1. **Summary of literature review**
2. **Methodology for determining dependence**
3. **Methodology for determining resilience**
4. **Identifying "vulnerable areas"**
5. **Scale**

Our purpose is to present information to help the Council to develop rebuilding plans for overfished groundfish species. The Magnuson Stevens Act requires among other things that time period for rebuilding an overfished species "be as short as possible, taking into account the status and biology of any overfished stocks of fish, the needs of fishing communities, recommendations by international organizations in which the United States participates, and the interaction of the overfished stock within the marine ecosystem;…"

Looking for concepts and methodological approaches, we have reviewed available literature that points towards using sets of indicators to characterize communities as "dependent", "resilient", vulnerable", or "engaged" which all may be components of assessing the "needs of fishing communities." Our ability to apply suggested approaches is limited by available data and the context of our fisheries. For example, few, if any of these studies, specifically address fishing communities that depend on recreational fishing as a source of income, jobs, or social "well being."

Below is a review of such literature, and our thoughts on the types of indicators that we are initially considering for presenting to the Council to review.

1. Summary of literature review

Types of literature reviewed

Several sources of literature were reviewed to collect information on methodologies used in other regions and industries to assess community dependence on natural resources (fisheries and forestry) and community adaptability to change. Effort was made to review all relevant literature. Over thirty-two studies were reviewed. These have been summarized and can be found in Appendix X. Most of these studies have been included in summaries contained in Tables 1 -5. The literature reviewed typically fell into one or more of the following categories:

- Studies offering general guidance in choosing indicators and indices
- Studies identifying key indicators potentially useful for tracking community dependence, resilience and resident well-being (see Table 1)
- Studies determining dependence and/or resilience (see Tables 2 and 3)
- Studies identifying "communities of concern" or "areas of vulnerability" (see Tables 2,3, and 4)

In general, most studies used the term "dependence" to mean use of a particular resource, sometimes above a threshold level. The term "resilience" usually implied a community's adaptability to change.

Use of indicators and indices to help determine "dependence" and "resiliency"
Because there is no one agreed upon method for measuring dependence and resilience as defined above, research attempting to characterize dependence and/or resilience use various types of data as proxies. Literature sources summarized in Table 1 describe several indicators and indices potentially useful in tracking dependence, resilience and sustainability of communities.

Table 1. Socio-Economic and Cultural Indicators

Author(s)	Key Indicators	Comments
Langdon-Pollock-PSMFC (forthcoming)	• Marine education programs • Number of crew members and processor employees residing in a fishing community • Reliance on other natural resources • Changes in ownership over time • Descriptions of support industries • Commercially landed pounds and revenue • Recreationally landed pounds and revenue • Fishing related social groups and organizations • Subsistence fisheries • Number of vessel owners that reside in the community • Number of vessel owners that land fish but do not reside in the community • Adaption strategies • Industry structure • Training institutions • Perceptions and descriptions of tourism • Women's role in the fishing industries • Processors and fishery support industries • History of fishing industries	
General Fisheries Commission for the Mediterranean (2001)	National Indicators • Gross consumption of fishing products per inhabitant • Fish export/import commercial balance • Fish employment ratios • Fish coverage rates of national consumption • Extraversion rate • Fish contribution to the GNP • Ratio harvesting value	Of a larger group of potential indicators, an advisory group determined that adequate information existed for only sixteen variables that were used to construct the indicators shown. These results would be

	• Ratio harvesting rate Local Operating Unit Indicators • Vessel physical productivity • Capacity physical productivity • Power physical productivity • Per vessel hour physical productivity • Capacity productivity • Vessel productivity • Power productivity • Per vessel hour productivity • Man physical productivity • Man productivity • Average wage • Landing prices • Invested capital • Salary cost • Opportunity cost • Gross estimated profit • Profit rate • Gross added value	tracked over time to develop a better understanding of main socioeconomic trends within the Alboran Sea Mediterranean fisheries management unit.
Kusel, Fortmann (1991)	• Economic well-being (poverty, average income, income inequality) • Health (work injuries) • Social Pathology (rate of burglary) • Capacity • Economic importance of forestry sector • Amount of public land • Concentration of private timber land • Economic importance of tourism • Immigration	Well-being is reformulated in terms of Sen's concepts of capabilities (opportunities an individual has to choose from) and functioning (what (s)he succeeds in doing with the commodities at her command) coupled with an expanded conception of community which is used to explore the question of how communities develop and maintain the capacity to enhance their well-being and to defend their interests against outsiders. *Study 1:* statistical analyses between indicators of well-being and measures of forest and use *Study 2:* rapid rural appraisal of 7 forest communities to determine issues of local importance and to assess capacity to undertake action to address them *Study 3 (v2):* evaluates the well-being of 3 forest communities in CA.
Northeast Fisheries Management Council (2003)	• *Size and demographic characteristics of the fishery workforce in the community* • *Cultural issues*	This SIA was framed by the following questions: - Will standards, style, or

	- attitudes, beliefs, values of fishermen, their families, and their communities • *Social structure and organization* - the ability of communities to provide necessary social support and services to families • *Non-economic social aspects* - lifestyle, health, and safety issues • *Historical dependence on fishery* - reflected in the structure of fishing practices and income distribution	pace of living change? - Will cooperation and interaction patterns change? - Will change be sudden or gradual? - How does the proposed action fit with historical trends and participation in the fishery? - Does the change fit with cultural or normative expectations of behavior in the fishery or community? - How do fishermen and the community members view the alternatives?
Pollnac (2006)	o *Occupational attributes:* o Annual rounds o Fishing units and gears o Cost of entry o Crew structure o Occupational mobility o Productivity o Absenteeism o Turnover o Safety o Flexibility o *Individual attributes* o Mental health (anxiety, low self-esteem, worry, tension) o Psychosomatic illness o Heart disease o Longevity o Education and training o Flexibility o Resilience o *Social structure:* o Occupation structure o Community solidarity o Power structure o Social stratification o Family relationships o Flexibility o Resilience o Robustness o *Social problems:* o Conflict o Non-compliance o Unemployment o Impaired inter-personal relationships o Family violence o Unemployment	
Pollnac and Poggie (1988)	• *Job satisfaction* • Individual longevity • Mental health	

	• Family violence • Worker productivity	
Smith et al. (2003)	*Mental health* • Anxiety • Stress • Mastery • self-esteem • industry changes • depression • employment • spirituality	

Dependence

Dependence was often described for the purpose of identifying communities that could potentially be impacted by a particular change in management regulations. Descriptions of dependence used one or more indicators that served as proxies of dependence. Table 2 provides a summary of the literature review conducted on studies assessing resource (fishing and forestry) dependence. The analyses reviewed usually used at least one, and usually more than one, of the following indicators as proxies for dependence:

- Employment in fishing as a percentage of total employment in the area under analysis
- Income from fishing as a percentage of total income in the area under analysis
- Number of fishing vessels in the area under analysis
- Number of fishing permits in the area under analysis
- Number of processors/buyers in the area under analysis
- Fish landings to the area under analysis

While other indicators (see Hall-Arber et al., 2001) were sometimes used to describe dependence, these were the indicators used most often.

Typically, one of two approaches, or a variation thereof, was used for describing a community's dependence on a resource (see Table 2 for more detail on individual studies and Table 2a for a summary of various methodological approaches).

- Communities are ranked based on indicator values for each indicator category for each community. Those communities with the highest indicator values are assumed to more "more dependent" on the resource than those communities with lower indicator values.
- Communities are ranked from highest to lowest by indicator value for each indicator category for each community. Communities with indicator values above chosen thresholds are labeled "dependent".

Table 2. Determining Dependence

Author(s)	Primary variables considered	Thresholds
Dyer and Griffith (1996)	• Repair/supply facilities • Fish dealers/processors • Religious art/architecture dedicated to fishing • Secular art/architecture dedicated to fishing • Number of Multispecies Groundfish (MGF)	No specific thresholds. Consideration of the suggested variables can give an indication with regard to the relative degree of dependence.

	permits • Number of MGF vessels	Factors were scored in two ways: nominally (as either present or absent) and ordinally (ranked from 5-highest to 1-lowest). Higher scores indicate greater dependence. Scores for each factor are added together to rank the relative dependence of ports.
Jacob et al. (2002)	• Fishing employment (directly and indirectly derived from the fishing sector with the use of regional economic multipliers) as a percentage of total employment	Dependence was defined as at least 15% of total employment (chosen based on ERS calculations – see below)
Hall-Arber et al. (2001)	• Employment in fishing as a percentage of the labor force in all occupations • Employment in fishing as a percentage of employment in related occupations within the Bureau of Labor Statistics category of fisheries/forestry/farming • Summary measure of a series of dependency ratios that explore the number of fishermen per hundred to various alternative occupational roles that fishermen could enter with their particular skill profiles	No specific thresholds. Consideration of the suggested variables can give an indication with regard to the relative degree of dependence.
European Commission (2000)	• Share of fisheries activity in value added • Share of fisheries employment as a percentage of total regional employment • Share of catch as a proportion of total catch	No specific thresholds. Consideration of the suggested variables can give an indication with regard to the relative degree of dependence.
USDA Economic Research Service	• Average annual labor over two years as a percentage of total labor • Proprietors' earnings over two years as a percentage of total earnings	Farming – 15%[1] or more of average annual labor and proprietor's earnings derived from farming during 1998-2000 OR 15% or more of employed residents worked in farm occupations in 2000[2]. Mining – 15% or more of average annual labor and proprietors' earnings derived from mining during 1998-2000 Manufacturing – 25% or more of average annual labor and proprietors' earnings derived from manufacturing during 1998-2000 Federal/state government –

[1] In general, the ERS used one standard deviation from the mean labor and proprietor income for each economic type to help determine the cutoff. The cutoff was then rounded to the nearest 5% (ERS, 2005).

[2] Farming was based on two thresholds. The farming occupation option was adopted to allow counties into the farming-dependent group that had highly farming-oriented economies but did not meet the earnings threshold, most often due to negative farm earnings estimates for some or all of the analyzed years.

		15% or more of average annual labor and proprietors' earnings derived from Federal and State government during 1998-2000 Services – 45% or more of average annual labor and proprietors' earnings derived from services during 1998-2000
Forest Service (1987) as referenced by Donoghue and Haynes (2002)	• A community's employment in the forest products industry as a percentage of total employment	Dependence was defined as at least 10% of total employment
Kenneth and Beale (2002)	A weighted average of : • Wage and salary employment in entertainment and recreation, accommodations, eating and drinking places, and real estate as a percentage of all employment reported in the Census Bureau's County Business Patterns for 1999 • Percentage of total personal income reported for the same categories by the Bureau of Economic Analysis • Percentage of housing units intended for seasonal or occasional use reported in the 2000 Census • Per capita receipts from motels and hotels as reported in the 1997 Census of Business.	This study analyzes community dependence on recreational industries. The industry categories were chosen after reviewing data for a sample of counties of well-known, undisputed high recreational dependence. The variables were converted into z-scores and combined into a weighted index to reflect recreational activity (0.3 employment + 0.3 income + 0.4 seasonal homes). Counties with index scores of 0.67 or higher were regarded as potential recreation counties. Other counties were also considered if they had a score greater than the mean of the index and one of the following conditions was met: 1) the county had at least $400 per capita of hotel-motel receipts or 2) at least 25% of the housing in the county was seasonal. In this way, counties with a high volume of recreational activity but large urban centers that dilute their scores can be included.
Norman et al. (forthcoming)	• Value of fish landed in the community • Metric tons of fish landed in the community • Permit holders residing in the community • Vessel owners residing in the community • Number of vessels delivering fish to the community	All variables were outputs generated by a Data Envelopment Analysis (DEA) Model, where inputs were community populations. The model thereby compared all communities to one another in terms of fishing outputs per capita, and generated a list of communities in rank order by

		level of dependence on fishing. Communities were analyzed as dependent upon fishing in general, or engaged in a specific fishery, relative to one another and then rank ordered according to the relative importance of their dependence or engagement score. No specific threshold was identified. However, once assembled in a rank ordering, communities which scored at least one standard deviation above the mean on either the dependence or engagement scale were selected for detailed profiling.
Sepez et al. (2005)	• Metric tons of fish landed in the community • Number of processors in the community • Number of vessels delivering fish to that community • Number of vessels homeported in the community • Number of vessel owners residing in the community • Number of crew licenses in the community • Ratio of state-issued fishing permits to population • Ratio of state-issued setnet fishing permits to population • Ratio of federally issued vessel permits to population • Aggregate of all indicators described above per capita	If any one of these indicators for a particular Alaskan community exceeded the threshold of 0.15, which in most cases was determined as a ratio to community population, it was determined to be significantly linked to fishing and selected for profiling.
Langdon-Pollack (2004)	• Population • Poverty • Unemployment • Per capita income • Year that houses were built • Percent of vacant houses • Number of industries outside fishing • Number of berths • Percent that a harbor is filled with commercial and/or rec vessels • Landings data and number of suppliers • Processors • Community fishing organizations • Community fishing events	The author suggests the use of these indicators in a dependency index. However, after collecting this data for the Pacific coast region, it was determined that creating a dependency index was impractical given the available information.
Daniels (2004)	• The amount of forest land per county as a percentage of total county land	The ranked list of counties and their values were divided into three equal parts. The top third was labeled with a “high” dependence, the second third

		with a “medium” dependence and the lowest third was labeled with “low” forest dependence.

Table 2a. Methodologies Used in Past Research to Identify Dependence

Method	Sources that use this method	Threshold identified? How?	Primary variables	Notes
Dependence threshold using indicators as proxies for dependence	Forest Service (1987), USDA ERS, Jacob et al. (2002)	The threshold was identified by estimating one standard deviation from the mean for each variable to help determine the cutoff. The cutoff was then rounded to the nearest 5%.	• Industry employment as a percentage of total area employment (using multipliers or input-output model) • Industry earnings as a percentage of total area earnings	
Dependence threshold using an index as a proxy for dependence	Kenneth and Beale (2002)	The variables were converted into z-scores and combined into a weighted index to reflect recreational activity (0.3 employment + 0.3 income + 0.4 seasonal homes). Counties with index scores of 0.67 or higher were regarded as potential recreation counties. Other counties were also considered if they had a score greater than the mean of the index and one of the following conditions was met: 1) the county had at least $400 per capita of hotel-motel receipts or 2) at least 25% of the housing in the county was seasonal. In this way, counties with a high volume of recreational activity but large urban centers that dilute their scores can be included.	• Wage and salary employment in entertainment and recreation, accommodations, eating and drinking places, and real estate as a percentage of all employment • Percentage of total personal income • Percentage of housing units intended for seasonal or occasional use reported • Per capita receipts from motels and hotels	Used to determine recreational dependence
Relative dependence of communities using indicators as proxies for dependence	Daniels (2004), Hall-Arber et al. (2001), European Commission (2000)	No threshold identified. Consideration of the suggested variables can give an indication with regard to the relative degree of dependence.	• Employment in fishing as a percentage of the labor force in all occupations • Employment in fishing as a percentage of employment in related occupations within the Bureau of Labor Statistics category of fisheries/forestry/farming • Summary measure of a series of dependency ratios that explore the number of fishermen per hundred to various alternative occupational roles that fishermen could enter with their particular skill profiles • Share of fisheries activity in value added • Share of catch as a proportion of total	Daniels (2004) used this method to help identify "areas of concern". The ranked list of counties and their values were divided into three equal parts. The top third was labeled with a "high" dependence, the second third with a "medium" dependence and the lowest third was labeled with "low" forest dependence.

			catch • The amount of forest land per county as a percentage of total county land	
Relative dependence of communities using as index as a proxy for dependence	Dyer and Griffith (1996)	No threshold identified. Consideration of the suggested variables can give an indication with regard to the relative degree of dependence.	• Infrastructure - Repair/supply facilities, fish dealers/processors • Art/architecture dedicated to fishing • Number of permits • Number of vessels	
Relative dependence on fishing and engagement in specific fisheries using indicators as proxies for dependence and engagement	Norman, et al. (forthcoming)	Communities were analyzed as dependent upon fishing in general, or engaged in a specific fishery, relative to one another and then rank ordered according to the relative importance of their dependence or engagement score. No specific threshold was identified. However, once assembled in a rank ordering, communities which scored at least one standard deviation above the mean on either the dependence or engagement scale were selected for detailed profiling.	• Value of fish landed in the community • Metric tons of fish landed in the community • Permit holders residing in the community • Vessel owners residing in the community • Number of vessels delivering fish to the community	Engagement analysis focused on the value of fish landed, permit holders, and fishery-specific vessels owned by community members. Each of these categories was broken down by each North Pacific and Pacific fishery management group.

