounding the "who is in charge" problem. When Exxon or VECO representatives were available, they were typically not endowed with authority to make decisions considered key by those in the communities. Organizational difficulties were exacerbated by the fact that Exxon personnel were frequently rotated through the local communities. When one local representative would be "brought up to speed" on local concerns, he or she was replaced by another individual.

While some communities utilized existing structures to manage the increased demands created by the oil spill, other communities either implemented nonstandard, but locally-based, structures or pulled together specialized organizational management structures from outside the community. (It should be noted that were funding available to all communities to do so, some of the organizational problems seen in many communities may have been avoided.)

An example of the uses of such a structure is the MAC group formed in Seward in response to the spill. This group evolved through a series of stages beginning with the city's own Emergency Operations Center. The Emergency Operations Center was the locus of oil spill-related activity for the first week of the spill. It was located in the council chambers and operated on a 24-hour basis. The Emergency Operations Center utilized the organizational principles of an "Incident Command System," an organizational format that is common in emergency services such as fire and law enforcement services. Under the Incident Command System, local officials were assigned predetermined emergency duties outside of their normal day-to-day responsibilities in order to efficiently bring the resources of the city to bear on a particular problem. Under the Seward implementation of the Incident Command System the fire chief, for example, was given the responsibility of overall logistics. In other words, in addition to his duties as fire chief he was responsible for coordinating logistics for the overall city response, regardless of departmental boundaries. *This is the strength of the Incident Command System -- individuals are assigned specific functions and given authority to draw together resources that are normally "compartmentalized" or "departmentalized" in order to facilitate community response.*

It soon became clear, however, that even in its "own backyard," the city of Seward could not effectively coordinate and implement effective response to an event of the scale of the oil spill. From a city-based emergency response, Seward expanded its response resources. Critical in this shift in level of response was the involvement of the National Parks Service representative, located in Seward, in emergency activities. At that stage of the response, the individuals involved realized the potential for assistance on a federal level. Consequently, the Interagency Incident Management Team, a federal emergency response group, came to Seward. The primary function of the Interagency Incident Management Team is to act as an "overhead" team in coordinating large scale, multi-agency responses to large wildfires in Alaska. This team has a cast of coordinators who also operate along the lines of an Incident Command System, with one position allocated for logistics, one for finance, and so on. This team of experts came to Seward and initially managed the response. After a transition period, local representatives of the various governmental agencies in and around Seward were trained to take over the positions filled by members of the Interagency Incident Management Team, so that the experts were able to withdraw. Locally-based Exxon employees were trained by the Interagency Incident Management Team as well. With the transition to local staffing, the emergency response organ that began as the Interagency Incident Management Team became known as the Multi Agency Coordinating (MAC) group. The MAC group met twice daily and set daily cleanup objectives and facilitated and tracked cleanup activities.

What made the MAC group unique was that its leaders decided to include representatives from a multitude of groups and agencies with an interest in the protection of the ecological zone encompassing Seward. There were representatives from the Fish and Wildlife Service, the Chugach Alaska Corporation, Alaska Department of Fish and Game, the Department of Natural Resources, and a representative from a commercial fishermen's group. Each of the representatives sitting on the MAC group had decision-making ability on behalf of the organization they represented. Eventually Exxon agreed to cover any expense the MAC group approved if Exxon could have a representative at the MAC group meetings. In Seward, the MAC group controlled oil spill response. Such an arrangement was unheard of in other affected communities where Exxon and VECO controlled cleanup operations. The "vertical integration" of the MAC group as an organizational structure was also essential to its success. That is to say, it was a local level structure that had the ability to plug into regional, statewide, and federal response structures, eliminating problems of communication, resource allocation, and the like which were found elsewhere.

There are a number of points to be taken from Seward's relatively smooth disaster response.

- First, it is critical for local capabilities within an Incident Command System to be current. Those involved need to train regularly. Whenever there is turnover in personnel, the new employee needs to be trained in the procedures for Incident Command System activation.
- For disasters extending outside the jurisdiction covered by a standing Incident Command System, that is the city itself, there needs to be an awareness of outside resources such as the federal Interagency Incident Command Team. Without an awareness of potential sources of assistance, city officials are wasting valuable time innovating ways to respond to the emergency instead of actually responding. In the case of the *Exxon Valdez* oil spill, most of the communities affected were innovating rather than responding.
- In most communities Exxon and VECO complicated local response efforts by simultaneously imposing their own cleanup plan. Seward was able to maintain local control by integrating local and outside resources.
- Representatives sitting on the MAC group were empowered decision makers who could commit the resources of their various entities. Communities that got various agency representatives together without having those representatives vested with decision-making powers found such multi-agency groups ineffective.
- Despite the differences in jurisdiction, those involved in Seward's emergency management effort ultimately approached the cleanup of the Seward "zone" as one ecologically integrated area.

There were general organizational lessons learned during the spill outside of Seward's experience. These included:

- The value of intercommunity response. For multi-community response beyond existing regional associations such as boroughs, the formation of the Oiled Mayors provided the communities a single voice and hence some political power with the state and with Exxon. The Oiled Mayors group was also a valuable source of information exchange among the communities. Such a structure is valuable either on an ad hoc or more ongoing basis as a force to protect communities in the future.

- The value of organizing early. No matter what the form of various response structures that helped communities respond to the spill, those communities in which there was some organizational structure in place, or soon transferred in, were in a much better position to enact a response than those communities that had no such structure and had to create something anew. Those communities that had to create a response structure found the creation process to be a serious drain on time, energy, effort, etc.
- The value of easing access to resources through direct contact with appropriate agency representatives. It should also be noted that institutions located outside of the communities had the ability to ease the difficulty of accessing resources in the myriad agencies and entities involved. The value of the governor's representatives sent to several of the communities should not be understated. These representatives were a direct channel to state government that, if nothing else, helped to cut through the red tape and sometimes provided a means of problem solving. This was apparent in Cordova especially. While such roving representatives are not a structure per se, their contribution was significant and this experience should be carried forward as a lesson learned: face-to-face communication with the highest levels of state government, and having governor's representatives personally on site in communities touched by a disaster, have a high value in facilitating accurate communication to the state of the type and scope of problems being experienced on the local level. This type of communication goes a long way to easing problem solving in what can be a tangle of state and local bureaucracies.

5.3 Plans for Response

The utility of having emergency preparedness plans in place was obvious from the communities that were able to implement existing plans. It was also apparent that communities that utilized plans that had not been gathering dust on the shelf were more successful than others. According to one emergency service worker, the only way to be prepared for a disaster is to have a disaster. If the kinks of the emergency plans have been worked out through hands-on experience, operations will go much more smoothly.

Preparedness level is a function of several factors.

- First is the length of time since the last implementation of the emergency management plans. The more time between review and rehearsal of emergency plans, the less likely it is that personnel will respond as planned.

- Second is the rate of turnover among emergency service workers -- if the last implementation of the emergency plan was more than a "generation" in terms of personnel, that experience is lost.
- A third factor is the rate of turnover and operational changes among outside agencies at the regional, state, and federal levels. If local response agencies do manage to keep levels of preparedness up through either utilization or appropriate training, they must still interact with outside agencies on large responses, and this necessitates knowing the policies and procedures of the outside agencies. Ideally, outside agency personnel are known as well to facilitate interagency interactions.

Kodiak provides an example of an extremely smooth implementation of an emergency plan. Officials credit the strength of the plan to the fact that Kodiak was so hard hit during the Great Earthquake of 1964 and the fact that they have used that experience to their benefit. In the words of one official, Kodiak "knows it can happen here," and as a result the Kodiak Island Borough and the City of Kodiak have identical ordinances that form the Emergency Services Council (see section 3.1.2). The ESC utilizes a common, comprehensive emergency plan. This intergovernmental entity was up and running and accessing response resources within two hours of activation. Individual roles assigned under the emergency plan and designed primarily for earthquake and tsunami response were easily tailored to fit the oil spill context.

An essential component of preparedness, of course, is to know what to be prepared for. Most emergency plans are limited in their treatment of human impacts, concentrating primarily on environmental impacts. Those plans that do deal with human impact issues address housing and care of persons displaced as a result of evacuations or destruction of their homes, or emergency medical care needed as the result of immediate public health risks. From the *Exxon Valdez* and similar experiences, however, it is clear that there is a range of human impacts that need to be addressed outside of immediate and limited needs. It has been shown, for example, that demand for social, psychological, and medical services will increase dramatically, and that these needs will continue for a significant period of time. These needs can and should be anticipated and planned for. (See section 5.7.1 for further discussion of this issue.)