Resilience

Once dependence is described in the reviewed literature, resilience is often assessed for the areas under analysis. Resilience is described in order to assess the potential impact the change in management regulations will have on the areas under analysis. It is typically assumed that the greater socio-economic and cultural diversity and infrastructure an area has, the more resilient an area will be if a management regulation negatively affects the area. Indices, or aggregations of indicator values are often used as a proxy for resilience. These indices include a greater variety of indicators than the list of indicators used as proxies for dependence (see Table 3). Resiliency indices in the studies reviewed sometimes included some of the following indicators:

- Employment in various industries
- Unemployment
- Income
- Mobility
- Education, skills and training
- Population density (as a proxy for community infrastructure)
- Community isolation
- Fisheries specific infrastructure

Several of the studies reviewed use indices of community well-being as a guide in developing resiliency indicators.

Table 3. Determining Resilience

Author(s)	Variables incorporated into resilience indicator	Comments
Hall-Arber et al. (2001)	• Infrastructure o Icehouse o NMFS extension office o Dockside diesel fuel o International fish brokers o Boat insurance o Local trucking o Fish processor o Fishing monument o Boat welders o Fishermen supply house o Vessel haul out facility o Bait house o 3+ fishing associations o Marine supply house o Local net maker o Fish retail store o 2 or fewer association	Surveys of 25 local communities and principal components analysis was used to rank the infrastructure factors and aggregate these into a score for each community to show relative resilience.
Charles et al. (2001)	• Debt levels among fishermen • Reported bankruptcies • Bankruptcy liabilities • Distribution of landed value across species • Proportion of fishers with multiple licenses • Age distribution of fishers • Diversification of employment sources	The authors suggest use of these indicators to proxy resilience.
Pollard (2004)	• Isolation	This report identifies “vulnerable”

	• Deprivation index
	  o Income
	  o Employment
	  o Health deprivation and disability
	  o Education skills and training,
	  o Housing
	  o Geographical access to services
		areas based on their location (as categorized by Travel to Work Areas – an indication of their rural status and remoteness), deprivation, and regional policy.

Daniels, JW (2004); Horne and Haynes (1999)	• *Lifestyle diversity* Mobility Ethnicity Degree of urbanness Race Income Education • *Economic diversity* employment in county *i* in industry *j*, *Ei* = total employment in county *i*, *Ej* = total employment in industry *j* in all counties, and *E* = total employment in all industries across all counties. • *Population density* (proxy for civic infrastructure) Greater population density is assumed to lead to a more developed county infrastructure and so increases socioeconomic resiliency.	Each county received an overall socioeconomic resiliency rating corresponding to an unweighted average of its ranks for lifestyle diversity, economic resiliency, and population density. These values were then sorted from highest to lowest value and divided into thirds. Counties in the top third had the highest socioeconomic resilience and so were given a rating of "high." Counties in the middle third were given a "medium," and counties in the last third were given a "low" socioeconomic resiliency rating.
Sommers (2001)	• Demographics • Employment • Government revenues • Facilities and infrastructure • Social services burden • Federal assistance • Business trends • Taxes	
Wilson and McCay (1998)	• Existence of alternative activities, both fishing and non-fishing (the more alternatives available to someone who must change their behavior because of a regulation, the better that person is able to deal with the change) • Economic vulnerability (amount and sources of pressure and competition faced in running fishing operators and selling their products. The more vulnerable the fish-related operation is, the greater the impact's regulation. • Community support (communities differ in the degree to which social capital is available to people and fishing operations affected by regulation. The more community support, the better the communities can absorb the regulation's impact.	While this study does not call itself a resiliency report, it offers "3 characteristics of communities influencing the magnitude and importance of the impact" which is a measure of resiliency

Communities of concern or areas of vulnerability

In the reviewed literature, the purpose of identifying "communities of concern" or "areas of vulnerability" is to alert decision-makers to areas that may require particular focus and/or mitigation efforts. Most of the studies reviewed that attempted to measure dependence *and* resilience, used these two measurements to identify the areas that had both relatively high dependence and relatively low resilience levels. These areas are then labeled as "communities of concern" or "areas of vulnerability" (see Table 4). The states of Washington, Oregon and California have their own definitions of "distressed", "disadvantaged" or "high unemployment" areas (see Table 5). Washington and California rely upon unemployment rates while Oregon uses indices averaging employment change, average wage change, annual employment rate relative to the state level, and per capita personal income relative to state[3].

Scale

Almost all of the literature reviewed cautioned against the use of the dependence and resiliency indicators and indices as the primary guidance for making fishery management decisions due to the scale of analysis. Most of the studies used data on the county level which was admittedly too large a scale to accurately measure community dependence and resilience. However, in almost all cases, data on a smaller scale was not available.

Table 4. Linking dependency and resilience to identify vulnerable areas or areas of concern.

Author (s)	Definition of "communities of concern" or "vulnerable areas"	Comments
Crone and Haynes (2001)	Wood products counties of concern – a minimum 10% employment in SIC category 24 and contained two or more communities with medium to very high wood products specialization rating Range counties of concern – 12% or more of agricultural sales derived from sheep or cattle produced from federal forage, harvest levels, animal unit months	Community ranking - Communities were ranked that contained two or more isolated communities that had a medium to very high wood products or agricultural specialization and for which at least 33% of the land in a 20 mile radius circle is FSBLM land (wrt wood products). The counties were ranked from 1 to 3 based on how high a concern the area was. Finding the preferred alternative - Rankings were aggregated and the lowest aggregate level indicated the preferred alternative.
Daniels (2004)	Areas with "low" socioeconomic resilience and "high" forest dependence (see Tables 2 and 3 for definitions)	
Pollard (2004)	Areas with overlap of high dependence, remoteness, and a high deprivation index score	See Table 3 for more details on indicators used.

[3] To determine whether an incorporated city or sub-city area in a non-distressed county is distressed, four factors were used including: poverty rate, per capita personal income, percent of population aged 25+ with college education, and unemployment rate.

Table 5. Distressed Communities

State	Definition of "distressed"	Communities
Washington	Counties having three year average unemployment rate greater than or equal to 120% of the state average (Jan 2002-Dec 2004)	Adams, Clark, Columbia, Cowlitz, Ferry, Grant, Grays Harbor, Klickitat, Lewis, Okanogan, Pacific, Pend Oreille, Skamania, Stevens, Wahkiakum, Yakima[4]
Oregon	To determine whether a county is distressed or not, four factors were used to create an index for the county. These factors are: • Employment change (ever the most recent period for which data is available); • Average wage change (over the most recent period for which data is available); • Annual employment rate relative to state (latest year for which data is available); and • Per capita personal income relative to state (latest year for which data is available.[5] To determine whether an incorporated city or sub-city area in a non-distressed county is distressed, four factors were used: • Poverty rate (i.e. percent of the population in poverty) • Per capita personal income • Percent of population aged 25+ with college education • Unemployment rate[6]	Severely distressed counties – Baker, Columbia, Coos, Crook, Douglas, Grant, Harney, Klamath, Lake, Linn, Malheur, Sherman, Umatilla, Wallowa, Wasco, Wheeler Distressed counties – Curry, Gilliam, Hood River, Jefferson, Josephine, Lincoln, Marion, Morrow, Union Severely distressed city/area – Monroe, Butte Falls, Eagle Point, Talent, Phoenix, Gold Hill, Oakridge, Creswell, Lowell, Cottage Grove, Springfield, Florence, Lents area of Portland, North/NE Portland, Rockwood area of Portland, Falls City, Independence, Garibaldi, Gaston, Dayton, Sheridan, Lafayette, McMinnville Distressed city/area – Johnson City, Estacada, Warrenton, Seaside, Astoria, Rogue River, Veneta, Westfir, Fairview, Wood Village, Dallas, Monmouth, Tillamook, Bay City, Cornelius, Forest Grove, Amity, Newberg, Willamina[7]
California	There are several measures used to qualify communities for specific programs in California. Some examples are: 1) A county is labeled "distressed" if it has an unemployment rate exceeding 125% of the statewide average. 2) The Employment Training Administration of the Federal Department of Labor designates Labor Surplus Areas for Workforce Development and defines them as	1) Del Norte, Alpine, Monterey, San Joaquin, Modoc, Lake, Madera, Stanislaus, Glenn, Siskiyou, Plumas, San Benito, Yuba, Kern, Sierra, Fresno, Sutter, Trinity, Merced, Kings, Tulare, Colusa, Imperial[8] 2) Alpine, Colusa, Del Norte, Glenn, Imperial, Kern, Kings, Lasses,

[4] Assessed by the Washington State Employment Security Department. Distressed Areas List for 2005. www.workforceexplorer.com/article.asp?ARTICLEID=5010

[5] The index is a composite of these four factors. A county is distressed if its index is less than 1.0 and non-distressed otherwise. If a county is distressed, all of its parts are considered to be distressed. An index less than one shows that, on average, economic conditions worsened for a county relative to the state over the period under consideration.

[6] If three or more of these factors were worse than a threshold value, then that place was identified as distressed. The threshold value is a representative value for each of the four factors in distressed counties.

[7] Assessed by the Oregon Economic and Community Development Department for 2005. www.econ.state.or.us/distMethods.htm

[8] "Economically distressed counties" are defined in a 1999 state statute and the counties qualifying are based on 2004 data. Information in the above table came from the California Economic Development Department (http://www.edd.ca.gov/).

	areas that have had unemployment rates of 120% of the national average for two fiscal years. 3) To qualify for the Federal Foreign Investor Visa Program, a county must be a high unemployment area with an unemployment rate of 150% above the national average).	Madera, Merced, Modoc, Monterey, Plumas, San Benito, San Joaquin, Santa Clara, Shasta, Sierra, Siskiyou, Stanislaus, Sutter, Tehama, Trinity, Tulare, Yuba 3) Kern, Imperial, Fresno, Kings, Madera, Merced, Stanislaus, San Benito, San Joaquin, Tulare, Sutter, Yuba

2. Methodology for determining dependence

Characterization of dependence will involve consideration of dependence on the total fish resource and dependence on the groundfish resource specifically. The following six indicators are being considered as proxies for overall community dependence on the Pacific coast fishery resources:

- Number of federal and state fishing permits
- Number of commercial fishing vessels
- Revenue from fishing as a share of total revenue from fishing
- Income from fishing as a share of total personal income
- Employment in fishing as a percentage of total employment
- Number of processors/buyers

The following six indicators will be used as proxies for community dependence on the Pacific coast groundfish fishery specifically:

- Number of groundfish permits
- Number of commercial fishing vessels using groundfish gear (non-whiting)
- Groundfish revenue as a percentage of total fisheries revenue
- Groundfish revenue as a percentage of total groundfish revenue
- Groundfish income as a percentage of total fisheries income
- Groundfish employment as a percentage of total employment in fishing

These sets of indicators were chosen based on: 1) the kind indicators seen in the literature and 2) data availability. The top set of indicators are proxies for commercial fishing dependence and engagement. The second set of indicators are a mix of: 1) proxies for both community dependence on groundfish compared to other communities (first four indicators) and 2) proxies for community dependence on groundfish compared to other fish harvested (last four indicators).

To describe the relative dependence of communities on the Pacific fishery resource, first, each area will be assigned a value for each indicator listed above for both overall community dependence on the fish resource and for community dependence on the groundfish fishery. Second, the communities will be ranked from highest value to lowest value for each indicator. Third, the top one-third of communities for each indicator will be listed in a table and deemed “high dependency”.

3. Methodology for determining resilience

The methodology for characterizing resilience is simply a presentation of socioeconomic resiliency indicators in three categories:

- Population characteristics diversity
  - Average age of population
  - Average of highest education degree obtained
- Economic diversity
  - Average income
  - Total employment rate
  - Isolated counties
- Infrastructure
  - Population density
  - Fishing and community infrastructure
  - Number of permits owned

The theoretical basis for socioeconomic resiliency rests on the concept of social well-being, which is sometimes defined as a composite of four factors: economic resiliency, social and cultural diversity (population size, mix of skills), civic infrastructure (leadership, preparedness for change), and amenity infrastructure (attractiveness of the area) (McCool and others 1997).

In some papers, the authors assume that the relation between diversity and resiliency in social and economic systems is similar to that in the ecological literature. That is, a system with higher diversity is less affected by change than a system with lower diversity and the former therefore has higher resiliency. Socioeconomic systems with higher resiliency are defined here as those that adapt quickly as indicated by rebounding measures of socioeconomic well-being. People living in areas of high resiliency have a wide range of skills and access to diverse employment opportunities. Thus, if specific firms or business sectors experience downturns, unemployment rates rise only briefly until displaced people find other employment. Systems with low resiliency have more lingering negative impacts, such as unemployment or out-migration rates that remain high for several years.

4. Identifying “vulnerable areas”

Vulnerable areas will be identified as those communities that have both “high dependency” and “low resiliency”. The method for doing this has not yet been defined.

5. Scale

Data availability largely influences the scale of the analysis regarding dependency and resilience. Measuring dependence and resilience requires use of indicators that are available for all areas analyzed. Therefore, data from central sources (2001 Census, PacFIN, RecFIN) were relied upon primarily, and data available for some areas, but not others, will be included as supplemental

information in the text. For this reason, the scale of analysis was largely limited to port group and county.

However, there are some serious drawbacks to the use of port group and county to describe community dependence and resilience. Port group and county level analysis will likely dilute community fishery dependence values when a county/port group analyzed has communities (other than fishing communities) with high employment levels in non-fishing industries. To mitigate for this, other indicators are relied upon (number of vessels, number of permits, income, etc).

Another drawback to the use of port group and county in the analysis is that it will likely bias community fishery resilience values when a county/port group analyzed has communities (other than fishing communities) with employment diversity, high population density, and other indicators values that differ from the fishing communities within the area.

6. Dependency Indicator Results

Overall Community Dependence on Commercial Fishing

Number of federal and state fishing permits

Table 6. Ports with the highest number of fishing permits, 2005.

City	Permit Count
ASTORIA	258
NEWPORT	169
WESTPORT	137
PORT ORFORD	124
BELLINGHAM	119
SEATTLE	109
BROOKINGS	101
COOS BAY	99
ABERDEEN	87
ANACORTES	81
WARRENTON	79
CHARLESTON	67
CRESCENT CITY	59
BANDON	45
GARIBALDI	45
PORTLAND	44
FLORENCE	42
FORT BRAGG	40
PACIFIC CITY	40
BLAINE	40
GOLD BEACH	38
TOLEDO	37
CHINOOK	36
ILWACO	36

HARBOR	35
REEDSPORT	35
CATHLAMET	35
CLATSKANIE	34
SILETZ	34
NORTH BEND	33
SOUTH BEACH	33
FERNDALE	31
SALEM	29
TOKELAND	29
LONGVIEW	28
LONG BEACH	27
TACOMA	27
GRAYLAND	26
SOUTH BEND	26
GIG HARBOR	24
HAMMOND	23
DEPOE BAY	21
OCEAN PARK	21
PORT ANGELES	20
FRIDAY HARBOR	20
TILLAMOOK	20
CLACKAMAS	19
GEARHART	19
EUREKA	19
SEQUIM	18
HOQUIAM	17
NASELLE	17
RAYMOND	17
OLYMPIA	16
EUGENE	15
COQUILLE	14
WINCHESTER BAY	14
CHEHALIS	14
EDMONDS	14
OREGON CITY	13
WALDPORT	13
BOW	13
CLOVERDALE	13
WESTLAKE	13
CASCADE LOCKS	12
SAN FRANCISCO	12
ROCKAWAY	12
SEAVIEW	12
LAKE FOREST PARK	11
LAKE FOREST	11
EVERETT	11
BAY CITY	11
BEAVERTON	11
VANCOUVER	10

SEASIDE	10
OAK HARBOR	10
PORT TOWNSEND	10
CENTRALIA	10
MILWAUKIE	9
NEAH BAY	9
ROSEBURG	9
CLINTON	9
SHELTON	9
BAY CENTER	9
DALLAS	9
HALF MOON BAY	9
SCAPPOOSE	8
SIXES	8
OCEAN SHORES	8
COSTA MESA	8
ATASCADERO	8
ARLINGTON	8
CAMANO ISLAND	8
LOGSDEN	7
MARYSVILLE	7
BODEGA BAY	7
LOPEZ ISLAND	7
MT VERNON	7
SEDRO WOOLLEY	7
RAINIER	6
KELSO	6
BRINNON	6
RENTON	6
BREMERTON	6
MONTEREY	6
MORRO BAY	6
EL GRANADA	6
BURLINGTON	6
SNOHOMISH	6
SEBASTOPOL	6
NEHALEM	6
ROCKAWAY BEACH	6
TIGARD	6
LYNDEN	6
CURTIS	6
LUMMI IS	6
CORVALLIS	5
COSMOPOLIS	5
LANGLEY	5
BELLEVUE	5
SHORELINE	5
VASHON	5
PORT ORCHARD	5
KLAMATH FALLS	5

SPRINGFIELD	5
VENETA	5
LINCOLN CITY	5
FOX ISLAND	5
LOS OSOS	5
SAN JOSE	5
SANTA CRUZ	5
OXNARD	5
CUSTER	5
BAINBRIDGE ISLAND	5
MCMINNVILLE	5
CHELAN	4
CANBY	4
LAKE OSWEGO	4
LA PUSH	4
CASTLE ROCK	4
GASQUET	4
BEND	4
EPHRATA	4
ARCATA	4
MCKINLEYVILLE	4
GRANTS PASS	4
FEDERAL WAY	4
WOODINVILLE	4
SALKUM	4
SILVER SPRINGS	4
ALBION	4
SALINAS	4
VAUGHN	4
EL CAJON	4
MOUNT VERNON	4
LYNNWOOD	4
SANTA ROSA	4
HERMISTON	4
ROSBURG	4
FOREST GROVE	4
HILLSBORO	4
PETERSBURG	4
BEAVER	4
FT BRAGG	4
NAHCOTTA	4
PITTSBURG	4
WEDDERBURN	4
ANCHORAGE	3
FORKS	3
BRUSH PRAIRIE	3
RIDGEFIELD	3
WASHOUGAL	3
CANNON BEACH	3
LAKESIDE	3

Table 7. Counties with the highest number of fishing permits, 2005.

County	Permit Count
Clatsop County	393
Lincoln County	328
Curry County	313
Grays Harbor County	281
Coos County	267
Pacific County	218
Whatcom County	205
King County	178
Tillamook County	135
Skagit County	105
Lane County	75
Pierce County	73
Douglas County	71
Del Norte County	63
Clackamas County	61
Snohomish County	61
Clallam County	54
Columbia County	52
Mendocino County	49
Multnomah County	47
Wahkiakum County	43
Humboldt County	42
Cowlitz County	40
Marion County	38
Washington County	32
Island County	30
Lewis County	28
Orange County	27
Jefferson County	25
Clark County	24
San Juan County	21
San Luis Obispo County	21
San Mateo County	21
Thurston County	20

Table 8. Port Groups with the highest number of fishing permits, 2005.

Number of commercial fishing vessels

Table 9. Ports with the highest number of fishing vessels, 2005.

Port	Number of fishing vessels	Number of vessels as a percentage of total coastwide number of vessels
Newport	902	6.9%
Coos Bay	784	6.0%

San Francisco	564	4.3%
Westport	538	4.1%
Astoria	538	4.1%
Fort Bragg	514	4.0%
Bodega Bay	468	3.6%
Bellingham	464	3.6%
Moss Landing	440	3.4%
Princeton/	436	3.4%
Pseudo port code	380	2.9%
Ilwaco/Chinook	338	2.6%
Tillamook	332	2.6%
Santa Barbara	306	2.4%
Crescent City	268	2.1%
Santa Cruz	240	1.8%
Terminal Island	232	1.8%
San Pedro	232	1.8%
Seattle	228	1.8%
Morro Bay	222	1.7%
Anacortes	214	1.6%
Willapa Bay	208	1.6%
Brookings	204	1.6%
Eureka	202	1.6%
Blaine	202	1.6%
Oxnard	178	1.4%
Port Angeles	164	1.3%
Port Orford	160	1.2%
Other Orange/LA	156	1.2%
Monterey	156	1.2%

Table 10. Counties with the highest number of fishing vessels, 2005.

County	Number of fishing vessels	Number of vessels as a percentage of total coastwide number of vessels
SFBay/SanMateo	966	8.5%
Lincoln	928	8.1%
Clatsop	912	8.0%
Coos	798	7.0%
Mont/StaCruz	730	6.4%
Whatcom	606	5.3%
Marin/Sonoma	596	5.2%
Orange/LA	580	5.1%
GraysHrbr	560	4.9%
Mendocino	550	4.8%

Table 11. Port Groups with the higest number of fishing vessels, 2005.

Revenue from fishing as a share of total revenue from fishing

Table 12. Ports with the highest revenue from commercial fish landings as a percentage of revenue from total commercial fish landings coastwide, 2005.

Port	Port fish revenue/Coastwide fish revenue
WESTPORT	13.3%
ASTORIA	11.4%
NEWPORT	9.4%
COOS BAY	6.6%
BELLINGHAM BAY	6.0%
ILWACO/CHINOOK	4.2%
CRESCENT CITY	2.4%
PORT HUENEME	2.2%
SAN PEDRO	2.0%
SEATTLE	2.0%
EUREKA	1.9%
FORT BRAGG	1.9%
TERMINAL ISLAND	1.8%
VENTURA	1.8%
BLAINE	1.7%
SAN FRANCISCO	1.7%
NEAH BAY	1.6%
SANTA BARBARA	1.6%
MOSS LANDING	1.6%
WILLAPA BAY	1.5%
PRINCETON / HALF MOON BAY	1.4%
TILLAMOOK/GARIBALDI	1.3%
BROOKINGS	1.3%
ANACORTES	1.2%
OTH SOUTH PUGET SOUND PORTS	1.1%
OTH WA COASTAL PORTS	1.1%
LA PUSH	1.0%
PORT ORFORD	1.0%
TACOMA	0.9%
SHELTON	0.9%
PORT TOWNSEND	0.9%
BODEGA BAY	0.9%

Source: PacFIN, 2005.

Table 13. Counties with the highest revenue from commercial fish landings as a percentage of revenue from total commercial fish landings coastwide, 2005.

County	County fish revenue/Coastwide fish revenue
GRAYS HARBOR COUNTY	13.8%
CLATSOP COUNTY	11.8%
LINCOLN COUNTY	9.8%
WHATCOM COUNTY	8.0%
COOS COUNTY	6.9%
VENTURA/STA BARBARA COUNTIES	6.6%
PACIFIC COUNTY	6.0%
ORANGE/LA COUNTIES	5.0%
CLALLAM COUNTY	4.1%
SF BAY/SAN MATEO COUNTIES	3.3%

Source: PacFIN, 2005.

Table 14. Port Groups with the highest revenue from commercial fish landings as a share of revenue from total commercial fish landings coastwide, 2005.

Income from fishing activity as a share of total personal income

Commercial fishery-related income is estimated through use of the FEAM model by port group area. The information included below taken from Table 8-8.a in Appendix A of the 2005-06 Pacific Coast Groundfish Final Environmental Impact Statement (2004).

Table 15. Port Group Areas with the highest level of income from commercial fishing activities, 2001.

Port Group Area	Fishery-related income as a share of total personal income
South WA Coast	4.78%
Newport	4.27%
Crescent City	3.9%
Astoria/Tillamook	3.29%
Central WA Coast	2.03%
Brookings	1.77%

Employment in fishing as a share of total employment

Table 16. Port Group Areas with the highest level of employment from commercial fishing activities, 2001.

Port Group Area	Fishery-related employment as a share of total employment
South WA Coast	14.24%
Newport	10.76%
Crescent City	9.43%
Astoria/Tillamook	7.72%
Brookings	5.76%
Central WA Coast	4.26%

Number of processors/buyers

Table 17. Ports with the highest number of buyers/processors, 2005.

Port	Number of buyers/processors
Princeton/Half Moon Bay	142
Newport	138
Bodega Bay	106
Santa Barbara	102
San Francisco	96
Oxnard	94
Westport	90
Morro Bay	88
Fort Bragg	84
Coos Bay	80
Santa Cruz	74
San Pedro	74
Moss Landing	74
Bellingham Bay	68
Terminal Island	68

Other Orange/LA	68
Other San Diego	64
Ventura	58
San Diego	56
Tillamook	54
Astoria	52
Pseudo port code-	48
Dana Point	48
Winchester Bay	46
Seattle	44
Eureka	42
Crescent City	40
Brookings	40
Berkeley	40
Anacortes	38
Other SF Bay/San	34

Table 18. Counties with the highest number of buyers/processors, 2005.

Table 19. Port Groups with the highest number of buyers/processors, 2005.

Community Dependence on Commercial Groundfish Fishing

Number of groundfish permits

Table 20. Ports with the highest number of groundfish permits, 2005.

Table 21. Counties with the highest number of groundfish permits, 2005.

Table 22. Port Groups with the highest number of groundfish permits, 2005.

Groundfish revenue as a percentage of total groundfish revenue

Table 23. Ports with the highest revenue from commercial groundfish landings as a percentage of revenue from total commercial groundfish landings coastwide, 2005.

Port	Port groundfish revenue/Coastwide groundfish revenue
ASTORIA	18.0%
NEWPORT	16.4%
WESTPORT	11.6%
COOS BAY	8.1%
BELLINGHAM BAY	6.9%
EUREKA	5.1%
NEAH BAY	4.4%
FORT BRAGG	4.0%
ILWACO/CHINOOK	3.0%
CRESCENT CITY	2.3%
PORT ORFORD	2.0%
BROOKINGS	1.8%
MORRO BAY	1.7%

MOSS LANDING	1.7%
BLAINE	1.5%
PORT ANGELES	1.4%
SAN FRANCISCO	1.4%
OTH WA COASTAL PORTS	1.2%
LA PUSH	0.9%
OTH LA/ORANGE CTY PORTS	0.9%
AVILA	0.8%
PRINCETON / HALF MOON BAY	0.7%
OXNARD	0.5%
GOLD BEACH	0.5%
OTH SAN DIEGO CTY PORTS	0.4%
OCEANSIDE	0.4%
MONTEREY	0.3%
EVERETT	0.3%
TERMINAL ISLAND	0.3%
NEWPORT BEACH	0.2%
SANTA BARBARA	0.2%

Source: PacFIN, 2005.

Table 24. Counties with the highest revenue from commercial groundfish landings as a percentage of revenue from total commercial groundfish landings coastwide, 2005.

County	County groundfish revenue/Coastwide groundfish revenue
CLATSOP COUNTY	18.2%
LINCOLN COUNTY	16.7%
GRAYS HARBOR COUNTY	11.8%
WHATCOM COUNTY	8.5%
COOS COUNTY	8.2%
CLALLAM COUNTY	6.8%
HUMBOLDT COUNTY	5.2%
CURRY COUNTY	4.3%
MENDOCINO COUNTY	4.2%
PACIFIC COUNTY	3.0%

Source: PacFIN, 2005.

Table 25. Port Groups with the highest revenue from commercial groundfish landings as a percentage of revenue from total commercial groundfish landings coastwide, 2005.

Groundfish employment as a share of total fisheries employment

Table 26. Port Group Areas with the highest level of groundfish employment from commercial fishing activities, 2001.

Port Group Area	Groundfish-related employment as a share of total fisheries employment
Puget Sound	60.6%
Astoria/Tillamook	52.0%
Eureka	50.9%
Newport	48.4%
Coos Bay	39.5%

Central WA Coast	24.9%

Groundfish income as a share of total fisheries income

Table 27. Port Group Areas with the highest level of groundfish income from commercial fishing activities, 2001.

Port Group Area	Groundfish-related income as a share of total fishery income
Puget Sound	60.6%
North WA Coast	58.9%
Astoria/Tillamook	52.0%
Eureka	50.9%
Newport	48.4%
Brookings	42.7%

Groundfish revenue as a share of total fisheries revenue

Table 28. Ports with the highest revenue from commercial groundfish landings as a percentage of total port fish revenue from commercial landings, 2005.

Port	Port groundfish revenue/Port fish revenue
OTHER STA CRUZ/MONTEREY CTY PORTS	100.0%
GOLD BEACH	73.7%
AVILA	67.7%
WILLMINGTON	57.0%
NEAH BAY	53.5%
OTH LA/ORANGE CTY PORTS	52.6%
EUREKA	51.2%
MORRO BAY	47.3%
PACIFIC CITY	45.0%
FORT BRAGG	40.4%
PORT ORFORD	40.4%
NEWPORT BEACH	39.5%
PORT ANGELES	35.6%
NEWPORT	34.0%
ASTORIA	30.6%
ALBION	28.7%
BROOKINGS	27.6%
COOS BAY	23.8%
BELLINGHAM BAY	22.5%
OCEANSIDE	22.2%
OTH WA COASTAL PORTS	21.9%
MOSS LANDING	21.0%
CRESCENT CITY	18.5%
LA PUSH	18.0%
POINT ARENA	17.9%
BERKELEY	17.6%
WESTPORT	16.9%
BLAINE	16.8%
OTH SAN DIEGO CTY PORTS	16.7%

EVERETT	16.5%
MONTEREY	16.1%

Source: PacFIN, 2005.

Table 29. Counties with the highest revenue from commercial groundfish landings as a percentage of total county fish revenue from commercial landings, 2005.

County	County groundfish revenue/County fish revenue
SAN LUIS OBISPO COUNTY	51.7%
HUMBOLDT COUNTY	42.6%
MENDOCINO COUNTY	38.9%
CURRY COUNTY	35.3%
LINCOLN COUNTY	33.7%
CLALLAM COUNTY	33.3%
CLATSOP COUNTY	30.5%
COOS COUNTY	23.8%
WHATCOM COUNTY	21.2%
DEL NORTE COUNTY	18.5%

Source: PacFIN, 2005.

Table 30. Port Groups with the highest revenue from commercial groundfish landings as a percentage of total county fish revenue from commercial landings, 2005.

Number of commercial vessels using groundfish gear

Table 31. Ports with the highest number of vessels using non-whiting groundfish gear, 2004.

Port	Number of fishing vessels using non-whiting groundfish gear	Number of fishing vessels using non-whiting groundfish gear as a percentage of the total number of fishing vessels using groundfish gear coastwide
EUREKA	144	10.8%
BODEGA BAY	109	8.1%
PORT ORFORD	104	7.8%
MORRO BAY	64	4.8%
AVILA	64	4.8%
NEWPORT	60	4.5%
MOSS LANDING	59	4.4%
ASTORIA	56	4.2%
SANTA BARBARA	55	4.1%
WESTPORT	44	3.3%
PORT ANGELES	44	3.3%
BELLINGHAM BAY	40	3.0%
OXNARD	32	2.4%
SAN FRANCISCO	31	2.3%
PRINCETON / HALF MOON BAY	31	2.3%
DEPOE BAY	29	2.2%
OTH SAN DIEGO CNTY PORTS	29	2.2%

Table 32. Counties with the highest number of vessels using non-whiting groundfish gear, 2004.

Table 33. Port Groups with the highest number of vessels using non-whiting groundfish gear, 2004.

Overall Community Dependence on Recreational Fishing

Community Dependence on Recreational Groundfish Fishing

7. Resiliency Results

8. Vulnerable Areas Results

Appendix X

Literature Review

Summaries of literature addressing natural resource community dependence, resilience and vulnerability

Jacob, Steve, Michael Jepson, Carlton Pomeroy, David Mulkey, Chuck Adams, and Suzanna Smith. 2002. Identifying Fishing-Dependent Communities: Development and Confirmation of a Protocol. A MARFIN Project and Report to the NMFS Southeast Fisheries Science Center.

Background

The purpose of this research was to develop a definition of fishing dependent communities and a protocol for identifying such places. Five commercially dependent communities in the state of Florida were chosen based on 1996 data.