5.4 Access to Resources

In local assessments of response to the oil spill, one of the critical factors in whether or not local efforts were considered effective was the question of access to resources. Communities considered themselves more or less successful in this endeavor. Several factors contributed to a community's success in accessing resources. These included:

- Understanding what resources are useful. Prior to accessing resources, community leaders needed to understand what resources would be useful. This proved problematic at times due to the fact that, for most leaders, the oil spill was a type of event that was unique in their tenure.
- Understanding where those resources are. Once the resources have been identified, there is the problem of knowing where those resources are located. There were problems during the spill, particularly during the early days, of finding resources.
- Understanding how to access resources. Once resources are identified and located, there remains the difficulty of understanding how to go about accessing those resources, whether those resources are under the control of private companies (such as Exxon or a boom construction company) or public entities (such as state agencies).
- Having the ability to access resources. Even in cases where resources were identified, located, and the routes of access were known, it was not always the case that communities were able to access those resources. This was true for a number of reasons. Smaller communities had lesser political clout to access resources than larger communities; communities within boroughs were able to mobilize regional-level support more effectively than communities outside of boroughs. Effectiveness of community leaders and response strategies also varied when it came to accessing resources. Some communities chose to go after resources that Exxon stated were unavailable and obtained them through independent means.

5.5 Information Documentation Needs

Documentation of effects of the spill was critical to cost recovery efforts. The ability to track capital and personnel costs and link those to the oil spill were required by Exxon for spill claims. Some localities were able to initiate more efficient systems for this than others. There were a number of different strategies to effective documentation. These included:

- Creation of a position in the local government structure to put a single individual in charge of oil spill-related tasks. This had the effect of allowing department heads and other administrators to "clear their desks" of oil spill-related work. This concentration of tasks allowed for a coordinated response and improved tracking ability. It helped to ensure systematic followup on spill-related matters with outside entities -- only one person was calling and corresponding with other government entities and Exxon, in effect establishing a "united front," on behalf of the community, for dealing with those entities. This helped to minimize "mixed messages" being sent or received by local governments.
- Creation of a "paper department" was utilized by some municipalities as a means to centralize spill-related expenditure and revenue information. In this case, no personnel were added, but in order to leave the budgetary and expenditure process intact, spill-related expenditures and revenues were flagged with an oil spill department number rather than an existing department number. In this way increased labor expenses in, for example, a public works department that were attributable to the oil spill would be accounted for under the oil spill department rather than under the public works department. This allowed for closer accounting of oil spill expenses, and allowed departments to maintain tracking of resources allocated through normal processes.

5.6 Communication

Communication or transfer of information was critical to response effectiveness during the spill in at least two ways.

- Efficient transfer of information between affected parties greatly influenced the efficacy of interactions between responding agencies. It was apparent that information was not exchanged between entities who agreed later that it would have been beneficial had they done so. Information flow between different arms of the same level of government was not always efficient; information transfer from Exxon and its subcontractors to local governments was not always smooth. ("Organizational structures" influencing information flow are discussed in section 5.2.)
- It was also noted that the efficient transfer of information to the public was one factor in community perception of response efforts. Effective public

dissemination of information was accomplished in a number of ways. These included:

- News conferences that were held daily or twice daily at specified times known in advance. People knew where to go to receive information and there were expectations about the timely receipt of information. News conferences that followed daily or twice-daily response team coordination meetings were seen as informative.
- Local broadcasts were also used as a means of public dissemination of information. Either local radio or television capabilities can be used for public updates daily or twice daily, so that members of the public can know when and how to get current information.
- A single designated spokesperson was used for the dissemination of community information. This person may be the mayor, or a designee, but this person should be recognized as the official source of information, so that other persons are relieved of this responsibility. Channeling information through one individual also lessens the chances for conflicting information being passed along. A number of persons should have direct access, however, to first-hand information gathering to prevent claims of bias on the part of the spokesperson. For example, in Seward a representative of a fisherman's group went on spill area overflights. While this person did not act as a spokesperson for the community as a whole, the fact that different community interests, including fisheries, had a hand in the information gathering process lent credence to the official assessment of the situation.
- The provision of a forum for regular public input through which individuals and groups could feed information back into the response system was regarded as valuable as well. Daily, and then weekly, meetings held in some communities were seen as important in allowing people to feel they had input into the community-level response.
- Continuous access to information through an information center was very important to effective public response. The use of hot lines or information lines that provided a rumor control function were used successfully. In at least one community, an information line was set up with a recorded message that was frequently updated. Individuals could call in and listen to current oil spill information. Local print media was utilized as well: as an example, the "Cordova Fact Sheet"

was of value in keeping the community informed about spill and cleanup issues.

These types of information media centralized information about the spill and cleanup, and relieved the local government of acting as a public information center on spill issues, a function that was a major drain on local government resources at the height of spill-related activity. With one person in charge of an information center, information demands on local officials can be channelled through that person or his or her designees. In other words, once local officials give information to the information center, they do not have to be bothered by repeated demands for the same information by multiple individuals from various institutions, including the media.

The goal of scheduled news conferences, local broadcasts, having a designated spokesperson, providing for public input, and having an information access system is the same. This is to provide rumor control and to have a reliable conduit of accurate information to (and from) the public that is accessible in a timely and predictable manner. In community-wide crisis situations, this is essential, as public reactions based on inaccurate information are counterproductive to any response effort.

5.7 Legislation and Advocacy

Before we begin our discussion of recommended legislative actions, it is important to recognize that much has already been accomplished in the wake of the *Exxon Valdez* disaster to respond to impacts and to ensure the protection of citizens in the event of another spill. Significant state and federal legislation has been passed, improved contingency plans have been developed, a wide range of safety and spill prevention measures have been implemented, new organizations have been formed (e.g., Regional Citizens Advisory Committee, the Oiled Mayors), and a vast array of information on, and understanding of, oil transportation risks is now available. In addition, the general awareness of oil spill response consequences and capabilities, and potential social and economic impacts is extremely high. It is not our objective to restate in this section changes that have already been made but to identify issues still in need of resolution.

5.7.1 The Need for Recognition of Human Impacts

At present, no federal or state government agency officially recognizes documenting the human consequences of an oil spill or other technological accident as its responsibility. However, the representatives of such agencies recognize the existence of such impacts and either tacitly or explicitly acknowledge that protecting the public from such impacts is an inherent concern of their agencies. The lack of official recognition of the economic, social, and psychological impacts of an oil spill meant that it would take nearly eight months following the spill for a major assessment of the human impacts to be undertaken -- and then only as a result of the initiative of the mayors of the affected communities themselves. One of the bureaucratic difficulties in this regard is that no single federal or state agency considered such issues and impacts to fall entirely or exclusively within its purview. The problems encountered in initiating the current study underline the need for changes in applicable federal law and state protections designed to assure that future damage assessments also include the human consequences of an oil spill on directly affected communities. While resolution through the courts is theoretically available, such resolution, if it comes at all, will probably be a decade in the future, and will then only involve some monetary settlement. It will have done nothing to protect the communities during that period from further damages, to mitigate ongoing economic, social, and psychological impacts. Legal resolution of these issues also cannot address those kinds of regulatory changes needed to protect local residents from subsequent oil spills.

The following sections provide recommendations for legislative action which communities can pursue on a federal, state, and industry level. The objective of these actions is to ensure protection and compensation to communities for economic, social, and psychological impacts which can be sustained, as shown in this volume, from an oil spill disaster.

5.7.2 Community Action: Federal Government

Problem

The problem in locating money to address human impacts from the federal government involved complicated undertakings by state agencies. Federal and state agencies became enmeshed in what has become known as the "CERCLA process." CERCLA is the acronym for the federal Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. 9601 et seq.), which, in combination with the Clean Water Act (33 U.S.C. 1321), were the primary driving forces behind the state-federal "Damages Assessment Process." Under these Acts, three federal agencies (the Departments of Agriculture, Commerce, and Interior) and the state share trusteeship for the living and non-living natural resources

affected by the oil spill. The "CERCLA Trustee Council" that evolved consisted of a representative of the Forest Service (Dept. of Agriculture), the Fish and Wildlife Service (DOI), National Marine Fisheries Service (Commerce), and Alaska Department of Fish and Game. Gradually, as this CERCLA process unfolded, federal and state agencies came to officially accept and acknowledge this "Trustee Council" as the controlling authority on all things related to the assessment of damages from the oil spill -- including the human impacts. The first task of this group was to develop a State/Federal Natural Resource Damage Assessment Plan for the *Exxon Valdez* Oil Spill which was disseminated in September 1989, though a final version was not completed for several months. Unfortunately, this damage assessment plan did not provide for consideration of the economic, social, or psychological impacts of the accident on the directly affected human populations.

Recommendation

Local communities should exert concerted effort to have the Alaska Congressional Delegation assure that congressional guidance is provided to CERCLA agencies to insure that local community impacts are taken into consideration in the event of a future accident. This guidance would, in effect, specifically identify the "intrinsic social, and economic values of public natural resources and uses" affected by any future oil spill as suitable for inclusion under the provisions of CERCLA.