Summary of Methodology

Dependence was defined as at least 15% of employment derived from the fishing sector. This level of dependence is consistent with research by USDA ERS on other forms of natural resource dependence. Employment data was based on estimates of the number of jobs directly and indirectly related to fishing in each community with the use of regional economic multipliers. Data was utilized at the zipcode level[9]. A long list of potentially dependent fishing communities were identified by an advisory panel and by ranking zipcode communities according to landings and population divided by the number of commercial fishing permits. Telephone surveys and other surveys were conducted to ground truth the results.

Note: Seven communities were also identified as recreationally fishing dependent. However, the researchers did not have complete confidence in the recreational indicators and did not recommend that they be used for anything other than a demonstration of the protocol if better data were available.

Key Socioeconomic Indicators

Number of jobs directly and indirectly related to fishing in each community with the use of regional economic multipliers.

[9] Zipcodes were aggregated to form "zipcode communities" in the following way:

> *First, the highest-population zip code in the state was taken as the center of a central place, and zip codes within ten miles of its center were assigned to that community. Zipcode boundary files used for this research included a population variable with census estimates from 1996. Each aggregated zipcode community was then placed under a single heading and zipcode (e.g., Miami, 33180) to be used for future aggregation and identification. The zipcode with the next largest population that remained in the database was the identifies and all zipcodes within a 10-mile radius of it were selected and again removed from the database (Hawley 1950). This process was repeated until all zipcodes had been removed from the database file and were grouped under a single zipcode for each new community boundary. The zipcode database software used for this analysis contained 1882 zipcodes for Florida. The aggregation produced 213 zipcode communities, 81 of which were coastal communities and potential fishing dependent communities.*

Hall-Arber, Madaleine, Chris Dyer, John Poggie, James McNally, and Renee Gagne. 2001. New England's Fishing Communities. Revised version of the final report for Northeast MARFIN grant #NA87FF0547.

Background

There were two objectives identified for this report: 1) to identify fishing communities in the New England region and 2) to assess the fishing dependency of these communities.

Summary of Methodology

Three methods were used in this study. One method involved a regional consideration of fishing-related employment that measures dependence. Another method formulated the approaches that measure the complexity of the fishing infrastructure and the degree of gentrification of specific communities. The third method is a port profile approach that provides a detailed consideration of individual ports, "revealing patterns of contacts, characteristics of the community's culture and institutions, and some perspective on local resident's views about their way of life and about fisheries management".

New England was divided into eleven distinct sub-regions, "centered on major ports or clusters of fishing or fishing-related industry".

Data was utilized on the county level. Sub-regions are aggregations of counties.

Key Socioeconomic Indicators

Regional method to determine dependence

The three indices used to indicate dependence were: 1) the labor force in fishing as a percentage of the labor force in all occupations[10]; 2) the labor force in fishing as a percentage of labor force in related occupations within the Bureau of Labor Statistics category of fisheries/forestry/farming[11]; and 3) a summary measure of a series of dependency ratios that explore the number of fishermen per hundred to various alternative occupational roles that fishermen could enter with their particular skill profiles[12].

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[10] $\sum fishermen / \sum all\ \ occupations$

[11] $\sum fishermen / \sum BLS\_category(I)$

[12] The authors explain the calculation of the Occupational Alternative Ratio Summary (OARs) index as requiring a series of steps. The OAR measures represent a standard set of alternative occupations that are compatible with the basic skills and training that are part of the fishing occupation. According to the authors, "it is assumed that a fisherman could take up any one of these occupations but chooses not to, due to satisfaction with their current position as a fisherman" (p. 30). The authors identify 13 occupations: 1) security guard, 2) food service/janitor, 3) trees and farming, 4) mechanics, 5) skilled construction, 6) machine operators, 7) manufacturing, 8) hand workers, 9) truck drivers, 10) marine related, 11) laborers & helpers, 12) manufacturing/other, and 13) unemployed. The OAR measures are calculated using the standard formula for a dependency ration:

$(\sum fishermen / alternative\_occupation(i)) * 100$ where (i) is the total number of individuals engaged in the ith alternative occupation.

Next, the OAR measures are summed into a single measure of the total impact of fishing on an economic region.

Indicators used to Assess Vulnerability, Infrastructure and Gentrification among Fishing Dependent Communities

Infrastructure – surveys of 35 local communities and principal components analysis was used to rank the infrastructure factors and calculate a score for each community.

1) Icehouse
2) NMFS extension office
3) Dockside diesel fuel
4) International fish brokers
5) Boat insurance
6) Local trucking
7) Fish processor
8) Fishing monument
9) Boat welders
10) Fishermen supply house
11) Vessel haul out facility
12) Bait house
13) More than 2 fishing associations
14) Marine supply house
15) Local net maker
16) Fish retail store
17) Two or fewer associations

Gentrification – surveys of 35 local communities and principal components analysis was used to rank the gentrification factors and calculate a score for each community.

1) Visitors bureau
2) Marinas
3) Upscale condominium
4) Recreational bait shop
5) Fish retailer
6) Recreational tackle
7) Fishing excursion vessels
8) Trendy retail shops
9) Recreational boat tours
10) Seaside restaurants
11) Whale watching tours
12) Recreational boat dealers
13) Hotels/inns dockside

OARs = $(\sum_{n}^{1} OAR) / N$ where N=13 in this instance.

"The OARs measure provides two valuable insights into the importance of the fishing industry. First, it tells us the relative competitiveness of the fishing industry within a specific Natural Resource Region. The higher the OARs score the more important fishing is as an economic occupation within the NRR compared to the alternative occupation set" (p.31).

14) Maritime museum
15) Lobster retailers

Charles, Anthony, Heather Boyd, Amanda Lavers, and Cheryl Benjamin. 2001. A Preliminary Set of Ecological, Socioeconomic and Institutional Indicators for Nova Scotia's Fisheries and Marine Environment. GPI Atlantic report.

Background

The goal of this report was to produce a set of indicators that would help to better assess the well-being of the fishing industry and the marine environment. The indicators are tools to help managers, scientists, fishery participants, other ocean users and the public visualize the state of the marine environment and fishery, and discuss issues of common interest and concern. Indicators enable the tracking of the fishery over time. The socioeconomic indicators focus on measuring how well we are maintaining or enhancing overall long-term socioeconomic welfare, based on a blend of relevant economic and social indicators. These indicators deal with such aspects as generation of sustainable net benefits, reasonable distribution of those benefits, and maintenance of the system's overall viability within local and global economies. Community indicators revolve around the desirability of sustaining communities, both for their contribution to sustainability in the marine environment and the fishery system, and as valuable in their own right, as more that simple collections of individuals. Hence indicators in this grouping focus on the maintenance or enhancement of the economic and sociocultural well-being of coastal and fishery-dependent human communities, as well as their overall cohesiveness and long-term health. Institutional indicators measure how well we maintain suitable financial, administrative and organizational capability over the long-term, as a prerequisite for the above components of well-being and sustainability. Ideally, indicators here would measure the manageability and enforceability of resource use regulations, and of the organizations that implement management approaches – the bodies and agencies that manage the fishery and protect the marine environment.

Summary of Methodology

In selection of indicators, the indicators had to be:

a) based on scientifically valid data
b) available on a broad geographic scale and for a sufficient time series
c) accessible, easy to understand and relevant to those involved in the fishing industry
d) practical in terms of monitoring

Key Socioeconomic/Community Indicators

Economic Valuation of Fishery Resources and the Marine Environment

1) Total landed value
2) Fishery Gross Domestic Product (GDP)
3) Value of fishery exports
4) Employment per unit of landed weight
5) Employment per unit of landed value
6) Market price
7) Natural capital (fish stock value)
8) Annual depreciation (or appreciation) in natural capital
9) Value of marine ecosystem services

Distributional Indicators

1) Distribution of access and catch among fishers within a fleet sector
2) Distribution of catch among fishers within a fishery
3) Distribution of landed value by vessel length

Resilience

1) Debt levels among fishers
2) Reported bankruptcies
3) Bankruptcy liabilities
4) Distribution of landed value across species
5) Proportion of fishers with multiple licenses
6) Age distribution of fishers
7) Diversification of employment sources

Aquaculture

1) Value of aquaculture production
2) Employment in the aquaculture sector

Workplace Safety

1) Accident claims registered per 1000 fishers
2) Accident claims compensated per 1000 fishers

Cobb, Clifford W. and Craig Rixford. 1998. Lessons Learned from the History of Social Indicators. Report produced by Redefining Progress.

This report provides a history of the use of social, economic and environmental indicators and provides guidance for practitioners today. They emphasize that while indicators are important in developing creative solutions to social problems, they can and often have been misinterpreted, misused, and viewed as an end in themselves. By understanding how these mistakes have been made in the past, the authors hope that the newly emerging indicator movement will avoid them in the future. The report provides the following guidance or lessons:

1) *Having a number does not necessarily mean that you have a good indicator.*
2) *Effective indicators require a clear conceptual basis.*
3) *There's no such thing as a value-free indicator.*

   …All indicators are laden with values or carry implicit messages. Consideration of the values or concept underlying each indicator can lead to a more balanced presentation.

4) *Comprehensiveness may be the enemy of effectiveness.*

   …A narrow range of indicators is more powerful than a laundry list.

5) *The symbolic value of an indicator may outweigh its value as a literal measure.*

   …For example GDP may be an appropriate measure in some contexts, such as when the Federal Reserve is trying to estimate the growth of the money supply in relation to market production. As a technical tool, GDP has its place. However, when GDP is used as a metaphor of well-being it fails utterly. It does not distinguish between constructive expenditures and those that merely reflect spending to avoid the damage caused elsewhere in the economy.

6) *Don't conflate indicators with reality.*

   …Every indicator is a flawed representative of a complex set of events. Confusing the statistic with the reality is all too common, but it should be avoided by those who care about creating high-quality indicators. Even the best indicator is only a fractional measurement of the underlying reality. One of the best ways to guard against this solidification of ideas is to try to develop multiple indicators for the same phenomenon. In this way, it is possible to remain constantly clear that no single indicator completely represents reality.

7) *A democratic indicators program requires more than good public participation processes.*

   …widespread participation may not be the best "indicator" of whether an indicator project is really democratic.

8) *Measurement does not necessarily induce appropriate action.*

   …Indicators make sense as a tool only to the extent that they are part of a larger plan of action. It is possible that new information contained in indicators may change perceptions, but the connections to actions are not automatic.

9) *Better information may lead to better decisions and improved outcomes, but not as easily as it might seem.*

   …To change behavior, information needs to affect motives or perceptions of how the world works. Indicators, which are one form of information, can only be a piece in a larger puzzle.

10) *Challenging prevailing wisdom about what causes a problem is often the first step to fixing it.*

    ...The greatest power on public policy debates lies in being able to change the definition of a problem. This is the first step in changing a policy and perhaps one of the most effective uses of indicators work.

11) *To take action, look for indicators that reveal causes, not symptoms.*

    …Indicators that focus only on symptoms can rarely solve the actual problem. In order to alter a symptom, it is necessary to have a theory about what is causing it and to test that theory repeatedly.

12) *You are more likely to move from indicators to outcomes if you have control over resources.*

    …Indicators are not an end in themselves. Their purpose is to alert the public and policymakers about the existence and cause of problems so that they might be solved. This is only possible when the groups responsible for indicator development have a connection to those with the power to make substantive changes. Otherwise, indicators may not influence outcomes at all.

The European Commission. 2000. Regional Socioeconomic Studies on employment and the levels of dependency on fishing.

Background

The objectives of this study were to: a) quantify and describe the socio-economic importance of fishing and aquaculture in Europe, b) determine the level of dependency on fisheries of these areas, in terms of jobs and incomes, c) examine the trends in evolution in employment since the 1991 socioeconomic studies and d) examine the extent to which the socio-economic measures currently in place have been implemented, and the potential in the coastal areas for conversion and diversification of employment.

Summary of Methodology

Twenty-two separate fisheries regions were considered. In each region, four tasks were completed.

Task 1: Provide an overview of the whole fishing industry in each region. Focus on data relating to employment and value added.

Task 2: Measure three indicators of dependency (listed below under "Key Socioeconomic Indicators"). Use employment multipliers where feasible with local input-output models created from national input-output tables. Case studies within each region.

Task 3: Examine changes over time in socio-economic parameters and levels of dependency since previous study conducted in 1991.

Task 4: Identify and comment on the types of socio-economic support measures available to the fishery sector in each region

Key Socioeconomic Indicators

1) Share of fisheries activity in value added
2) Share of fisheries employment as a percentage of total regional employment
3) Share of catch as a proportion of total catch

***Bunce L., P. Townsley, R. Pomeroy, R. Pollnac. 2000. *Socioeconomic manual for coral reef management.* National Ocean Service, NOAA, Silver Spring, MD.**

This is a manual designed to demonstrate methods to assess how people who use and affect coral reefs. Its intention is to show how people interact with coral reefs and improved management of their activities to ensure that these marvelous ecosystems will continue to provide sustainable services for communities into the future.

Coral reef managers have to balance sustainable use and reef conservation; therefore the relations between human behavior and reef ecosystems are critical. Reef health is affected by human activities, but also the livelihoods and prosperity of people living in coastal tropical areas depend on the condition of the marine resources. Therefore, coral reef uses, reef management and reef ecology cannot be considered in isolation.
There is a close link between how people use coral reefs and their socioeconomic background. Understanding the socioeconomic context of reef stakeholders is essential for assessing, predicting and managing reef use. To balance sustainable use and reef protection, the reef manager needs to know: 1)the status of the reef and changes in the health of coral and fishes etc; and 2) the people that use and affect the reef, including their use patterns, perceptions of reef management and characteristics.

Socioeconomic parameters:
1. Resource use patterns
2. Stakeholder characteristics
3. Gender issues
4. Stakeholder perceptions
5. Organization and resource governance
6. Traditional knowledge
7. Community services and facilities
8. Market attributes for extractive uses of coral reefs
9. Market attributes for non-extractive uses of coral reefs
10. Non-market and non-use values

General Fisheries Commission for the Mediterranean. 2001. Feasibility Assessment or a Database on Socioeconomic Indicators for Mediterranean Fisheries. Studies and Reviews, No. 17.

This report provides an overview of a pilot study carried out for the Alboran Sea, a General Fisheries Commission for the Mediterranean management unit. The goal of the project was to build an understanding of main socioeconomic trends within the Alboran Sea Mediterranean fisheries management unit. It was hoped that the results would be applicable to the rest of the management area. To achieve this end, a set of 16 variables were used to devise various indicators that would be tracked over time.

Summary of Methodology

Literature reviews and recommendations of an advisory group were taken into consideration to help select indicators. The advisory group determined that adequate information existed for only 16 variables that could be used to construct indicators.

National Indicators

1) Apparent consumption – gross consumption of fishing products per inhabitant
2) Fish commercial balance – shows whether exports or imports of fishing products are higher in a given country
3) Ratio fish employment
4) Fish coverage rate – rate of consumption covered by national production
5) Extraversion rate – shows to what extent the fishing sector depends on foreign trade (imports and exports)
6) Fish contribution to the GNP
7) Ratio harvesting value – shows the importance of fishing in comparison to aquaculture in terms of income
8) Ration harvesting rate – shows the importance of fishing in comparison to aquaculture in terms of production weight

Local Operating Unit Indicators

1) Vessel physical productivity – based on weight of landings
2) Capacity physical productivity – weight of landings for each capacity unit of the vessels
3) Power physical productivity – weight of landings per unit of horsepower
4) Per vessel hour physical productivity – average production in weight of landings for each full fishing hour
5) Capacity productivity – average production in market value in the first sale for each capacity unit installed in the vessel
6) Vessel productivity – average production in terms of market value at first sale for each vessel
7) Power productivity – average production in terms of market value at first sale for each unit of horsepower

8) Per vessel hour productivity – average production in terms of market value at first sale for each fishing hour
9) Man physical productivity – average production in terms of weight of landings for each man employed
10) Man productivity – average production in terms of value at first sale for each man used
11) Average wage
12) Landing prices
13) Invested capital – current value of all vessels
14) Salary cost – fisher's income
15) Opportunity cost – shows the yield that the owner could obtain if he invested his money in National Debt instead of investing in his business
16) Gross estimated profit – total profits obtained by all vessel owners in the management unit once operating costs have been deducted
17) Net estimated profit – total earnings obtained by all owners once the depreciation cost has been deducted from the gross estimated profit (assuming the service life of the vessel is 10 years)
18) Profit rate – indicates the percent ratio of yearly net profits plus the opportunity cost in relation with the investment (does not include wages from an owner working as an employee)
19) Gross added value – added value that the management unit contributes to the national economy (includes salary, profits, opportunity cost and depreciations)

Sutinen, Jon G., Patricia Clay, Christopher L. Dyer, Steven F. Edwards, John Gates, Tom A. Grigalunas, Timothy Hennessey, Lawrence Juda, Andrew W. Kitts, Philip N. Logan, John J. Poggie, Jr., Barbara Pollard Rountree, Scott R. Steinbeck, Eric M. Thunberg, Harold F. Upton, and John B. Walden. 2005. "A Framework for Monitoring and Assessing Socioeconomics and Governance of Large Marine Ecosystems". Chapter 3 in Sustaining Large Marine Ecosystems. Edited by Timothy Hennessey and Jon Sutinen.

Summary

This paper outlines an approach for monitoring and assessing socioeconomic trends based on the Large Marine Ecosystems (LMEs) method of dividing the oceans. The approach is presented with 12 steps for monitoring and assessment:

1) Identify principal uses of LME resources
2) Identify LME resource users and their activities
3) Identify governance mechanisms influencing LME resource use
4) Assess the level of LME-related activities
5) Assess interactions between LME-related activities and LME resources
6) Assess impacts of LME-related activities on other users
7) Assess the interactions between governance mechanisms and resource use
8) Assess the socioeconomic importance of LME-related activities and economic and sociocultural value of key uses and LME resources
9) Identify the public's priorities and willingness to make tradeoffs to protect and restore natural resources
10) Assess the cost of options to protect and restore key resources
11) Compare the benefits with the costs of protection and restoration options
12) Identify financing alternatives for the preferred options for protecting and restoring key LME resources

Steps 8 and 9 address how the authors think socioeconomic value should be identified and prioritized. The authors suggest the use of socioeconomic indicators like unemployment rates. They also suggest that surveys be conducted of the public to identify priorities. These results would be used to aid in decision-making.

Step 8 details: Resource valuation methods should be used to assign value to direct and indirect services of an LME. They list four types of value associated with resource services: use value, passive use value, total value (use and passive use), and option value. They suggest the use of sociocultural analysis to assess value to social and cultural factors. They suggest the use of Natural Resource Communities (NRCs) defined as populations whose sustainability depends upon the utilization of renewable natural resources. They suggest broadening this definition to include those dependent on the non-renewable aspects of the marine environment. Natural Resource Regions (NRRs) are defined as the interface between a regional system of extractive NRCs, their service flows and the associated LME. LME dependent communities are defined as aggregations of NRRs where NRRs include social, cultural, human, economic and biophysical capital and their interactions within networks of LME-dependent communities. The authors summarize work by Dyer and Griffith (1996) to isolate five variables that help identify fishing

community dependence on an LME. Some of the following variable overlap and must be considered together:

1) *Relative isolation or integration of LME resource users into alternative economic sectors – To what extent have users (e.g., fishermen, processors) segmented themselves from other parts of the political economy or other fisheries?*
2) *User types and strategies of users within a port of access to LME resources – What impact does the mix of types (e.g., fixed fishing gear – weirs, fish corrals – versus mobile fishing gear) across ports and States have on the long-term sustainability of LME resource stocks.*
3) *Degree of regional specialization – To what extent have users from related areas and use sectors moved into the region? Clearly, those users who would have difficulty moving into alternative use-sectors are more dependent on LME resources than those who have histories of moving among several sectors in an opportunistic fashion.*
4) *Percentage of population involved in LME resource-related industries – Those communities where between five and ten percent of the population are directly employed in LME resource-related industries are more dependent on the LME than those where fewer than five percent are so employed.*
5) *Competition and conflict within the port, between different components of use sectors – Competition between smaller scale and industrial scale users can create conflict between users within the same port – as well as between different actors in a use-sector (such as boat owners, captains and processors). Dependence may have a strong perceptual dimension, with users perceiving the resources they are extracting to be scarce and that one user group's gains (e.g. industrial trawling, purse seining) is another user group's loss (e.g. gill netting).*

The paper also provides examples of how to use the monitoring and assessment framework. This is followed by a discussion of the potential benefit of the use of property rights entitlements in an LME.

Charles, Anthony. 2001. Sustainable Fishery Systems. Fish and Aquatic Resource Series 5, Blackwell Science.

Summary

This book provides an illustration of a systems approach to sustainability where the system involves interacting ecological, biophysical, economic, social and cultural components. The discussion refers to an ecological system, a socioeconomic system and an institutional system. Sustainability is discussed with references to the categories of ecological, socioeconomic, community, and institutional sustainability. Of particular interest is Chapter 10 which examines the nature of sustainability and resilience, and the methodologies of sustainability assessment and sustainability indicators.

Chapter 10

This chapter discusses what is meant by sustainability and presents a framework for sustainability assessment in fishery systems. The approach involves four steps:

1) *Deciding on a set of relevant sustainability components for the fishery system, which together reflect the overall idea of 'fishery sustainability'.*
2) *Developing a concrete set of criteria that must be evaluated in assessing each component of sustainability (sustainability checklist).*
3) *Determining a corresponding set of quantifiable sustainability indicators, reflecting the measurable status of each of the criteria, and allowing comparisons between criteria.*
4) *Formulating suitable means to aggregate the indicators into indices of sustainability, perhaps one for each component of sustainability (if the indicators within a given sustainability component are at least somewhat comparable), or to otherwise facilitate comparison across indicators, recognizing that comparisons of fundamentally non-commensurable indicators should be left to policy makers as a 'political' task.*

Components of sustainability

The author describes the process of sustainable development as the simultaneous achievement of four fundamental components of sustainability: ecological[13] (avoid foreclosinf future options), socioeconomic[14] (sustainable and equitable economic and social benefits), community[15] (valuing

[13] "Ecological sustainability incorporates (a) the long-standing concern for ensuring that harvests are sustainable, in the sense of avoiding depletion of the fish stocks, (b) the broader concern of maintaining the resource base and related species at levels that do not foreclose future options, and (c) the fundamental task of maintaining or enhancing the resilience and overall health of the ecosystem."

[14] "Socioeconomic sustainability focuses on the 'macro level', i.e. on maintaining or enhancing overall long-term socioeconomic welfare. This socioeconomic welfare is based on a blend of relevant economic and social indicators, focusing essentially on the generation of sustainable net benefits (including resource rents), a reasonable distribution of those benefits amongst the fishery participants, and maintenance of the system's overall viability within local and global economies. Each indicator in this grouping is typically measured at the level of individuals, and aggregated across the given fishery system."

community as more than a collection of individuals) and institutional[16] (long-term capabilities/resource system manageability) sustainability. Charles asserts that simultaneous achievement of all four components is required to achieve to obtain overall sustainability.

Sustainability checklist

Charles suggests development of a 'checklist' of criteria for ecological, socioeconomic, community and institutional sustainability which requires a determination of what sustainability criteria are required in order to assess a fishery system. Charles provides an example of a sustainability checklist for all four components. Those related to socioeconomic and community sustainability are included below:

Socioeconomic sustainability

1) *Will the activity increase the aggregate long-term rate of employment?*
2) *Will the project enhance economic viability in the local and regional system?*
3) *Are possible impacts on input and output prices understood?*
4) *Is resource depreciation, and changes in natural capital more generally, incorporated into national accounting practices?*
5) *Are the current and projected levels of distributional equity in the system sufficient?*
6) *Will long-term food security and livelihood security be maintained or increased, as measured in both average and minimal terms?*

Community sustainability

1) *Is the project likely to maintain or increase the long-term stability of affected communities?*
2) *Does the local population have access to the resource base?*
3) *Is the local population integrated into resource management and development practices, with traditional management approaches utilized to the extent possible?*
4) *Are traditional value systems of importance to the community maintained?*
5) *Are local sociocultural factors (such as tradition, community decision-making structure, etc.) incorporated?*
6) *Are traditional resource and environmental management methods utilized to the extent possible?*

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[15] Community sustainability emphasizes the 'micro' level, i.e. focusing on the desirability of sustaining communities as valuable human systems in their own right, and more than simple collections of individuals. Hence, emphasis is on maintaining or enhancing the 'group' welfare of human communities in the fishery system by maintaining or enhancing, in each community, its economic and sociocultural well-being, its overall cohesiveness, and the long-term health of the relevant human systems.

[16] "Institutional sustainability involves maintaining suitable financial, administrative and organizational capability over the long term, as a prerequisite for these three components of sustainability (ecological, socioeconomic, community). Institutional sustainability refers in particular to the sets of management rules by which the fishery is governed, and the organizations that implement those rules: the bodies and agencies that manage the fishery, whether at the governmental, fisher or community level, and whether formally (e.g. the legal system and governmental agencies) or informally (e.g. fisher associations and non-governmental organizations). A key requirement in the pursuit of institutional sustainability is likely to be the manageability and enforceability of resource-use regulations."

7) *Are there adverse impacts, at any level or in any component of the system, that unduly affect particular components of the community (e.g. youth, particular religious groups, etc.; gender-related impacts)?*

Charles writes that the checklist is meant to provide a framework by which to highlight 'trouble spots' in fishery systems.

Sustainability indicators

Charles suggests that the set of criteria chosen (such as those included as an example above) can be used to develop a set of quantitative indicators. He writes, "In such an approach, each relevant sustainability criterion is quantified appropriately, whether through and objective variable, which is in some sense observable or measurable (such as a human population of biomass level, or through a subjective measure which is amenable to evaluation (perhaps on a scale from 1 to 10)".

Charles provides several examples of sustainability indicators by criteria (see excerpts in table below). He also provides examples ranges for the indicators and identifies when the indicator is at a minimum.

Sustainability criteria	**Indicator**	**Range**	**Indicator at minimum if**
Community resiliency	Index of diversity in employment	0 to 1	Lack of livelihood alternatives (low diversity in employment)
Community independence	Percentage of economic activity based locally	0 to 1	High dependence on external economic forces
Human carrying capacity (livelihood)	Current (or potential) sustainable employment (relative to population)	0 to infinity	Sustainable economic or employment base is substantially below current (or predicted) population
Equity	Ratio of historical to current Gini coefficients of income and/or food distribution	0 to infinity	Dispersion in income and/or food supply is substantially above traditional norms
Sustainable fleet capacity	Ratio of capacity for harvesting at MSY to current capacity	0 to infinity	Current capacity exceeds that required to harvest at MSY

Indices of sustainability

Because a system may seem sustainable from the perspective of one indicator but not another, it is sometime helpful to combine the set of available indicators to get an indication of aggregate sustainability. This may seem most logical to do when there are several indicators for a particular component of sustainability. To do this, typically one of two approaches is taken: 1) each indicator value is given a certain weight and these two values are multiplied together to get a weighted indicators value and then the weighted indicator values are added together and averaged or 2) a geometric average is calculated of the weighted or unweighted indicator values. The first option has the potential for a low value to be compensated for by an equivalently high value. The second option has the property than an extreme value will have a greater influence on the overall level of sustainability.

Challenges in applying sustainability assessment

In this section, Charles discusses a real world application of his methodology to the Nova Scotia groundfish fishery system. Although the sustainability assessment focused on the indicators provided in his book (some of which are included in the table above), for various reasons it was not possible to implement many of the indicators due to a (1) requirement for the assessment to be applied to the province in its entirety (this resulted in a lack of data availability) and (2) a limited time frame as a consequent need to rely on secondary data. The first constraint resulted in the inability to assess community sustainability while the second constraint resulted in a limited quantitative assessment of ecological and socioeconomic sustainability and largely qualitative assessment of institutional sustainability. As a result, the indicators used were quite different from those listed above and in the book. The socioeconomic indicators used in the assessment of the Nova Scotia fishery were:

- *Level of employment relative to that calculated from 'safe' harvests (based on historical information)*
- *Landed value of fish caught (for comparison with resource depreciation (declines in the monetary value of the resource)*
- *Level of exports*
- *Resilience (age structure of fishers, extent of licensing for multiple species)*
- *Concentration of access and wealth (across fleet groups and ports)*
- *Level of debt and bankruptcies among fishers*
- *Safety at sea (measured by rate of injury and death)*

Charles writes, "It is notable that while several resource collapses occurred within this fishery system over the course of the late twentieth century, the indicators in the sustainability assessment were not all negative. Some (such as resource depreciation and size of fish) were indeed negative, but others (e.g. some aspects of toxic contamination) were positive, and still others (such as socioeconomic resilience) were neutral. This reinforces the key point that rather than seeking an overall aggregation of the results, it is preferable to display the various results and let policy makers and the public determine the balance among indicators, and the consequent actions required".

Trade-offs between ecological, socioeconomic, community and institutional sustainability

Charles also writes that "If, as seems to be the case, ecological, socioeconomic, community and institutional sustainability are fundamentally non-commensurable, then the inescapable tradeoffs between them should be a strictly *political* task, beyond the scope of quantitative analysis. Sustainability assessment does, however, provide a means to examine the implications of such trade-offs".

Validation of sustainability indicators

Charles also writes,

To what extent is a set a quantitative sustainability indicators useful in practice? This question relates to the task of validation. Unfortunately, it is not possible, given the nature of sustainability, to prove a prior that a given set of indicators will properly predict whether or not a given system will be sustainable. The best we can hope for is that the set of indicators being used has proved itself in the past. This implies the need to analyze the performance of the set of indicators across a number of case studies, with suitable contrasts across biophysical, ecological and human dimensions.

The idea is to determine systematically why some systems were sustainable while others were not. There is an intrinsic difficulty with this, however, since non-sustainable systems do not persist. There may well be a lack of suitable time-series data on such systems, thus preventing their full evaluation in an historical analysis. This is comparable to the assessment of species extinction rates, which is confounded by the fact that many species became extinct before ever being studied. The best hope may be to study currently problematic fisheries, where at least one component of sustainability has declined within recent history and to incorporate temporal information (time-series) where possible, so that a comparison of adjustment dynamics can take place. In any case, it should be noted that there will always be some uncertainty about the utility of sets of indicators, since quantification of sustainability inherently requires projections into the future.

Langdon-Pollock, Jennifer. DRAFT. West Coast Marine Fishing Community Descriptions. Pacific States Marine Fisheries Commission. Economic Fisheries Information Network.

This report provides a description of fishing communities in Washington, Oregon and California and provides a discussion of dependence and provides county level data. This document also provides a good discussion on the limitations of identifying communities and characterizing dependence. U.S. Census data was used to describe communities on a county level. The information was mapped using GIS analysis and seventeen isolated communities were identified[17]. PacFIN Landings data was also used to describe communities (landings, revenue, processors and vessel count by state and county and species).

This document discusses dependency and engagement and discusses how attempts were made to create a dependency index. The index

…could be created from several attributes of fishing communities that would indicate how dependent or substantially engaged a community was in the fishing industry. Data elements thought to provide information on the dependence and engagement in fishing included: population, poverty, unemployment, per capita income, the year a house was built, the percent of vacant houses in a given location, number of industries outside of fishing, number of berths in a marina, the percent a harbor or port is filled with commercial and/or recreational boats/vessels, landings data and the number of suppliers, processors, community fishing organizations and community fishing events in a community. Upon collecting this data, it was determined that creating a dependency index was impractical given the available information.

Although this information was not aggregated into an index, the information was published in the report to physically describe fishing communities by county.

The report provides a list of social indicators that could supplement economic analyses in the future:

- *Marine education programs*
- *Number of crew members and processor employees residing in a fishing community*
- *Reliance on other natural resources*
- *Changes in ownership over time*
- *Descriptions of support industries*
- *Commercially landed pounds and revenue*
- *Recreationally landed pounds and revenue*
- *Fishing related social groups and organizations*
- *Subsistence fisheries*
- *Number of vessel owners that reside in the community*
- *Number of vessel owners that land fish but do not reside in the community*
- *Adaptation strategies*
- *Industry structure*
- *Training institutions*

[17] A community was considered isolated if it had less than 1,900 people, was not near a major highway, and was 35 miles away from a city with a population greater than 20,000 people.