5.7.3 Community Action: State Government

Problem

The protections currently afforded to local communities under state of Alaska laws are little improved over those that failed to protect communities with respect to the *Exxon Valdez* spill.

Recommendations

Local communities should exert a concerted effort to assure that their state representatives reflect the concerns of the affected communities with regard to protecting the interests of directly affected communities in the event of a future spill. These actions would include:

- Passage of a bill creating an "oil spill contingency fund" that would be available to local communities to address urgent response requirements.
- Passage of a bill providing direct economic support to individuals and families negatively affected by the direct or indirect effects of the spill or its cleanup.
- Passage of a bill funding the development of community-based contingency plans which address recognized shortfalls in federal, state, and industry contingency plans.
- Provisions in state and industry plans for the inclusion of local community representatives and local experts in critical decision-making organizations.
- Development of criteria for reimbursement of costs from local response to an oil spill should be established by law or defined in regulatory policy. It should not be at the sole discretion of an oil company to decide if, when, and how local communities are to be reimbursed for their expenses in responding to an oil spill. Neither should this decision depend on the vagaries of the prevailing political processes.
- Communities immediately begin, in the event of any future oil spill, documenting all activities, times, places, and incidents requiring the commitment of public or private resources (including time) to meet the exigencies of responding an oil spill. This information should be included (with the standard fiscal and other economic impact data) as a basis for quantification of damages resulting from delayed, deferred, indefinitely postponed, or lost services to the community (i.e., opportunity costs). Quantification of such damages, in turn, should be included as an element of costs incurred as a direct result of the spill or other causal event. Such costs, after the initial crisis management phase, should be submitted on a monthly or quarterly basis as long as the effects continue to be experienced. Failure of the spiller to respond in a timely or affirmative way to these requests for reimbursement should result in an immediate claim against the federal Oil Pollution Act of 1990 fund under Section 1013 of the House version of the bill. (Recourse is not available to current claimants for damages as a result of the *Exxon Valdez* incident; i.e., Section 1013 provides that "no claim by a particular claimant may be approved or certified during the pendency of an action by the claimant in court to recover the costs which are the subject of the claim.") It must be realized that communities, the lowest level of government involved in a widespread emergency, cannot be expected to

shoulder the largest response burden while simultaneously being drawn into emergency response.

5.7.4 Community Action: Industry

Problem: Delays in acquiring needed resources are inevitable in a litigation environment. If litigation is the only means for a community to receive compensation for damages, such delays can seriously hinder a community's recovery from a disaster. Similarly, if a spiller is to fund various local government projects in an emergency, the spiller is in a position of potentially assuming liability for damages addressed by the government through the funding process itself. In other words, if a spiller pays to protect something, in litigation it may be argued that the spiller has admitted to being responsible for damages to that entity or resource.

Recommendation: Make funding of oil spill preparedness a required element of the industry's oil spill contingency planning and implementation process. If the individual, specific funding allocations are then decided by local governments or another level of government, the entity underwriting the fund is not liable for the decisions made by the fund administrator. Local governments can then justify their expenditures from fund sources after the fact, or in "real time" to an independent entity.

5.8 Resolution of Continuing Impacts

An important lesson to carry forward from this event is that continuing impacts need to be addressed as well as preparations for future disasters. In Sections 2 to 4 of this report recommendations are elaborated that address these continuing impacts. This discussion summarizes the recommendations to stress the importance of resolving existing problems.

5.8.1 Social and Psychological Impacts

Continuing social and psychological impacts may be at least partially addressed through the following actions:

- Expanded mental health services to handle increased cases of psychiatric disorder, substance abuse, and domestic violence. These needs are especially acute in Native communities where culturally sensitive interventions need development and implementation.

- Expanded primary health care services to respond to spill-related health problems and additional training for primary health care workers in addressing psychosocial and psychiatric complaints related to the oil spill and cleanup.
- Development of programs to reduce community conflict and restore community integration.
- Additional research about the nature and distribution of psychosocial problems related to the oil spill and cleanup.

5.8.2 Local Government Impacts

Continuing local government impacts may be mitigated through the following actions:

- Restoration of communities to their fiscal and operational integrity to where they were before the oil spill and cleanup.
- To ensure community needs and perspectives are addressed, local governments should be integrated into statewide, regional, and other planning efforts for oil spill and other disaster response.
- Mechanisms need to exist to relieve local governments of the cash flow and other fiscal and operational burdens of disaster response.
- Training of local government and especially smaller Native Village leaders in disaster response plans, structure, and operations.

5.8.3 Private Sector Economic Impacts

Mitigation of private sector economic impacts may be accomplished through the following actions:

- Introduction of programs to aid local businesses to recover spill-related losses.
- Consideration of temporary assistance programs such as debt refinancing, loan forgiveness, and tax relief that can aid businesses that experienced spill-related losses.

- Additional research that can quantify the full extent of losses to private businesses and how these losses will affect the future economic growth and development of the affected communities.

Without attention to the damages to local populations as well as the natural environment, the lessons of the *Exxon Valdez* oil spill have been only partially learned. Without restoring what was damaged, the injuries will only fester and worsen. Without acting to protect their families and communities in the future, the risks only increase. Closing the books on the impacts from *Exxon Valdez* oil spill and cleanup will take resources and extensive effort by local communities, state governments, and other concerned parties.

APPENDIX 1. Household Survey Research Methods

1. Household Survey Sample

A survey of 596 households in 13 communities, 11 in the region directly exposed to the oil spill itself and 2 control communities, was conducted between March 30 and May 15, 1990. Sampling frames were developed in the field from a variety of sources. Not all communities had available comparable sources of household addresses. Thus, the basis of the sampling frame for each community varied, based on availability of materials in each locale. In most instances maps indicating the location of domiciles were used. Included were Census Bureau tract maps, other city maps, or maps developed by interviewers and local experts. In some instances addresses were drawn from electric company billing listings. In each case, however, the number and location of households was verified by a census conducted by each fieldworker. After listing the addresses of all domiciles in the community, numbers were assigned to each household in the sampling frame.

After the sampling frame for each community was completed, random samples of households were drawn at a predetermined ratio using computer-generated tables of random numbers. For communities with more than 650 households (e.g., Valdez, Cordova, Seward, and Kodiak) approximately 7% of the households were selected for interviewing. Smaller communities, such as Tatitlek, Chenega Bay, Chignik, and Akhiok, were intentionally oversampled at a 50% or higher ratio based on the total number of households. Replacement households, necessitated in the case of refusals or unoccupied dwellings, were also selected from the same sampling frame using a table of random numbers.

Once each household was selected, a respondent within the household was randomly selected. The person to be interviewed was selected on the basis of birth date. For all persons within the household who were at least 18 years of age, the one whose birthday was closest to the date of the interview was selected as the respondent. If, for some reason, that person was unable to be interviewed, then the person with the next closest birth date was selected. Interviews were conducted by 15 trained fieldworkers and lasted between 45 and 120 minutes.

Incomplete information resulted in the elimination of two respondents, leaving a total sample size of 594. Approximately 78% of all randomly selected subjects agreed to participate. The sociodemographic characteristics of the sample were compared to those reported for each community in the most recent local census available. A high degree of correspondence was found, indicating that overall the sample was representative of the population of each community.

2. Measures

Demographic Variables

Demographic variables examined included age, gender, ethnicity, education, total household income in 1988, and marital status. Age was measured in years and grouped into five categories: 18-24 years, 25-44 years, 45-64 years, and 65+ years old. Ethnicity was measured using a 12-item variable including: white/Caucasian, Koniag/Aleut/Sugpiaq, Eyak, Athapaskan, Yup'ik/Inupiaq, Other Alaskan Native, Filipino, Hispanic, Asian/Oriental, Black, American Indian, and Other. These categories were further classified into Alaskan Native and non-Native groups. Education was measured using an 8-item variable ranging from less than sixth grade to a graduate degree and further classified into two groups on the basis of graduation from high school. Household income for 1988 was measured using a 13-item variable ranging from less than \$5,000 to more than \$150,000 and further classified on the basis of a median income of \$40,000 into two groups. Marital status include married, never married, not married but living together, widowed, divorced, and separated.

Exposure

Exposure to the oil spill and subsequent events was assessed on the basis of responses by residents of the affected communities to six different questions: (1) Did you or anyone in your household use, before the spill, areas along the coast that were affected by the spill; (2) Did you work on any of the shoreline or water cleanup activities of the oil spill; (3) Are there any other ways that you came into contact with the oil spill or cleanup activities, such as during recreation, hunting, fishing, or gathering activities; (4) Did you have any property that was lost or damaged because of the oil spill or cleanup; (5) Did the oil spill cause any damage to the areas you or other household members fish; and (6) Has the oil spill directly affected the hunting, fishing, or gathering activities of any members of this household? Each response was coded 0 for a no response and 1 for a yes. The responses were then summed to provide a continuous measure of exposure with a range of 0 to 6. The exposure index was found to have an inter-item reliability (Cronbach's alpha) of .73 for this population. On a scale from 0 (no exposure) to 6 (high exposure), the mean exposure score for residents in the affected communities was 2.54 (standard deviation = 1.69).