- *Perceptions and descriptions of tourism*
- *Women's role in the fishing industries*
- *Processors and fishery support industries*
- *History of fishing industries*

Crone, Lisa K., Richard W. Haynes. 2001. "Socioeconomic evaluation of broad-scale land management strategies". Forest Ecology and Management 153: 147-160.

This paper describes the potential social and economic impacts of several land management alternatives under evaluation. The alternatives promote support and collaboration with communities and tribal governments, particularly those that are isolated and economically specialized. Hence, the analysis requires identification of forest-dependent communities and of their level of resiliency[18].

Methodology

In this report, simple rules are used to identify counties that may be the most affected by the alternatives. To identify wood products counties of concern, a minimum 10% employment in SIC category 24 and contained two or more communities with medium to very high wood products specialization rating (defined by Reyna, 1998). To identify range counties of concern, a range reliance calculation was used (Home and Haynes, 1999). This included counties in which 12% or more of agricultural sales in the county were derived from cattle or sheep produced from federal forage. Counties were also ranked depending on their harvest levels and animal unit months (AUM) levels. Community effects were evaluated by ranking counties that contain two or more isolated communities that have a medium to very wood products specialization and for which at least 33% of the land in a 20 mile radius circle of the community is FSBLM managed land. The same ranking methodology was carried out for land with medium to very high agricultural specialization ratings. For all sets of data, the counties were ranked from 1 to 3 based on how high a concern the area was (3 was the highest level of concern). The rankings were aggregated and the lowest aggregate level indicated the preferred alternative.

Sixty-five tribal communities were also identified based on their proximity to reservations and medium to very high specialization ratings in agriculture and wood products.

With regard to environmental justice, the alternatives were evaluated using the most impacted counties identified from the previous analysis and examining them in terms of three economic variables: average unemployment rate (1970-97), average per capita income index (1970-97), and estimated poverty ranking (1995). Counties from the list of counties of concern with an average unemployment rate of 10% or more, an average per capita income index of 0.85 or less, and a poverty ranking of 20 are focused upon. Again, the rankings were aggregated to determine a preferred alternative.

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[18] Resiliency is defined as adaptability to change. Crone and Haynes write, "Social or economic systems with high resiliency would be those capable of absorbing external shocks, such as a recession, and rebounding as demonstrated in terms of system indicators, such as total employment and per capita income. Resiliency is influenced by more than just the economic structure of a community. It also depends on community leadership; activities like planning for the future, the presence and management of amenities that might attract and keep people in the area; and physical infrastructure (roads, sewers, and water)".

Crone and Haynes summarize a process developed by Home and Haynes (1999) for measuring socioeconomic resiliency in Columbia basin counties. Three factors were used: economic diversity, population density, and lifestyle diversity.

With regard to determining socioeconomic resiliency, a list of counties was made that included the "counties of concern" identified with the methodologies outlines above which had low socioeconomic resiliency ratings (as defined by Home and Haynes, 1999). Recreation counties were also included (defined by Johnson and Beale, 1995). Next, the authors estimated the predicted direction of change in timber outputs and federal grazing levels. Lastly, the authors developed an ordinal measure to examine the relative differences in alternatives. To do this, they multiplied each county's proportion of the total population (of the 28 counties examined) by the direction of the change (-1, 0, or 1) for that county for each alternative. These numbers were then summed across counties to get an aggregate score for each alternative.

Home, A.L., Haynes, R.W. 1999. Developing measures of socioeconomic resiliency in the interior Columbia River Basin. General Technical Report PNW-GTR-453. US Department of Agriculture, Forest Service, Pacific Northwest Research Station, Portland, OR, p. 41.

Johnson, K.M. and Beale, C.L. 1995. Nonmetropolitan recreational counties: identification and fiscal concerns. Working Paper No. 6 Demographic Change and Fiscal Stress Project. Loyola University Chicago, Chicago, IL, p. 14.

Reyna, N., 1998. Economic and social conditions of communities: economic and social characteristics of interior Columbia basin communities and an estimation of effects on communities from the alternatives of the eastside and upper Columbia River basin draft environmental impact statements, Part 1, BLM/OR/WA/

Horne, Amy L. and Richard W. Haynes. 1999. Developing Measures of Socioeconomic Resiliency in the Interior Columbia Basin. USDA General Technical Report PNW-GTR-453.

This report develops measures for socioeconomic resiliency for counties for the Interior Columbia Basin Ecosystem Management Project. The definition of socioeconomic resiliency used is defined as the ability of human institutions to adapt to change. The Interior Columbia Basin Ecosystem Management Project (ICBEMP) is the most ambitious attempt to date to assess economic and social conditions at a community level for a large portion of the Northwest (Sommers 2001). As is the case with other impact studies, there is no explicit model or framework linking economic changes to social impacts. However, the report does provide a qualitative assessment of probable impacts of various management alternatives being considered by federal government agencies for the lands under their jurisdiction in this region. For example, the report discusses possible impacts of grazing alternatives on agriculturally-dependent communities, and the possible impacts of alternative timber management policies on timber-dependent communities. Combined with lists of communities with these types of economic specializations or "dependencies," the report provides a guide to the geographic distribution of possible impacts of the various land management alternatives under review.

This study develops measures of socioeconomic resiliency. The theoretical basis for socioeconomic resiliency rests on the concept of social well-being, which was defined as a composite of four factors: economic resiliency, social and cultural diversity (population size, mix of skills), civic infrastructure (leadership, preparedness for change), and amenity infrastructure (attractiveness of the area) (McCool and others 1997). These authors note that communities are constantly exposed to change in their economic environment and that it is therefore interesting to consider factors that make communities resilient or able to adapt to changes. They are specifically interested in measures of resiliency that would aid federal land management agencies in understanding potential impacts of policy changes.

Findings: This study found that most of the basin's residents (67 percent) live in counties with a high degree of socioeconomic resiliency; however, these counties represent only 20 percent of the land base. These findings allow land managers to better gauge the impacts of land management actions and to focus social and economic mitigation strategies on places of greatest need.

"Complicating the search for a measure of socioeconomic resiliency are two factors. First, because social indicators are often just proxies for some unmeasurable concept, findings derived from proxies should be related back to that concept. Second, the use of social indicators assumes that, for some measures at least, it is appropriate to express them on some ordered scale (Carley, 1981)."

"We assume in this paper that the relation between diversity and resiliency in social and economic systems is similar to that in the ecological literature…that is, a system with higher diversity is less affected by change than a system with lower diversity and the former therefore has higher resiliency. Socioeconomic systems with higher resiliency are defined as those that adapt quickly as indicated by rebounding measures of socioeconomic well-being. People living

in areas of high resiliency have a wide range of skills and access to diverse employment opportunities. Thus, if specific firms or business sectors experience downturns, unemployment rates rise only briefly until displaced people find other employment. Systems with low resiliency have more lingering negative impacts, such as unemployment or out-migration rates that remain high for several years…"

"Note that having greater diversity (and higher resiliency) does not eliminate the possibility of wide fluctuations for single economic entities or sectors. This concept differs from many discussions of ecosystem management where the focus is on the goals of economic sustainability and community stability…"

Methodology

The authors state that the concept of socioeconomic resiliency is based on the concept of social well-being which they define as a composite of four factors: economic resiliency, social and cultural diversity (population size, mix of skills), civic infrastructure (leadership, preparedness for change), and amenity infrastructure (attractiveness of the area). They provide the following explanation for development of a socioeconomic resiliency index:

Our approach follows the spirit of the definition of social well-being. An index of economic resiliency can be developed directly from measures of diversity in employment or income among economic sectors. Social and cultural diversity can be measured by using data on lifestyle diversity. Because there was no direct way to measure civic infrastructure, we used population density as a proxy, following the work of Barkley and others (1996). There was no easy way to index amenity infrastructure. The Socioeconomic resiliency index we developed was thus a composite of three factors: economic resiliency, population density, and lifestyle diversity.

Economic resilience
Economic resiliency was defined as diversity of employment. Ratings were assigned based on how the counties compare to all U.S. counties. All U.S. counties were then divided into three equally numbered groups with the top third labeled as having "high" economic diversity, the middle third as having a "medium" economic resilience and the bottom third as having a "low" economic resilience. The Basin counties were then labeled according to this method.

Population density
Population density of each county was calculated by dividing the total population by the number of square miles in the county. With this information, the following rating system was used:

> *A rating of 3 was assigned to counties with population densities equal to or greater than 33 people per square mile. A rating of 2 was given to counties having population densities between the basin average (11 people per square mile) and 33 people per square mile. A rating of 1 was given to counties having population densities less than the basin average (11 people per square mile) but not less than six people per square mile. The rating of 0 was given to "new frontier" counties, those having population densities of less than six people per square mile.*

Lifestyle diversity
Lifestyle diversity calculations used a database (PRIZM) that identified 62 lifestyle groups in the U.S. through a method called cluster analysis on census data (education, affluence, family life cycle, mobility, race, ethnicity, and degree of urbanization). By considering the proportion of households in each lifestyle group for each county, a lifestyle index was able to be calculated. The counties in the top third received a rating of 3, the middle third received a rating of 2, etc.

Socioeconomic resiliency
The above factors were added together for each county to estimate a socioeconomic resiliency rating. All three factors were equally weighted. The highest rating possible was a 9. Counties receiving a composite score greater than 6 were categorized as having a high socioeconomic resilience, a medium socioeconomic resilience if the score was a five or six and a low rating if the score was four or less.

Findings
The remainder of the report focuses on describing the results of the analysis. The results indicated that the counties with high socioeconomic resiliency were those with high population densities, high to medium economic resiliency, and high to medium life style diversity. However, some counties were rated with high socioeconomic resilience even though they had low population densities due to their high rankings in the other two factors. Consistent with the findings of other studies, high resiliency counties tend to lie along transportation corridors and/or often are counties with high scenic amenities and quality of life. Counties with low socioeconomic resiliency were often located in arid parts of the study area or are located in rugged and isolated areas.

The three factors used in the socioeconomic resiliency index were highly correlated. The specific correlations suggested that the mixture of people in a county may be more important to providing human systems with resiliency than the sheer numbers of people.

The authors also discuss the use of counties as the unit for socioeconomic resilience. They note that, “two-thirds of the people live in counties with a high degree of socioeconomic resilience; however, these counties represent only 20 percent of the land base. Although 68 percent of the basin is categorized as having a low socioeconomic resiliency, only 18 percent of the people live in these areas.

The effect of scale on the analysis is also discussed through comparison of larger areas that are comprised of several counties. The findings indicate that larger areas have higher economic resilience than smaller areas. The highest economic resiliency ratings are for areas containing metropolitan counties. Comparing these results to counties leads the authors to conclude that counties are too small to represent economies and that the well-being of people is connected with larger areas than the county they live in. For example, people often extend job searches beyond the county they live in and the authors note that in 1990, one in six workers in the average basin county worked outside the county they lived in.

Future trends in socioeconomic resiliency are predicted using future population projections. These predictions are incorporated into the composite rate. Several counties increase their socioeconomic resilience rating as a result.

Sommers. 2001. USGS Forest and Rangeland Ecosystem Science Center, Monitoring Socio-Economic Trends in the Northern Spotted Owl Region: Framework, Trends Update, and Community-Level Monitoring Recommendations. Cascadia Field Station. College of Forest Resources. University of Washington.

This study uses eight Indicators (and specific indicators for each of these 8) to determine the social and economic status of communities in the affected region:

1. Demographics
2. Employment
3. Government revenues
4. Facilities and infrastructure
5. Social services burden
6. Federal assistance
7. Business trends
8. Taxes

On page 15, there is a diagram illustrating flows within the community to evaluate the effects of federal laws on socioeconomic variables.

Economic Research Service website. 2006.
http://www.ers.usda.gov/Briefing/Rurality/Typology/

The Economic Research Service provides various measures of industry dependence at the county and sometimes city level. The categories, definitions, and analytical results are posted on their website at the above address. The following categories are defined:

Farming-dependent (440 total, 403 nonmetro) counties—either 15 percent or more of average annual labor and proprietors' earnings derived from farming during 1998-2000 or 15 percent or more of employed residents worked in farm occupations in 2000. Note that a few counties have changed farm dependency status from the preliminary group posted in May 2004. See methods, data sources, and documentation for an explanation of these changes.

> **Farming** dependence was based on two thresholds—farm earnings accounting for an annual average of 15 percent or more of total county earnings during 1998-2000 or farm occupations accounting for 15 percent or more of all occupations of employed county residents in 2000. The farming occupation option was adopted to allow counties into the farming-dependent group that had highly farming-oriented economies but did not meet the earnings threshold, most often due to negative farm earnings estimates for some or all of the analyzed years. Farming dependence was determined first and takes precedence over all the other economic dependence types.

Mining-dependent (128 total, 113 nonmetro) counties—15 percent or more of average annual labor and proprietors' earnings derived from mining during 1998-2000.

Manufacturing-dependent (905 total, 585 nonmetro) counties—25 percent or more of average annual labor and proprietors' earnings derived from manufacturing during 1998-2000.

Federal/State government-dependent (381 total, 222 nonmetro) counties—15 percent or more of average annual labor and proprietors' earnings derived from Federal and State government during 1998-2000.

Services-dependent (340 total, 114 nonmetro) counties—45 percent or more of average annual labor and proprietors' earnings derived from services (SIC categories of retail trade; finance, insurance, and real estate; and services) during 1998-2000.

Nonspecialized (948 total, 615 nonmetro) counties—did not meet the dependence threshold for any one of the above industries.

Housing stress (537 total, 302 nonmetro) counties—30 percent or more of households had one or more of these housing conditions in 2000: lacked complete plumbing, lacked complete kitchen, paid 30 percent or more of income for owner costs or rent, or had more than 1 person per room. See methods for more details.

Low-education (622 total, 499 nonmetro) counties—25 percent or more of residents 25-64 years old had neither a high school diploma nor GED in 2000.

Low-employment (460 total, 396 nonmetro) counties—less than 65 percent of residents 21-64 years old were employed in 2000.

Persistent poverty (386 total, 340 nonmetro) counties—20 percent or more of residents were poor as measured by each of the last 4 censuses, 1970, 1980, 1990, and 2000.

Population loss (601 total, 532 nonmetro) counties—number of residents declined both between the 1980 and 1990 censuses and between the 1990 and 2000 censuses.

Nonmetro recreation (334 designated nonmetro in either 1993 or 2003, 34 were designated metro in 2003) counties—classified using a combination of factors, including share of employment or share of earnings in recreation-related industries in 1999, share of seasonal or occasional use housing units in 2000, and per capita receipts from motels and hotels in 1997. See methods for more details.

> **nonmetro recreation:** This classification was originally completed in 2002 and results were published in *Rural America*. Only counties that were classified as nonmetro by the 1990 census were classified. The classification was updated for this typology by coding the metro counties in 1990 that changed to nonmetro status in 2000. While this is the only typology code that does not apply to all U.S. counties, it can be used to look at nonmetro counties using either the 1993 or 2003 definition of nonmetro.
>
> Data used to create the nonmetro recreation classification were:
>
> 1. wage and salary employment in entertainment and recreation, accommodations, eating and drinking places, and real estate as a percentage of all employment reported in the Census Bureau's County Business Patterns for 1999;
> 2. percentage of total personal income reported for these same categories by the Bureau of Economic Analysis;
> 3. percentage of housing units intended for seasonal or occasional use reported in the 2000 Census; and
> 4. per capita receipts from motels and hotels as reported in the 1997 Census of Business.
>
> The three variables measuring employment, income, and seasonal housing were converted to z-scores and combined into a weighted index (weights of 0.3 were assigned to income and employment and 0.4 to seasonal housing) to reflect recreational activity. Counties with index scores of 0.67 or higher were regarded as potential recreation counties.
>
> Additional counties were considered to be recreation counties if their value was greater than 0 (the mean of the index) and they had at least $400 per capita of hotel-motel receipts. Inclusion of such counties to the list added some comparatively large counties with a high volume of recreation activity but with urban centers big enough to dilute the

percentage of direct recreational income and employment or the proportion of second homes.