Subjects were classified into three groups on the basis of maximum level of exposure. Residents in the affected communities were classified as being either high-exposed or low-exposed, depending on whether their exposure index score fell above or below the group median. Residents living in the two control communities were classified as being not-exposed.

The distribution of subjects by exposure status within each of the 13 communities and five subregions is provided in Table A1.1. The Kenai Peninsula subregion had the highest percentage of residents in the high-exposed category, followed by the Kodiak Island and Chignik subregions. In general, small, predominately Native communities like English Bay, Tatitlek, Chenega Bay, and Larsen Bay had a larger percentage of residents in the high-exposed category than large, predominately non-Native communities like Valdez and Seward.

A description of the characteristics of the study subjects by exposure status is provided in Table A1.2. Exposure groups differed from one another only with respect to ethnicity and marital status. Natives were slightly overrepresented in the high-exposed category and slightly underrepresented in the low-exposed category. The percentage of adults who were separated or divorced was also significantly higher in the low-exposed group. Otherwise, the three exposure status groups were fairly well matched with respect to distribution of age, sex, and socioeconomic status groups.

Table A1.1 Exposure Status by Subregion and Community				
Subregion or Community	Number of Subjects	Exposure Status		
		% High Exposed	% Low Exposed	% Not Exposed
Prince William Sound	156	46.8	53.2	0.0
Chenega Bay	11	81.8	18.2	0.0
Cordova	66	50.0	50.0	0.0
Tatitlek	14	85.7	14.3	0.0
Valdez	65	29.2	70.8	0.0
Kenai Peninsula Subregion	84	57.1	42.9	0.0
English Bay	24	95.8	4.2	0.0
Seward	60	41.7	58.3	0.0
Kodiak Island Subregion	163	53.4	46.6	0.0
Akhiok	11	54.5	45.5	0.0
Karluk	11	54.5	45.5	0.0
Kodiak	119	48.7	51.3	0.0
Larsen Bay	22	77.3	22.7	0.0
Chignik Subregion	29	51.7	48.3	0.0
Chignik Bay	29	51.7	48.3	0.0
Southeast Subregion	162	0.0	0.0	100.0
Angoon	60	0.0	0.0	100.0
Petersburg	102	0.0	0.0	100.0
Total Region	594	37.6	35.1	27.2

Table A1.2
Demographic Characteristics of Respondents
by Exposure Status

Demographic Characteristic	Exposure Status		
	% High-Exposed (n=224)	% Low-Exposed (n=209)	% Not-Exposed (n=162)
<i>Sex and Age</i>			
Males	52.9	51.0	45.1
18-24	6.0	4.7	1.4
25-44	66.7	56.6	57.5
45-64	22.2	26.4	32.9
65+	5.1	12.3	8.2
Females	47.1	49.0	54.9
18-24	13.5	10.8	5.6
25-44	59.6	60.8	67.4
45-64	19.2	19.6	15.7
65+	7.7	8.8	11.2
<i>Ethnicity</i>			
Native	41.2	21.7	32.3
Non-Native	58.8	78.3	67.7
<i>Education</i>			
< 12 years	49.5	51.5	49.4
H.S. Grad	50.5	48.5	50.6
<i>Income</i>			
< \$40,000	47.5	58.2	53.2
≥ \$40,000	52.5	41.8	46.8
<i>Marital Status</i>			
Married	70.0	65.2	75.1
Single	14.5	9.2	11.2
Separated/Divorced	10.0	19.3	6.8
Widowed	5.5	6.3	6.8

Family Relations

The oil spill's impact on the family was examined using two separate measures. The first was a series of 11 questions relating to the behavior of children in the household. Responses to these questions ranged from 1 (strongly disagree) to 5 (strongly agree). These responses were coded and summed to comprise a child dysfunctional behavior index. The inter-item reliability (Cronbach's alpha) of this scale was .65. A similar measure was developed to assess the degree of perceived family support. This 11-item family support scale had an internal reliability of .88 in this population.

Social Relations

The oil spill's impact of social relations was examined by asking respondents if relations with spouse or partner, children living at home, other relatives, neighbors and friends, people from other communities, and coworkers had improved, stayed the same, or declined since the spill. Respondents were also asked whether they had experienced any problems with outsiders or with friends since the spill.

Traditional Subsistence Activities

The oil spill's impact on traditional subsistence production and distribution activities was assessed by asking respondents about time normally spent hunting, fishing, and gathering; time spent with people from other households on these activities; the amount of harvested resource foods shared with others and with elders; the amount of harvest resource foods received from other families; the number of household members participating in subsistence production activities; and the opportunities for children to learn subsistence production skills. Respondents were asked whether participation in these activities increased, stayed the same, or decreased since the spill compared with the same time in 1988.

Depression

Depressive symptoms were measured using the Center for Epidemiologic Studies Depression scale (CES-D; Radloff 1977). This scale has been used extensively in community studies of the prevalence of depressive symptoms. The scale has been shown to have high inter-item and test-retest reliability as well as sufficient convergent and discriminant validity for use as a measure of the level of depressive symptomatology in general populations (Radloff 1977; Weissman et al. 1977). In this population, the CES-D was found to have an inter-item reliability (Cronbach's alpha) of .88; among Native respondents, the reliability was .90 and

among non-Native respondents the reliability was .86. This compares with coefficient alphas of .84, .85, and .90 reported by Radloff (1977) in her CES-D field trial data.

Respondents described their mood over the past week by rating each of 20 items on a scale from 0 (rarely or none [less than 1 day]) to 3 (most or all [5-7 days]). A depression score was calculated for each respondent by summing the ratings, after first reversing the ratings of four reverse-worded items. If a respondent had completed 85% or more of the CES-D items but less than 100% (n=10), responses to missing items were imputed by using the mean of that person's answers to the nonmissing items.

Respondents with scores of 16 or above were classified as being depressed for the purpose of calculating post-spill prevalence rates. A number of studies have documented the validity of this cut-point in distinguishing groups with high depressive symptomatology from those with low depressive symptomatology. However, the use of this cut-point does not provide an accurate enough measure to ascertain rates of clinical depression as defined by the Diagnostic and Statistical Manual of Mental Disorders, Version III-R (DSM-III-R), criteria in the general population. Nevertheless, the extensive use of this scale in other community studies of the prevalence of depression enables us to compare observed results with similar findings in other segments of the U.S. general population.

The 16.6% prevalence of CES-D scores of 16 or greater reported in this study is much higher than the six-month prevalence rates of DSM-III depressive disorders (ranging from 0.1 to 1.6% for major depressive episodes and from 0.5 to 3.1% for dysthymia) found in the general U.S. population (Myers et al. 1984). However, comparison between the results of this study and those of other studies are limited by differences in study criteria (depressive symptoms versus DSM-III diagnoses) and measurement (CES-D versus Diagnostic Interview Schedule protocol). The CES-D was selected for use in this study because of its ability to describe that type of depressive symptomatology that would impact on all aspects of the health care system and not merely on mental health services.

Anxiety

Unlike the diagnosis of depression, the diagnostic criteria for generalized anxiety disorder (GAD) were based on a DSM-III criteria and therefore reflect a clinical diagnosis. Respondents first had to acknowledge anxiety (i.e., have you ever had a time when for a month or more most of the time you felt worried or anxious, perhaps afraid that something bad was going to happen either to you or someone that you cared about?). In addition, respondents had to acknowledge at least three additional symptoms of anxiety. These included one or more symptoms of motor tension (i.e., muscle tension, restlessness, and easy fatigability), one or more symptoms of autonomic hyperactivity, and one or more symptoms

of vigilance and scanning (i.e., feeling keyed up or on edge, difficulty concentrating, trouble falling or staying asleep, and irritability).

Because disasters are known to lead to new cases of a psychiatric disorder as well as exacerbate an existing disorder, we asked respondents when was the last time they experienced these symptoms. All GAD symptoms were used to calculate a lifetime prevalence rate and all symptoms reported within the past year were used to calculate a post-spill prevalence rate. If a respondent indicated that the first time they were worried or anxious or afraid most of the time for at least a month occurred within the past year, they were defined as a new case and used this to calculate a post-spill incidence rate. In contrast, prevalence refers to the total number of cases (both new cases and cases which may have existed prior to the spill) within a specified period of time (throughout the individual's lifetime and since the spill).

Post-Traumatic Stress Disorder

The diagnostic criteria for post-traumatic stress disorder (PTSD) were based on DSM-III-R criteria. A respondent was diagnosed with PTSD if he or she experienced three or more of the following: persistent unpleasant memories, repeated bad dreams or nightmares, disturbing memories, feeling worse when in a situation that reminded you of a past event, flashback; three or more of the following: loss of interest in previously important activities, trying hard not to think of something that happened to you, stop caring about previously important activities, avoidance of places or activities that reminded you of something that had happened, avoidance of feelings about past event, avoidance of other people, loss of feeling or reduction in emotion, change in future plans, and inability to remember part of past; and two of the following: trouble concentrating, vigilance, insomnia, startled by noise, feeling panicky, fearful, or anxious, irritability, and autonomic hyperactivity (sweating, breathing heavily, heart pounding).

As with anxiety, we asked respondents when was the last time they experienced these symptoms. All PTSD symptoms were used to calculate a lifetime prevalence rate and all symptoms reported within the past year used to calculate a post-spill prevalence rate.

Substance Abuse and Domestic Violence

Because of the cultural sensitivity in rural Alaskan communities over the issues of alcohol and drug abuse and domestic violence, respondents were not asked about changes in their own patterns of drinking or drug usage or their involvement in episodes of domestic violence. It was felt that such questions would not lead to useful response rates or

meaningful results. Instead, respondents were asked if they thought people in their particular community and their close friends and family were drinking, using drugs, and fighting more than before, about the same, or less than before the spill. They were also asked if the amount of drinking, drug use, and domestic violence is leading to problems that weren't there before the spill.

Health Status

Although none of the residents in the sample incurred injuries as a result of direct exposure to the oil spill, the stressful nature of the events might be expected to have affected various aspects of their physical health. To explore this possibility, subjects were asked whether they had experienced a number of chronic conditions since the spill and whether or not these conditions had been verified by a physician. Chronic conditions verified by a physician were summed to provide a measure of illness. Self-perceptions of health status before and after the spill also were assessed by asking respondents to rate their pre-spill and current health status as excellent, very good, good, fair, or poor. These indicators were then compared by exposure status.

3. Statistical Analysis

Prevalence rates of depression, generalized anxiety disorder, and post-traumatic stress disorder were calculated on the basis of percentage of respondents or groups of respondents meeting the criteria for these conditions. Comparison of prevalence rates and proportional distributions across the three exposure categories were based on a chi-square test for trend in proportions (Fleiss 1981). Prevalence rates were further adjusted to account for differences in the distribution of residents by ethnicity and marital status across the three exposure groups, using the Mantel-Haenszel chi-square procedure. Comparisons of mean scores were performed using an analysis of variance procedure. Nonparametric tests (Wilcoxon) were used to compare changes in perceived health status before and after the spill in each exposure group.

APPENDIX 2. Methodology and Implementation of Business Survey

1. Introduction

The overview of private sector economic impacts in section 4.0 relies on findings from the Oiled Mayors' Business Survey. Presented below is a detailed discussion of the methods used to develop and implement this survey for determining some order of magnitude of economic impacts. One objective of this project was to ascertain information about oil spill impacts that was not available in regular published secondary data sources. The kind of information targeted in the business survey questionnaire includes (1) how business plans were affected by the spill with specific reference to oil spill induced shifts in actual and planned business investment, and (2) the type of gains and losses brought about as a consequence of the *Exxon Valdez* oil spill.

The approach used to obtain this information was to conduct a mail survey to over 7,000 business firms representing the universe of business operators in the 24-community Oiled Mayors' study area. The methods employed to administer this study closely follow those prescribed in Mail and Telephone Surveys: The Complete Approach, by Don Dillman of Washington State University (1976).

The methods used to develop and implement the Oiled Mayors' Business Survey consist of three principal elements:

- Questionnaire design
- Sample Frame
- Implementation

2. Questionnaire Design

The questions contained in the survey instrument are organized around five major themes all related to the question: What happened to North Gulf Coast businesses as a consequence of the oil spill? These themes are:

- Industry composition
- Direct participation in spill cleanup
- General business performance
- Business plans before and after the spill
- Gains and losses from the spill.

Industry composition pertains mainly to factual information about the size, type, structure, and location of NGC businesses. Information on industry composition is essential to understanding where impacts may be concentrated. In this analysis, business firms are organized around major economic sectors: commercial fishing, other (nonfish) basic industries, and support industries.

Direct participation in spill cleanup refers to the many facets of business involvement in spill cleanup operations. Four survey questions addressed this issue. The definition of spill cleanup participation was fairly specific. Business firms that were indirectly effected, such as tourist operators that experienced increases (or cutbacks), fishermen (due to closures), stores, and hotels were counted as direct only if their participation met strict criteria. A following set of six questions dealt with general business performance. These questions covered changes in gross business income, in number of employees, and in a series of factors pertaining to business operations from 1988 to 1990 (expected). Several questions in this section addressed business conditions without specific reference to oil spill impacts.

Topics covered under business plans investigated how business plans for buying and selling business assets over the next three-to-five years changed as a consequence of the spill. A series of questions covered business plans to purchase and sell assets before and after the spill and actual purchase and sale of business assets since the spill were addressed in 13 separate questions. In addition to planned or actual amounts purchased and sold, several questions probed more general changes in business operations.

The subject of spill-related gains and losses was also addressed. In one question, all respondents were asked to indicate the extent (dollar value) that the oil spill produced increases or decreases in business profits, as well as in the value of business assets and property. For completeness, business respondents also were asked to indicate if they experienced no change in business profits or asset value. The nature of business losses were probed more deeply. Business respondents that accrued spill-related losses were asked to indicate if compensatory claims were made and, if so, the proportion of their claim covered.

A key feature in questionnaire and database design is the ability to cross-reference one aspect of the database with another. For example, the results to questions pertaining to business performance may be compared for business respondents that directly participated in spill cleanup activities with findings for businesses that did not participate. Furthermore, survey results may be summarized for different industry groups (i.e., fishermen versus service industries) for different types of businesses (corporations versus sole proprietorships), and for businesses having different tenure and so on.

The survey instrument was designed as a small booklet containing 40 questions to be administered as a mail questionnaire. Thus face-to-face and telephone survey strategies were not employed. The form of the questionnaire was designed to attract and keep the attention of the potential respondent. An introductory letter from city of Kodiak Mayor Bob Brodie was placed at the beginning of the booklet. Skip patterns were kept to a minimum, response categories were provided for most questions, and a self-addressed, stamped return envelope was furnished in each booklet. Several short-answer, open-ended questions were included to give the respondent every opportunity to express an opinion not addressed elsewhere.

3. Sample Frame

The sample frame refers to the universe of cases from which to sample and for which the analysis is geared. The sample frame for the Oiled Mayors' Business Survey includes business license holders and commercial fishing permit holders in the 24-community Oiled Mayors' study area.

The Alaska Department of Commerce and Economic Development (ADCED) administers a list of business license holders based on business license applications. The October 1989 business license list was obtained initially on nine-inch reel-to-reel computer tape. It was converted to PC floppy disk and reconfigured for this study using Q&A relational database software. The list was organized by zip code (i.e., community) and contains business and owner names and addresses plus an array of attributes included on the Alaska business license application form. Most important of these were the standard industrial category codes, business tenure, resident status, and type of business organization (sole proprietor, partnership, domestic, and foreign corporation).

This business license listing originally contained about 5,400 firms for the 24-community study area. It represents the foundation of the business survey sample frame.

The Alaska Commercial Fisheries Entry Commission (ACFEC) administers a statewide database containing attributes of commercial fishing permit holders for all state-regulated commercial fisheries. Approximately 1,600 resident permit holders were selected by zip code for Oiled Mayors study communities. The ACFEC list of permit holders included name and address information as well as attributes on management area, species, and gear type. Several steps were taken to avoid double counting two permit records using the same vessel.

The summary characteristics of commercial fishing operators selected for the business survey sample are presented in Table A2.1.

Table A2.1 Characteristics of Commercial Fishery Operators Business Survey Sample					
Species	PWS	Cook Inlet	Kodiak	Other*	Total
Herring	55	63	129	13	260
Salmon	363	464	325	82	1,234
Shrimp	32	2	0	0	34
Other	106	0	30	1	137
Total	556	529	484	96	1,665
* Includes: Chignik, Peninsula-Aleutians, and Security Cove.					

This sampling frame excludes major fisheries in Southeast Alaska, Bristol Bay, and the statewide halibut fishery. These exclusions are based on two sampling guidelines: first, to focus on fishermen that live and fish in the study region. Second, to focus on fishermen that do not have the option to fish in other areas. The statewide halibut fishery is an open-water, bottom fishery. It is managed by the International Pacific Halibut Commission (IPHC) because most fishing occurs beyond the three-mile jurisdiction for state waters. The IPHC concluded that the *Exxon Valdez* oil spill has not seriously affected the Alaska North Gulf Coast halibut fishery, based on the results of catch surveys conducted by the IPHC during the 1989 post-spill fishing season. In summary, our decision to exclude statewide halibut permit holders from the business sampling frame was based on (1) characteristics of the statewide halibut fishery, and (2) the observed limited nature of spill impacts on this fishery.