Counties were also accepted if at least 25 percent of their housing was seasonal, so long as the index exceeded the mean. Each potential candidate was individually appraised from printed and/or Internet sources and personal knowledge to determine or verify the nature of their recreational function. Fourteen counties that ostensibly qualified, but lacked any known recreational function, were deleted from the list either because they were very small in population with inadequate and misleading County Business Patterns coverage or because they reflected high travel activity without recreational purpose, i.e., overnight motel and eating place clusters on major highways.

Retirement destination (440 total, 277 nonmetro) counties—number of residents 60 and older grew by 15 percent or more between 1990 and 2000 due to inmigration.

**** In general, the Economic Research Service used one standard deviation from the mean labor and proprietor income for each economic type to help determine the cutoff. The cutoff was then rounded to the nearest 5 percent. The farming typology cutoff was determined using labor and proprietor income as well as the number of worked employed in farm occupations from the 2000 Census. This was because county-level farm income estimates are very unreliable and often underestimated the impact of farming (Personal communication, February 2006).**

Johnson, Kenneth M. and Calvin L. Beale. 2002. Nonmetro Recreation Counties: Their Identification and Rapid Growth. Rural America. 17(4): 12-18.

This article outlines a method to identify nonmetro counties with high recreation development. The article also looks at the linkages between recreational concentrations and population changes and discusses the implications for these counties.

Of all U.S. counties, 329 were classified as recreational based on a classification method where the relative amount of recreation-linked employment, income and housing is high.

Methodology

First, nonmetro counties were identified based on individual metro areas as defined by OMB. The authors note that metro and nonmetro boundaries based on the 2000 Census was scheduled to become available in 2003.

Second, several measures were chosen to characterize the recreational activity: 1) wage and salary employment in entertainment and recreation, accommodations, eating and drinking places, and real estate as a percentage of all employment reported in the Census Bureau's County Business Patterns fro 1999; 2) percentage of total personal income reported for the same categories by the Bureau of Economic Analysis; 3) percentage of housing units intended for seasonal or occasional use reported in the 1000 Census; and 4) per capita receipts from motels and hotels as reported in the 1997 Census of Business. The industry categories were chosen after reviewing data for a sample of counties of well-known, undisputed high recreational dependence.

Third, the variables were converted into z-scores and combined into a weighted index to reflect recreational activity (0.3 employment + 0.3 income + 0.4 seasonal homes). Counties with index scores of 0.67 or higher were regarded as potential recreation counties. Other counties were also considered if they had a score greater than the mean of the index and one of the following conditions was met: 1) the county had at least $400 per capita of hotel-motel receipts or 2) at least 25% of the housing in the county was seasonal. In this way, counties with a high volume of recreational activity but large urban centers that dilute their scores can be included.

Daniels, Jean M. 2004. Assessing Socioeconomic Resiliency in Washington Counties. USDA. Forest Service. Pacific Northwest Research Station. General Technical Report PNW-GTR-607.

This report presents a methodology for identifying forest dependency and socioeconomic resiliency as well as results for the state of Washington. This study combines measures of forest dependency with socioeconomic resiliency measures to assess how a county may respond to external shocks. This study calculates social and cultural diversity as represented by the diversity of lifestyles in each county. Economic diversity is measured by using an index of regional specialization. Civic infrastructure is measured by using population density as a proxy. Findings are then compared against traditional approaches used by the state of Washington to identify areas experiencing economic distress and areas considered dependent on public timber.

The authors state that this research can help identify communities (counties) of concern that may experience difficulty adapting to changes in Department of Natural Resources forest management policies.

Methodology

The steps used are: 1) each county is assigned a socioeconomic resiliency rating by combining lifestyle diversity, economic resiliency, and population density indices; 2) forest dependence is determines by rating all counties based on the proportion of forest land per county; and 3) counties of concern are identified based on high forest dependence and low socioeconomic resiliency. Methods are also outlined for focus on specific geographical areas.

Socioeconomic resiliency

Socioeconomic resiliency was assessed using methods described by Horne and Haynes (1999) (see above). However, the specific indices of lifestyle diversity, economic diversity, and population density) are calculated differently.

Lifestyle diversity index

While it cannot be directly measured, proxy measures are developed for the lifestyle diversity index using demographic data contained in the 2000 Census. The following indicators were used in calculation of the lifestyle diversity index:

- Mobility - proportion of people who changed their residence between 1995 and 2000 compared to those who did not
- Ethnicity – data from Census data on whether residents were born in the U.S. and whether they were born in the state
- Degree of urbaness - degree of urban and rural categorized as urban and inside urbanized areas, urban and inside urban clusters, rural farm, and rural nonfarm
- Race – proportion of citizens identifying themselves as various race categories
- Income – Proportion of people in 16 income categories
- Education – proportion of people over age 25 in 6 categories

The authors used the Shannon-Weiner diversity index[19] to make calculations for each indicator. The resulting values were added together for each variable and divided by 6 to get an overall diversity rating for each county.

Economic diversity

To calculate economic diversity, employment by SIC code for 2001 was used from the Labor Market and Economic Analysis Branch of Washington Department of Employment Security Web site. The regional specialization index[20] was then used to determine if a county is more or less specialized than the state. Once these values were calculated, the counties were ranked from lowest to highest, divided into four groups based on 25th, 50th and 75th statistical quartiles, and rated from 1 to 4 with low specialization indicating high economic diversity.

Population density

This measure was used as a proxy for civic infrastructure. The authors explain that it is assumed that greater population leads to a more developed county infrastructure and therefore increases socioeconomic resiliency. Data was from 2000 Census was used. State agencies provided the number of square miles in each county. Each county was given a rating from 0 to 4 depending on population density[21].

Overall socioeconomic resiliency rating

To estimate an overall socioeconomic resiliency rating, first, an unweighted average of the three indices was calculated. Next, the counties were sorted from highest to lowest and divided in thirds. The highest third were given a rating of "high" socioeconomic resilience. The middle third were labeled with a "medium" rating and the lowest third was given a "low" rating. The authors state that although other methods could have been used, dividing the counties into three equal parts resulted in the best agreement between counties with "low" ratings and those listed on the 2003 distressed county list published by the state.

Forest dependence

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[19] $D = -\sum p_i \ln(p_i) / \ln(s)$ where D = diversity measure ranging from 0 to 1, s = total number of subcategories for each of the six indicator variables, and p = proportion of people in each subcategory for each variable. Therefore, a relatively low value indicates uneven distribution of people across the indicator. "For example, because 95 percent of King County is concentrated in urban centers, King County would receive a relatively low diversity rating for the indicator of urbaness" (p. 10-11).

[20] $R_i = \sum \left| \left(E_{ij} / E_i \right) - \left(E_j / E \right) \right|$ where E_{ij} = employment in county i in industry j, E_i = total employment in county *i*, E_j = total employment in industry j in all counties, and E = total employment in all industries across all counties. Values close to zero indicate the county has about the same proportion of people employed in each industry as the state while values closer to 1 indicate that employment is more specialized in the county than in the state. The assumption is made that the higher the index value, the more vulnerable the county is if negative impacts occur because the county is less economically diverse and less able to adapt to change.

[21]

Population density of county	Rating
>816	4
237 to 816	3
33 to 236	2
11 to 32	1
<11	0

The proportion of forest land in each county was used as a proxy for forest dependence. The list of counties and their values were divided into three equal parts. The top third was labeled with a "high" dependence, the second third with a "medium" dependence and the lowest third was labeled with "low" forest dependence.

Identifying counties of concern
Counties of concern were classified as those having a "low" socioeconomic resiliency rating and "high" forest dependence.

The results indicated that high socioeconomic resiliency ratings were found in counties close to urban areas. They also contained a diversified industry mix with service and manufacturing sectors. Counties that were remote, isolated, and had poor transportation networks had "low" resilience rankings.

Six counties of 39 were classified as "counties of concern". All of these were also classified as "distressed" by the state in 2002 and 5 in 2003.

Lucas, Linda. 2001. Fishery Management and Local Communities: The Case of Madeira Beach, Florida. *Marine Fisheries Review*. 63(4): 32-42.

This article describes an empirical analysis conducted of the impacts to Madeira Beach, Florida from a 1 and 2 month closure of the grouper fishery. The analysis uses an input-output simulation model and uses income and employment to describe dependency.

The article begins by providing a literature review of sociological and anthropological studies that identify resource related communities and methods to assess alterations to the relationships within the communities that might result from regulations.

Sepez, J.A., B.D. Tilt, C.L. Package, H.M. Lazrus, and I. Vaccaro. 2005. Community Profiles for North Pacific Fisheries – Alaska. NOAA Technical Memorandum NMFS-AFSC-160.

This document profiles 136 fishing communities in Alaska with basic information on social and economic characteristics. Various federal statutes, including the Magnuson-Stevens Fishery Conservation and Management Act and the National Environmental Policy Act, among others, require agencies to examine the social and economic impacts of policies and regulations. These profiles can serve as a consolidated source of baseline information for assessing community impacts in Alaska.

The profiles are given in a narrative format that includes three sections: People and Place, Infrastructure, and Involvement in North Pacific Fisheries. People and Place includes information on location, demographics (including age and gender structure of the population, racial and ethnic make up), education, housing, and local history. Community Infrastructure covers current economic activity, governance (including city classification, taxation, Native organizations, and proximity to fisheries management and immigration offices) and facilities (transportation options and connectivity, water, waste, electricity, schools, police, and public accommodations). Involvement in North Pacific Fisheries details community activities in commercial fishing (processing, permit holdings, and aid receipts), recreational fishing, and subsistence fishing.

To define communities, we relied on Census place-level geographies where possible, grouping communities only when constrained by fisheries data, yielding 128 individual profiles. Regional characteristics and issues are briefly described in regional introductions. The communities were selected by a process which assessed involvement in commercial fisheries using quantitative data from the year 2000, in order to coordinate with 2000 Census data. The quantitative indicators looked at communities that have commercial fisheries landings (indicators: landings, number of processors, number of vessels delivering to a community), communities that are the registered homeports of vessels participating in the fisheries, and communities that are home to documented participants in the fisheries (indicators: crew license holders, state and federal permit holders, and vessel owners). Where appropriate, the indicators were assessed as a ratio to the community's population. Selection of a community was triggered by its surpassing a certain threshold in any one of the indicator categories, or in an aggregated category made up of the individual indicators.

The Alaska communities selected and profiled in this document are: Adak, Akhiok, Akiachak, Akutan, Aleknagik, Alitak Bay, Anchor Point, Anchorage/Chugiak/Eagle River/Girdwood, Angoon, Atka, Bethel, Chefornak, Chignik (Bay), Chignik Lagoon, Chignik Lake, Clam Gulch, Clark's Point, Cordova, Craig, Dillingham, Edna Bay, Eek, Egegik, Ekuk, Ekwok, Elfin Cove, Elim, Emmonak, Excursion Inlet, Fairbanks, False Pass, Fritz Creek, Galena, Goodnews Bay, Gustavus, Haines, Halibut Cove, Hobart Bay, Homer, Hoonah, Hooper Bay, Hydaburg, Igiugig, Iliamna, Ivanof Bay, Juneau/Douglas/Auke Bay, Kake, Karluk, Kasilof, Kenai, Ketchikan/Ward Cove, King Cove, King Salmon, Kipnuk, Klawock, Kodiak, Kokhanok, Koliganek, Kongiganak, Kotlik, Kwillingok, Larsen Bay, Levelock, Manokotak, Marshall, Mekoryuk, Metlakatla, Meyers Chuck, Naknek, Napakiak, Nelson Lagoon, New Stuyahok, Newhalen, Newtok, Nightmute,

Nikiski, Nikolaevsk, Ninilchik, Nome, Old Harbor, Ouzinkie, Palmer, Pedro Bay, Pelican, Perryville, Petersburg, Pilot Point, Pilot Station, Platinum, Point Baker, Port Alexander, Port Alsworth, Port Graham, Port Heiden, Port Lions, Port Moller, Port Protection, Portage Creek, Prudhoe Bay, Quinhagak, Saint George, Saint Mary's, Saint Paul, Sand Point, Scammon Bay, Seldovia, Seward, Shaktoolik, Sitka, Skwentna, Soldotna, South Naknek, Sterling, Tenakee Springs, Thorne Bay, Togiak, Toksook Bay, Tuntutuliak, Tununak, Twin Hills, Ugashik, Unalakleet, Unalaska/Dutch Harbor, Valdez, Wasilla, Whale Pass, Whittier, Willow, Wrangell, and Yakutat.

Pollard, Vicky. 2004. Fishing Communities and Regional Development. UK Prime Minister's Strategy Unit.

The main objectives of this report were to 1) analyze the current situation and problems with the UK fishing industry; 2) analyze the future options available to it and the range of inherent and potential risks the industry faces; and 3) devise a practical strategy which will help bring about a sustainable future for the fishing industry, associated communities and the marine environment.

The report measures dependency by the amount of local employment as a percentage of total employment. Employment is categorized in three categories – fish catching (direct catching dependency employment), processing sector (dependent processing employment), and the supply of goods and services through the supply chain to the fish catching industry (indirect catching dependent employment). Overall dependency is a total of the three categories.

The report also assesses the impact of fleet restructuring on communities using fleet modeling tools. The assessment indicates the change in vessel numbers by segment required over the next 10 years to bring about a profitable industry. In this assessment, the authors identify the potential impacts from employment decreases (accounting for the portfolio of fisheries a vessel participates in, the importance of fishing employment to total employment in a community, and the proportion of supply chain jobs to fish catching jobs), and the types of communities most likely to be negatively affected by changes in the industry (considering remoteness, dependence and port size[22]).

The report than assesses a community's vulnerability to change based on geographical remoteness and deprivation ranking (an index that combines income, employment, health deprivation and disability, education skills and training, housing and geographical access to services) to look for areas of overlap with dependency.

The authors use this research to help identify policy options which include: 1) Government has the option of modulating fisheries policy to minimize the social impacts of moving to a sustainable future for the industry, 2) Government should introduce a clear social element to fisheries policy, 3) Government intervention should focus on communities that are both fisheries dependent and vulnerable, 4) The UK should have a positive policy towards community quota schemes for the most vulnerable communities, if this can be done within EU law, 5) Government needs to consider the full range of options for community quota (hold-back, buyback), in order to try to overcome legal problems with existing schemes, 6) It is important to have clearly stated objectives including social objectives, to inform the management of the inshore sector, and 7) A process is needed under which inshore managers can involve stakeholders in agreeing on explicit objectives.

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[22] The report surmises that "The communities likely to be most negatively affected by changes in the industry, without further government intervention, are: 1) small, remote communities, which are highly dependent on fishing because fishing jobs are among just a few employment opportunities available in the area. These areas are also expected to be highly vulnerable to change because of the limited range of economics opportunities, and 2) medium-dependency communities, where ports are not well enough equipped to develop as fishing centers as the sector concentrates and the number of vessels declines. High dependency communities with larger ports can be expected to suffer less from re-structuring. Larger ports are expected to be better able to attract vessels as fleet segments concentrate by providing more and better services."

Options are presented for limiting concentration of the fleet and quota to support vulnerable fishing communities including government control over quota, restrictions on the number of vessels owned by one person, limiting eligibility to “fishermen” with a majority of their income from fishing, limiting movement of vessels between segments of the fishery, community quota.

Norman, Karma, Jennifer Sepez, Heather Lazrus, Nicole Milne, Christina Package, Suzanne Russell, Kevin Grant, Robin Petersen, John Primo, Megan Styles, Bryan Tilt, Ismael Vaccaro. Forthcoming. Community Profiles for West Coast and North Pacific Fisheries – Washington, Oregon, California, and other U.S. States. Socioeconomics Program, Northwest Fisheries Science Center. Economics and Social Sciences Research Program, Alaska Fisheries Science Center.

This document profiles 124 fishing communities in Washington, Oregon, California, and other U.S. states, with basic information on social and economic characteristics. Various federal statutes, including the Magnuson-Stevens Fishery Conservation and Management Act and the National Environmental Policy Act, among others, require federal agencies to examine the social and economic impacts of policies and regulations. These profiles can serve as a consolidated source of baseline information for assessing community impacts in these states.