The statewide list of shore-based seafood processors was obtained from the Alaska Department of Environmental Conservation. According to this list, the Oiled Mayors' study area contains a total of 54 seafood processors, mostly in the larger Group A communities.

The list of seafood processors and the list of resident commercial fishing permit holders were merged with the business license list to form the universe of over 7,000 business firms in the Oiled Mayors' study area. As with commercial fishing permit holders, steps were taken to eliminate the potential for double counting seafood processors.

In order to ensure representation of large business firms that may have been headquartered outside of the study area proper, lists of the ten largest businesses were obtained from the

Chambers of Commerce in all Group A communities. These business names were cross-checked with those listed above and added to the sample frame where appropriate.

4. Implementation

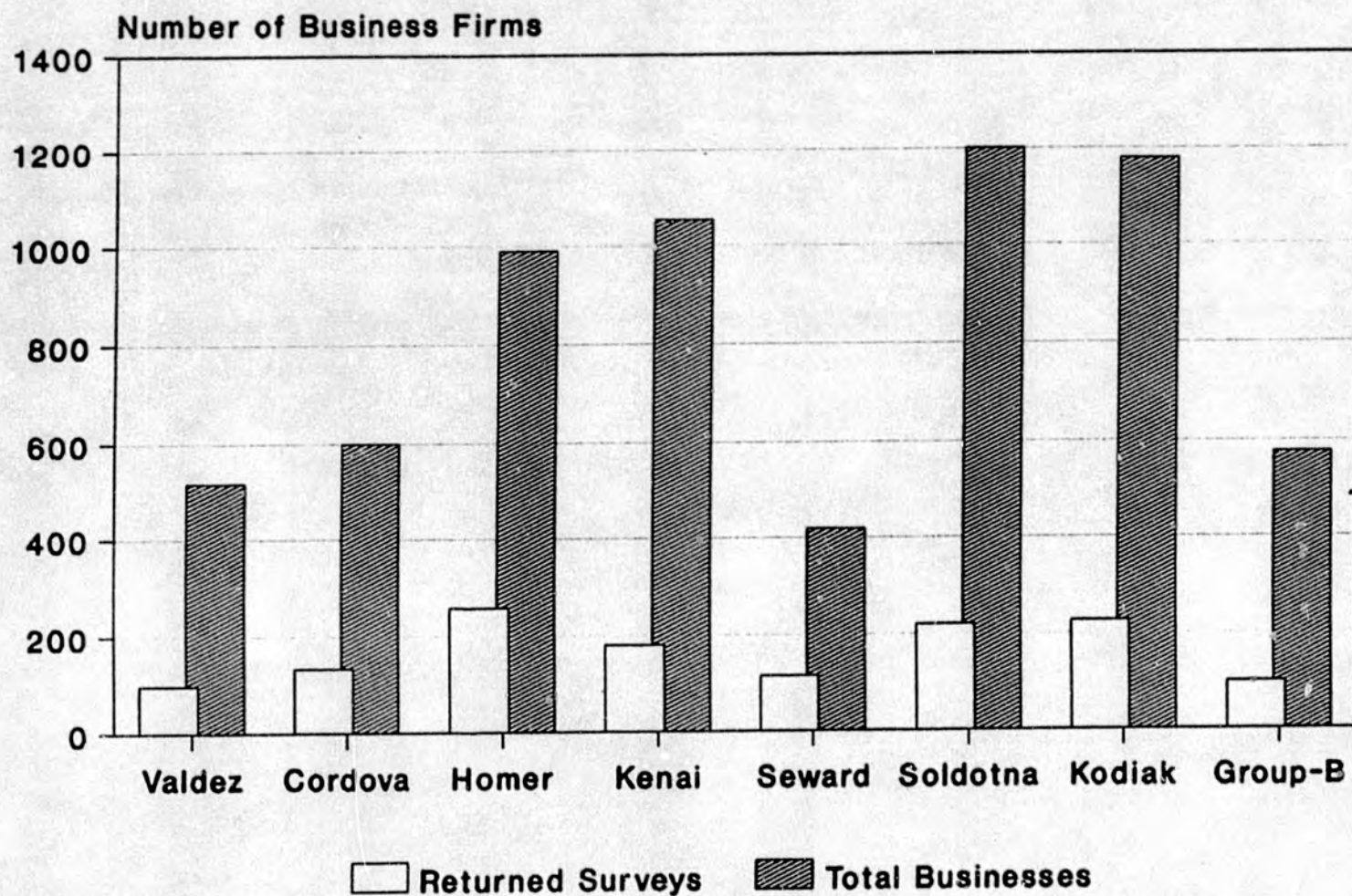
The business survey questionnaire mail was conducted in several stages. The first comprehensive mailout was conducted on April 18. On that date, 7,031 questionnaire booklets were submitted to the U.S. Postal Service Bulk Mail Office for mailing to business firms in 24 NGC communities. Mailing labels were generated from the Q&A database by IAI staff and attached to questionnaire booklets. Five days later on April 23, an equal number of postcards with identical attached mailing labels were submitted to the Bulk Mail Office. The postcards served as a reminder for potential respondents to complete the questionnaire. Also, the postcard provided a contact phone number for directing questions about the survey to IAI staff. In addition, businesses with new addresses and businesses for which the Postal Service could not determine a destination were returned to IAI with appropriate forwarding information where available. This provided IAI staff with vital information concerning the final disposition of study area business firms.

Business firms were assigned unique study numbers to enable IAI staff to maintain accurate records of survey responses without direct reference to business and owner names. IAI staff maintained daily computer records of completed questionnaire booklets returned to IAI. About 100 phone inquiries from potential respondents were received. Many respondents called to request another replacement booklet. A number of respondents called to indicate that their business was not affected by the spill. In such cases respondents were asked to complete and return their questionnaires, regardless of their specific impacts. Several respondents called to indicate that they were not in business at the time of the spill. These firms were removed from the sample frame along with those for which the Postal Service was unable to find a destination.

On May 7, a second bulk mailout of questionnaire booklets was administered to all business firms for which completed questionnaires had not yet been returned to IAI and for which no address change information had been received from the Post Office. This second mailout consisted of approximately 6,200 booklets. During the eight-week period, from mid-April to mid-June, 1,381 questionnaires were returned to the IAI Alaska office. Of these, 1,321 were logged as official, completed questionnaires. By July 31, twenty additional completed questionnaires were returned and logged. Figure A2.1 presents summary return information compared with total businesses.

Summary of Total Responses

Oiled Mayors' Study Area by Community



The information contained in the completed questionnaire booklets was entered into a special computer database designed by IAI staff specifically for this survey. The database was constructed using the SPSS Data Entry Option software. Using the data entry software, a computer form was created that replicated the form and content of the questionnaire booklet. This provided data entry technicians with a framework that reduced the potential for errors at the data entry stage. Furthermore, the SPSS data entry form contained built in "skip-fill" rules that paralleled skip patterns in the questionnaire booklet and accepted only response entries that fell within pre-set guidelines specific to each question.

Completed questionnaires were reviewed by a single editor to ensure that responses were properly and consistently recorded, thus shifting the burden of content accuracy to the editor and away from data entry technicians. A complete data entry verification pass was conducted to ensure accuracy.

REFERENCES

- Alaska Area Native Health Service
1988 Alaska Area Data Book. Anchorage: Alaska Area Native Health Service, Patient Care Standards Branch.
- 1989 Alaska Area Program Information Summary. Anchorage: Alaska Area Native Health Service, Patient Care Standards Branch.
- American Psychiatric Association
1980 Diagnostic and Statistical Manual of Mental Disorders, Third Edition. Washington, DC: American Psychiatric Association.
- 1987 Diagnostic and Statistical Manual of Mental Disorders, Third Edition, Revised. Washington, DC: American Psychiatric Association.
- Baum, Andrew, Richard J. Gatchel, and M. Schaefer
1983 Emotional Behavior and Psychophysiological Effects of Chronic Stress at Three Mile Island. *Journal of Consulting and Clinical Psychology* 51:565-72.
- Bromet, E.
1980 Three Mile Island: Mental Health Findings. Pittsburgh, PA: Western Psychiatric Institute and Clinic and the University of Pittsburgh.
- Escobar, Javier I., Jacqueline M. Golding, Richard L. Hough, Marvin Karno, M. Audry Burnam, and Kenneth B. Wells
1987 Somatization in the Community: Relationship to Disability and Use of Services. *American Journal of Public Health* 77:837-40.
- Fleiss, Joseph L.
1981 Statistical Methods for Rates and Proportions. New York: John Wiley and Sons.
- Gatchel, Richard J., M.A. Schaefer, and Andrew Baum
1985 A Psychophysiological Study of Stress at Three Mile Island. *Psychophysiology* 22:175-81.
- Goldberg, D., and P. Huxley
1980 Mental Illness in the Community: The Pathways to Psychiatric Care. London: Tavistock.

Hlady, W. Gary, and John P. Middaugh.

1986 The Recording and Epidemiology of Suicides in Alaska: 1983-1984. Anchorage: Epidemiology Office, Division of Public Health.

1983 Suicides in Alaska: Firearms and Alcohol. American Journal of Public Health 78:179-180.

Holder, H.D.

1987 Alcoholism Treatment and Potential Health Care Cost Saving. Medical Care 25:52-71.

Klausner, Samuel Z., Edward F. Foulks, and Mark H. Moore

1980 The Inupiat, Economics and Alcohol on the Alaskan North Slope. Philadelphia: Center for Research on the Acts of Man.

Kost-Grant, Brian L.

1983 Self-inflicted Gunshot Wounds Among Alaska Natives. Public Health Reports 98:72-78.

Kraus, Robert F., and Patricia A. Buffler

1979 Sociocultural Stress and the American Native in Alaska: An Analysis of Changing Patterns of Psychiatric Illness and Alcohol Abuse Among Alaska Natives. Culture Medicine and Psychiatry 3:111-151.

Lehman, A.F., N.C. Ward, and L.S. Linn

1982 Chronic Mental Patients: The Quality of Life Issue. American Journal of Psychiatry 139:1271-76.

Logue, J.N., H. Hansen, and E. Struening

1981 Some Indications of the Long-term Health Effects of a Natural Disaster. Public Health Reports 96:67-79.

Logue, J.N., M.E. Melik, and H. Hansen

1981 Research Issues and Directions in the Epidemiology of Health Effects of Disasters. Epidemiologic Reviews 3:140-62.

Murphy, Shirley A., and Mary E. Cowan

1985 Designing and Implementing a Disaster Study. In J. Laube and S. Murphy (eds.), Perspectives on Disaster Recovery, pp. 61-109. Norwalk, CT: Appleton-Century-Crofts.

Myers, Jerome K., Myrna M. Weissman, Gary L. Tischler, Charles E. Holzer III, Philip J. Leaf, Helen Orvaschel, James C. Anthony, Jeffrey H. Boyd, Jack D. Burke, Morton Kramer, and Roger Stolzman

1984 Six-Month Prevalence of Psychiatric Disorders in Three Communities. *Archives of General Psychiatry* 41:959-67.

Radloff, L.S.

1977 The CES-D Scale: A New Self-Report Depression Scale for Research in the General Population. *Applied Psychological Measurement* 1:385-401.

Robins, Lee N., Ruth L. Fischbach, Elizabeth M. Smith, Linda B. Cottler, Susan D. Solomon, and Evelyn Goldring

1986 Impact of Disaster on Previously Assessed Mental Health. In James H. Shore (ed.), *Disaster Stress Studies: New Methods and Findings*, pp. 21-48. Washington, DC: American Psychiatric Press.

Shinkwin, Anne and Mary Pete

1982 Alaskan Villagers' Views on Problem Drinking: "Those Who Forget." *Human Organization* 41:315-22.

Shkilnyk, Anastasia

1985 *A Poison Stronger than Love: The Destruction of an Ojibwa Community*. New London: Yale University Press.

Shore, James H., Ellie L. Tatum, and William M. Wollmer

1986 The Mount St. Helens Stress Response Syndrome. In James H. Shore (ed.), *Disaster Stress Studies: New Methods and Findings*, pp. 77-98. Washington, DC: American Psychiatric Press.

Smith, Robert L.

1977 Alaska Department of Health and Social Services, Community Mental Health Programs, Summary of Client and Service Data, mimeo.

Smith, Robert L. and Philip Hardee

1983 Annual Report to the Legislature 1982. Juneau: Alaska Department of Health and Social Services, Office of Alcoholism and Drug Abuse, mimeo.

Weissman, Myrna M., and Jerome K. Myers

1980 Psychiatric Disorders in a U.S. Community: The Application of Research Diagnostic Criteria to a Resurveyed Community Sample. *Acta Psychiatrica Scandinavica* 62:99-111.

- Weissman, Myrna M., D. Sholomskas, M. Pottenger, B.A. Prusoff, and B.Z. Locke
1977 Assessing Depressive Symptoms in Five Psychiatric Populations: A Validation Study.
American Journal of Epidemiology 106:203-214.
- Wells, Kenneth B., Anita Stewart, Ron D. Hays, M. Audry Burnam, William Rogers, Marcia
Daniels, Sandra Berry, Sheldon Greenfield, and John Ware
1989 The Functioning and Well-being of Depressed Patients: Results from the Medical
Outcomes Study. Journal of the American Medical Association 262:914-19.

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The 1991 State/Federal Natural Resource Damage Assessment and Restoration Plan for the Exxon Valdez Oil Spill

Volume I: Assessment and Restoration Plan
Appendices A, B, C



April 1991

Dear Reviewer:

This document describes studies proposed to be conducted jointly by the State of Alaska and the United States during the third year since the *Exxon Valdez* oil spill. The purpose of these studies is to determine injury to natural resources resulting from that spill. This document also describes restoration planning activities proposed for 1991.

The 1991 proposed plan has greatly benefitted by incorporation of many of the public comments on the "State/Federal Natural Resources Damage Assessment Plan and Restoration Plan for the *Exxon Valdez* Oil Spill, August 1990." This proposed plan was assembled through the cooperative efforts of the State of Alaska acting through the Departments of Fish and Game, Environmental Conservation, Natural Resources, and Law, and the United States acting through the Federal Departments of Justice, Agriculture and Interior, the National Oceanic and Atmospheric Administration, and the U.S. Environmental Protection Agency.

At this printing an agreement has been reached between the State and Federal Trustees, and Exxon, regarding a judicially supervised settlement of claims. Ratification of the settlement agreement may result in modification of plans and projects currently proposed to be conducted.

Public comment on this document will assist the Trustee Council in developing future injury assessment and restoration efforts and may also result in modification of plans and projects proposed to be conducted in 1991. Questions concerning the plan and its distribution should be directed to U.S. Department of Agriculture, Forest Service Public Affairs Office (907) 586-8806.



**VOLUME I: THE 1991 STATE/FEDERAL NATURAL RESOURCE
DAMAGE ASSESSMENT AND RESTORATION PLAN FOR THE
EXXON VALDEZ OIL SPILL AND APPENDICES A, B, C**

CORRECTION

**THIS DOCUMENT
HAS BEEN REPHOTOGRAPHED
TO ASSURE LEGIBILITY**

April 1991

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Comments should be received by June 3, 1991, at the following address:

Trustee Council
P. O. Box 22755
Juneau, AK 99802

We appreciate your interest and look forward to your participation in this important process.

Sincerely,

Michael A. Barton
Regional Forester
Alaska Region
Forest Service
Department of Agriculture

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State of Alaska

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Fish and Wildlife Service
Department of the Interior

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INTRODUCTION

The March 24, 1989, grounding of the tanker *Exxon Valdez* in Alaska's Prince William Sound caused the largest oil spill in U.S. history. Approximately 11 million gallons of North Slope crude moved through the southwestern portion of the Sound and along the coast of the western Gulf of Alaska (see map, Fig. 1). The spill injured fish, birds, mammals, and a variety of other forms of marine life, habitats, and resources.

The State of Alaska acting through the Alaska Departments of Fish and Game (ADF&G), Environmental Conservation (ADEC), and Law (Attorney General), and the United States acting through the federal Departments of Agriculture (DOA), Interior (DOI) and through the National Oceanic and Atmospheric Administration (NOAA), are acting together as Natural Resource Trustees as provided by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Clean Water Act (CWA), and other state and federal authorities. The Environmental Protection Agency (EPA) is assisting in damage assessment and is coordinating the federal restoration efforts with the State of Alaska.

This plan, which describes the proposed 1991 studies, continues or modifies certain 1989 and 1990 damage assessment studies. These studies are designed to determine the nature and extent of the injuries, losses or destruction of resources, and lost uses of the resources. These data provide a base for developing a restoration plan.

Funds received as the result of litigation or settlement will be used to restore, replace, or acquire the equivalent of the injured natural resources and services and to reimburse agencies for relevant costs incurred. The U.S. Department of Justice and Alaska Department of Law represent the federal and state governments, respectively, in pursuit of these claims.

In 1989, the Trustees developed a damage assessment plan incorporating 72 studies in 10 categories. In 1990, 50 studies were undertaken. The proposed 1991 damage assessment plans incorporates 42 studies in 10 categories.

Damage assessment is a dynamic process and it will continue to evolve. In order to identify studies that should be continued, terminated or new studies that should be initiated, the Trustees considered the extensive public comments on the first two years of work and consulted damage assessment investigators, other agency scientific staff, legal counsel, and independent outside expert reviewers. The studies were evaluated from five perspectives: (1) immediate injury, (2) long-term alteration of populations, (3) sublethal or latent effects, (4) ecosystem-wide effects, and (5) habitat degradation.

Studies were discontinued for a variety of reasons, such as the determination that field work had been completed or that there was no practicable way to measure injury. The mere fact that a study was discontinued does not indicate that the resource was uninjured by the spill. Funds are provided to conclude data analysis and report preparation for certain studies that are not being continued in 1991.

The studies described in this plan fall into ten categories: (1) Marine Mammals, (2) Terrestrial Mammals, (3) Birds, (4) Fish/Shellfish, (5) Coastal Habitat, (6) Subtidal Habitat, (7) Technical Services (including chemistry and an integrated geographic information system, complete with mapping) to support the resource studies, (8) Archaeological Resources, (9) Economic Studies, and (10) Restoration. The cost for all activities described in the 1991 State/Federal Natural Resource Damage Assessment and Restoration Planning for the Exxon Valdez Oil Spill is approximately \$35 million.

Marine Mammal studies include direct observations of injury (e.g., through carcass counts) as well as estimates of population effects based on censuses or pathologic and toxicologic indicators (as is being undertaken with otters and seals). In addition, the direct observational data allow for inferences to be made about injuries to populations.

Terrestrial mammals near the coast may have been exposed to hydrocarbons by breathing fumes or eating oiled carcasses or vegetation. The studies will determine the presence of hydrocarbons in tissues of dead animals and the effects, if any, of oil exposure on local populations of brown bears and river otters.

The 1991 effort to determine injury to birds will focus on seabirds, bald eagles, and waterfowl. Surveys and censuses, radio telemetry, and documentation of sublethal and physiological impacts will be used as means to determine injury. The information obtained will contribute to an understanding of mortality, population changes, and other factors essential for the damage assessment process. Studies proposed for birds focus on the collection of data on survival and reproductive success in relation to initial and continuing exposure to hydrocarbons and conversion products.

The Fish/Shellfish studies focus on identifying potential injury to the various life stages of fish and shellfish in areas affected by the oil spill. Species were selected for study based on their respective niche or overall importance within the ecosystem, ability to be sampled, and the existence of an historic data base.

The Coastal Habitat study measures spill-related changes in the intertidal and shallow subtidal zones. It is designed to document injury to resources that rely on these habitats, and to assess

damages for the loss of services provided by these habitats.

The Subtidal Habitat studies determine the distribution and composition of petroleum hydrocarbons or their environmental conversion products in water, sediments, and living resources. Information gathered on the distribution and nature of the hydrocarbons and their conversion products provides a basis for documenting exposure and for determining injury to resources. The combined results of the Coastal Habitat and Subtidal Habitat studies also form a basis for estimating rates of recovery of natural resources and the potential for accelerating recovery.

The Technical Services category includes activities that provide process support or information services to all studies in the areas of analytical chemistry and an integrated geographic information system, complete with mapping.

Studies on archaeological resources will proceed in two steps: (1) inventory, description, and classification; and (2) qualitative and quantitative descriptions and measurements of changes detrimental to the archaeological resources related to the spill.

The value of lost or injured natural resources, and the goods and services they provide humans, are based on results from economic studies. In this regard, damages forming the basis of the Trustees' claim against the potentially responsible parties are calculated by considering (1) the reduction of these goods and services, including intrinsic values, resulting from the spill, and (2) the cost of restoring these goods and services to their pre-spill level, replacing them, or acquiring their equivalent.

The restoration planning component describes the strategy and scope of the restoration process planned for the third oil spill year. Restoration measures will be implemented as appropriate methods are identified and funds are available.

TABLE ONE. STUDIES AUTHORIZED IN 1989, 1990 AND 1991

X = Initiated or Continued

STUDY CATEGORY	STUDY TITLE	1989	1990	1991
Marine Mammals (MM)				
1	Humpback Whale	X	X	
2	Killer Whale	X	X	X
3	Cetacean Necropsy	X		
4	Sea Lion	X	X	*
5	Harbor Seal	X	X	X
6	Sea Otter Injury	X	X	X
7	Rehabilitated Sea Otters	X	X	moved to MM 6
Terrestrial Mammals (TM)				
1	Sitka Black-Tail Deer	X	X	
2	Black Bear	X	X	
3	River Otter & Mink	X	X	X
4	Brown Bear	X	X	X
5	Small Mammals	X		
6	Mink Reproduction	X	X	*
Birds				
1	Beached Bird Survey	X	X	X
2	Census/Seasonal Distribution	X	X	X
3	Seabird Colony Surveys	X	X	X
4	Bald Eagles	X	X	X
5	Peale's Peregrine Falcons	X	X	
6	Marbled Murrelets	X		
7	Storm Petrels	X		
8	Black-Legged Kittiwakes	X		

TABLE ONE (Con't). STUDIES AUTHORIZED IN 1989, 1990 AND 1991

STUDY CATEGORY	STUDY TITLE	1989	1990	1991
Birds, continued				
9	Pigeon Guillemots	X		
10	Glaucous-winged Gulls	X		
11	Sea Ducks	X	X	X
12	Shorebirds	X		
13	Passerines	X	X	
14	Exposure North Slope Oil	X		
Fish/Shellfish (F/S)				
1	Salmon Spawning Area Injury	X	X	X
2	Eggs/Pre-emergent Fry Sampling	X	X	X
3	Coded-wire tagging	X	X	X
4	Early Marine Salmon Injury	X	X	X
5	Dolly Varden Injury	X	X	X
6	Sport Fishing Harvest & Effort	X		
7	Salmon Spawning Area Injury, Outside PWS	X	X	*
8	Egg & Pre-emergent Fry, Sampling Outside PWS	X	X	*
9	Early Marine Salmon Injury Outside PWS	X		
10	Dolly Varden & Sockeye Injury, Lower Cook Inlet	X		
11	Herring Injury	X	X	X
12	Herring Injury Outside PWS	X		
13	Clam Injury	X	X	X
14	Crab Injury	X		
15	Shrimp Injury	X	X	moved to subtidal

TABLE ONE (Con't). STUDIES AUTHORIZED IN 1989, 1990 AND 1991

STUDY CATEGORY	STUDY TITLE	1989	1990	1991
Fish/Shellfish, continued				
16	Oyster Injury	X		
17	Rockfish Injury	X	X	moved to subtidal
18	Trawl Assessment	X	X	*
19	Larval Fish Injury	X		
20	Underwater Observations	X		
21	Clam Injury Outside PWS	X	(combined with F/S 13)	
22	Crab Injury Outside PWS	X	X	
23	Rockfish Injury Outside PWS	X	(combined with F/S 17)	
24	Dermersal Fish Injury	X	X	moved to subtidal
25	Scallop Mariculture Injury	X		
26	Sea Urchin Injury	X		
27	Sockeye Salmon Overescapement		X	X
28	Run Reconstruction		X	X
29	Life History Modeling		(combined with F/S 28)	
30	Database Management		X	X
Coastal Habitat (CH)				
1	Intertidal Studies	X	X	X
Air/Water (A/W)				
1	Geographic Extent of Oil in Water	X		
2	Injury to Subtidal Sediments and Benthos	X	X	moved to subtidal
3	Hydrocarbons in Water	X	X	moved to subtidal
4	Injury to Deep Water	X	(combined with A/W 2)	
5	Injury to Air	X		
6	Oil Fate and Toxicity		X	moved to subtidal

TABLE ONE (Con't). STUDIES AUTHORIZED IN 1989, 1990 AND 1991

STUDY CATEGORY	STUDY TITLE	1989	1990	1991
Subtidal				
	1 Hydrocarbon Exposure, Microbial and Meiofaunal Community Effects (A/W2)			X
	2 Injury to Benthic Communities (CH 1 and A/W 2)			X
	3 Bio-availability and Transport of Hydrocarbons (A/W 3)			X
	4 Sediment Toxicity Bioassays (A/W 6)			X
	5 Injury to Shrimp (F/S 15)			X
	6 Injury to Rockfish (F/S 17)			X
	7 Injury to Demersal Fish (F/S 24)			X
Technical Services				
	1 Hydrocarbon Analysis	X	X	X
	2 Histopathology	X	X	
	3 Mapping	X	X	X
Archaeology				
	1 Archaeological	Part of Econ 9	X	X
Economics				
	1 Commercial Fisheries Losses	X	X	X
	2 Fishing Industry Costs	X	(combined with Econ 1)	
	3 Bioeconomic Models	X	(combined with Econ 1)	
	4 Public Land Effects	X	X	
	5 Recreational Losses	X	X	X
	6 Subsistence Losses	X	X	X
	7 Intrinsic Values	X	X	X