The profiles are given in a narrative format that includes four sections: People and Place, Infrastructure, Involvement in West Coast Fisheries, and Involvement in North Pacific Fisheries. People and Place includes information on location, demographics (including age and gender structure of the population, racial and ethnic make up), education, housing, and local history. Infrastructure covers current economic activity, governance (including city classification, taxation, and proximity to fisheries management and immigration offices) and facilities (transportation options and connectivity, water, waste, electricity, schools, police, public accommodations, and ports). Involvement in West Coast Fisheries and Involvement in North Pacific Fisheries detail community activities in commercial fishing (processing, permit holdings, and aid receipts), recreational fishing, and subsistence fishing. To define communities, we relied on Census place-level geographies where possible, yielding 124 individual profiles.

The communities were selected by a process that assessed involvement in commercial fisheries using quantitative data from the year 2000, in order to coordinate with 2000 U.S. Census data. The quantitative indicators reflected communities that have commercial fisheries landings (indicators: weight and value of landings, number of unique vessels delivering fish to a community) and communities that are home to documented participants in the fisheries (indicators: state and federal permit holders and vessel owners). Indicators were assessed in two ways, once as a ratio to the community's population, and in another approach, as a ratio of involvement within a particular fishery. The ranked lists generated by these two processes were combined and communities with scores one standard deviation above the mean were selected for profiling.

The communities selected and profiled in this document are, in Washington: Aberdeen, Anacortes, Bay Center, Bellingham, Blaine, Bothell, Cathlamet, Chinook, Edmonds, Everett, Ferndale, Fox Island, Friday Harbor, Gig Harbor, Grayland, Ilwaco, La Conner, La Push, Lakewood, Long Beach, Lopez, Mount Vernon, Naselle, Neah Bay, Olympia, Port Angeles, Port Townsend, Raymond, Seattle, Seaview, Sedro-Woolley, Sequim, Shelton, Silvana, South Bend, Stanwood, Tacoma, Tokeland, Westport, and Woodinville; in Oregon: Astoria, Bandon, Beaver, Brookings, Charleston, Clatskanie, Cloverdale, Coos Bay, Depoe Bay, Florence, Garibaldi, Gold Beach, Hammond, Harbor, Logsdon, Monument, Newport, North Bend, Pacific City, Port Orford, Reedsport, Rockaway Beach, Roseburg, Seaside, Siletz, South Beach, Tillamook,

Toledo, Warrenton, and Winchester Bay; and in California: Albion, Arroyo Grande, Atascadero, Avila Beach, Bodega Bay, Corte Madera, Costa Mesa, Crescent City, Culver City, Dana Point, Dillon Beach, El Granada, El Sobrante, Eureka, Fields Landing, Fort Bragg, Half Moon Bay, Kneeland, Lafayette, Long Beach, Los Angeles, Los Osos, Marina, McKinleyville, Monterey, Morro Bay, Moss Landing, Novato, Oxnard, Pebble Beach, Point Arena, Port Hueneme, Princeton, San Diego, San Francisco, San Jose, San Pedro, Santa Ana, Santa Barbara, Santa Cruz, Santa Rosa, Sausalito, Seaside, Sebastopol, Sunset Beach, Tarzana, Terminal Island, Torrence, Trinidad, Ukiah, Valley Ford, and Ventura. Two selected communities were located in other states: Pleasantville, New Jersey, and Seaford, Virginia.

Bunce L., P. Townsley, R. Pomeroy, R. Pollnac. 2000. *Socioeconomic manual for coral reef management.* National Ocean Service, NOAA, Silver Spring, MD.

This is a manual designed to demonstrate methods to assess how people who use and affect coral reefs. It's intention is to show how people interact with coral reefs and improved management of their activities to ensure that these marvelous ecosystems will continue to provide sustainable services for communities into the future. There is a close link between how people use coral reefs and their socioeconomic background. Understanding the socioeconomic context of reef stakeholders is essential for assessing, predicting and managing reef use. To balance sustainable use and reef protection, the reef manager needs to know: 1. The status of the reef and changes in the health of coral and fishes etc; and 2. The people that use and affect the reef, including their use patterns, perceptions of reef management and characteristics.

Socioeconomic parameters:
1. Resource use patterns
2. Stakeholder characteristics
3. Gender issues
4. Stakeholder perceptions
5. Organisation and resource governance
6. Traditional knowledge
7. Community services and facilities
8. Market attributes for extractive uses of coral reefs
9. Market attributes for non-extractive uses of coral reefs
10. Non-market and non-use values

Scholz, A et al. 2004. Participatory socioeconomic analysis: drawing on fishermen's knowledge for marine protected area planning in California. *Marine Policy*. 28(4): 335-349.

The purpose of this pilot study was to test the utility of geospatial analysis tools for eliciting and integrating fishermen's(1) knowledge into marine protected area (MPA) planning processes in California, United States. A participatory design yielded 30 local knowledge interviews that were coded for socioeconomic and biodiversity information. The resulting information is useful in understanding past conflicts around MPA siting proposals and for identifying likely sources of agreement and disagreement. Products include a protocol for rapid socioeconomic assessment a database of fishermen's knowledge and information; and a geographic information system for further use in California's MPA planning process.

Gatewood, J.B. and B. McCay. 1990. Comparison of job satisfaction in six New Jersey fisheries. *Human Organization.* 49(1):14-25.

This study presents a survey of several hundred fishermen with respect to 33 components of job satisfaction. (note: they didn't use consensus analysis) found:

1. Fishermen's job satisfaction is an important 'human benefit' to consider when formulating fisheries management plans.
2. The specific nature of fishermen's job satisfaction varies significantly from one fishery to another and across different statuses on board.
3. Since there are many ways to regulate fishing effort, managers should, other things being equal, select those tactics that preserve as much as possible what fishermen like about their work. These factors will vary from one fishery to the next.

Griffith, D. and C.L. Dyer. 1996. An Appraisal of the Social and Cultural Aspects of the Multispecies Groundfish Fishery in the New England and the Mid-Atlantic Regions. Prepared under Contract Number 50-DGNF-5-00008 between The National Oceanographic and Atmospheric Administration and Aguirre International.

In response to regulatory changes, this study finds that most fishers have suffered a "social and economic crisis" that they dealt with by:

1. experimented with new fisheries or aquaculture (preferred response but not possible with those with large capital investments; also dealing with territorial exclusion from already established fishing groups)
2. rotating or laying off crew (keeping individual shares stable)
3. supplementing incomes with casual shore employment or with the labor of their spouses, or curtailing consumption practices.
4. leaving fisheries for shore-based jobs
5. moving to other states with more relaxed regulations

Johnson, J.C., M.K. Orbach. 1990. A fishery in transition: The impact of urbanization on Florida's spiny lobster fishery. *City and Society.* 4(1):88-104.

Our task in the larger study described below was to construct a sociocultural profile of industry participants and to use this profile to assess the impact of various policy and management options for the fishery. In the course of this study, we discovered that, aside from the potential impact of future fisheries management actions, there are several other factors that will affect spiny lobster fishermen and their communities in the next few years, perhaps even more than the management regulations. In general, these factors taken together constitute a trend toward urbanization of the Florida Keys.

Kusel, J., L. Fortmann. 1991. Well-being in forest-dependent communities, vol. 1. Sacramento, CA: California Department of Forestry and Fire Protection, Forest and Rangeland Resources Assessment Program; report; contract 8CA85064. 245 p.
This study departs from standard approaches, casting well-being in forest dependent communities in terms of community stability (confines well-being to stable timber employment). Well-being is reformulated in terms of Sen's concepts of capabilities (opportunities an individual has to choose from) and functioning (what (s)he succeeds in doing with the commodities at her command) coupled with an expanded conception of community which is used to explore the question of how communities develop and maintain the capacity to enhance their well-being and to defend their interests against outsiders. This study looks at "community capacity" (ability of a community to address local problems and respond to external threats) and "commitments" (actions which improve the community and community capacity), taking a "social indicators approach to well-being"

Study 1: statistical analyses between indicators of well-being and measures of forest and use
Study 2: rapid rural appraisal of 7 forest communities to determine issues of local importance and to assess capacity to undertake action to address them
Study 3 (v2): evaluates the well-being of 3 forest communities in CA.

Dependent variables (well-being): economic well-being (poverty, avg income, income inequality), health (work injuries), social pathology (rate of burglary), capacity
Independent variables (nature and use of forest): economic importance of forestry sector, amt of public land, concentration of private timber land, economic importance of tourism, immigration.

Mederer H. 1996. Surviving the Changes: Families Respond to Fishery Management. *Nor'easter*. 8(2): 12-33.

A 2-year study of a small group of fishing families in New England. She makes the case that for full time fishermen, fishing is an identity. With employment change, role shifting between men and women occur and that some families are more able to adapt than others. Husbands that had roles other than breadwinning - however brief and episodic - are better equipped to change. The families in the study that are coping well are the families that "made room" for the absent member when he came home, and that are willing to be flexible in how they think about work and family roles. However, changing these established patterns of family life and family roles is difficult. The results of this study suggest that when fishing families are not flexible in roles, the ease of their transition out of fishing may depend on what occupation they are adopting. Jobs that allow families to maintain their "family strategy" of separate lives may be more compatible with families that are comfortable with separate spheres of work and family.

Northeast Fisheries Management Council. 2003. Northeast Multispecies Amendment 13 SEIS. Social Impact Assessment
http://www.nefmc.org/nemulti/planamen/final_amend13_dec03_section_24.pdf

This SIA was framed by the following questions:
- Will standards, style, or pace of living change?
- Will cooperation and interaction patterns change?
- Will change be sudden or gradual?
- How does the proposed action fit with historical trends and participation in the fishery?
- Does the change fit with cultural or normative expectations of behavior in the fishery or community?
- How do fishermen and the community members view the alternatives?

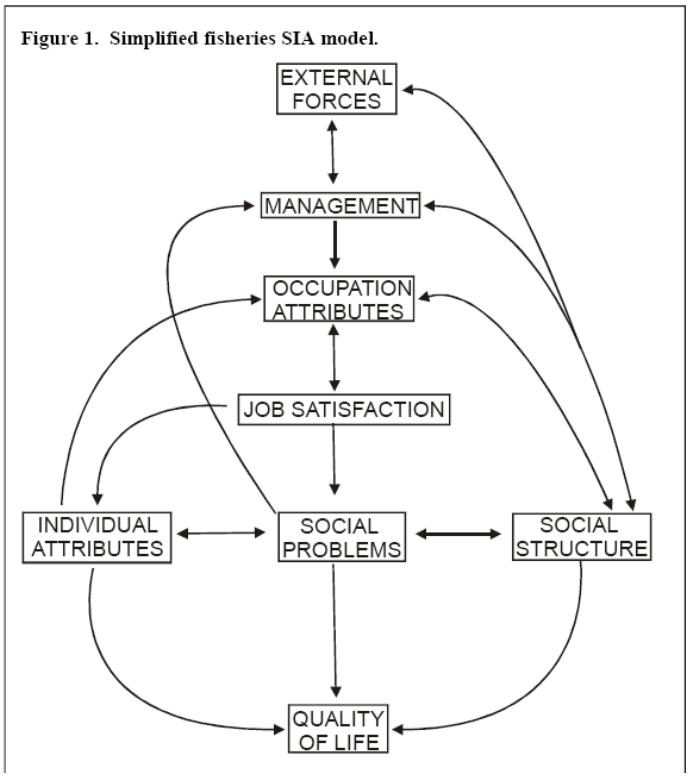
Social Impacts Assessment factors:
1. *Size and demographic characteristics of the fishery workforce in the community* –changes in these factors reflect demographic, income, and employment impacts in relation to the community's available fishery workforce
2. *Cultural issues* – attitudes, beliefs, values of fishermen, their families, and their communities
3. *Social structure and organization* – the ability of communities to provide necessary social support and services to families
4. *Non-economic social aspects* – lifestyle, health, and safety issues
5. *Historical dependence on fishery* – reflected in the structure of fishing practices and income distribution

Social impacts can be defined as the changes that a fisheries management action may create in people's way of life (how they live, work, play, and interact), people's cultural traditions (shared beliefs, customs, and values), and people's community (population structure, cohesion, stability, and character). As such, social impacts may result from changes in flexibility, opportunity, stability, certainty, safety, and other factors that are not specific to any community, but oftentimes to any individual or entity experiencing changes resulting from a fishing regulation.

Pollnac, R.B. and J.J. Poggie. 1988. The structure of job satisfaction among New England fishermen and its application to fisheries management policy. *American Anthropologist.* 90:888-901.

Fisheries management can affect changes that affect the structure of a person's work, which has important psychological, social and economic roles in the well-being of the individual. Job satisfaction is related to individual longevity, mental health, family violence, worker productivity so has societal repercussions (the repercussions are dependent on the society, but they don't thoroughly analyze this topic). They have a survey with job satisfaction variables.

Pollnac, R. The preliminary model for fisheries social impact assessment. Draft. Accessed 2.1.2006. Access online at:
http://www.st.nmfs.gov/st5/workshop/2004/documents/Pollnac_paper.pdf



Indicators to measure "quality of life"

Occupational attributes:
Annual rounds
Fishing units and gears
Cost of entry
Crew structure
Occupational mobility
Productivity
Absenteeism
Turnover
Safety
Flexibility

Individual attributes:
Mental health (anxiety, low self-esteem, worry, tension)
Psychosomatic illness
Heart disease
Longevity
Education and training

Flexibility
Resilience

Social structure:
Occupation structure
Community solidarity
Power structure
Social stratification
Family relationships
Flexibility
Resilience
Robustness

Social problems:
Conflict
Non-compliance
Unemployment
impaired inter-personal relationships
family violence
unemployment

Smith, S., S. Jacob, M. Jepson, and G. Israel 2003 After the Florida net ban: The impacts on commercial fishing families. *Society and Natural Resources* 16:39-59.

The results focus on the stress and coping processes families used to adjust to the net ban and the gender differences in the stress process and stress outcomes. Those affected were given surveys and asked to respond to the following categories: anxiety, stress, mastery, self-esteem, industry changes, depression, employment, spirituality. Findings indicate that both husbands and wives experience mental health impacts of changes in the industry and that these outcomes manifest in different ways by gender. Financial difficulties brought stress to the families. Individual coping strategies mitigated resilience.

Wilson, Douglas and Bonnie J. McCay. 1998 Social and Cultural Impact Assessment of the Highly Migratory Species Management Plan and the Amendment to the Atlantic Billfish Management Plan. Prepared for the Highly Migratory Species Office, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, July 1998. New Brunswick, NJ: The Ecopolicy Center. Available online at: http://www.st.nmfs.gov/st1/econ/cia/hms.pdf

Variables:
1) Distributional impacts, non-quantifiable considerations such as expectations and perceptions of the alternative actions, and the potential impacts of the alternatives on both small economic entities and broader communities.
2) Descriptions of the ethnic character, family structure, and community organization of affected communities.
3) Descriptions of the demographic characteristics of the fisheries.
4) Descriptions of important organizations and businesses associated with the fisheries.
5) Identification of possible mitigating measures to reduce negative impacts of management actions on communities.

3 categories of fishing regulation impacts:

1. The *volume* of money that is going through the community. In commercial operations this is a function of the amount and price of fish. In recreational operations this is a function of the amount people are willing to pay for a fishing experience.
2. The *flexibility* of fishing operations. This is the ability of the operation to change in response to changes in the resource, the market, or their customer base.
3. Can impose *direct costs* on fishing operations by requiring them to buy something or to pay someone to do something. These impacts on operations, in turn, create impacts in the broader community.

3 characteristics of communities influencing the magnitude and importance of the impact:
1. Existence of alternative activities, both fishing and non-fishing. The more alternatives available to someone who must change their behavior because of a regulation, the better that person is able to deal with the change.
2. Economic vulnerability. This is the amount and sources of pressure and competition those in fishing related businesses face in getting the things they need to run their operations and in selling their products. The more vulnerable the fish-related operation is, the greater the impact of a regulation on the lives of the people related to that operation. 3. Community support. Communities differ in the degree to which social capital, i.e., networks of people able to lend aid, is available to people and fishing operations affected by regulations. The more community support, the better the communities can absorb the impact of the regulation.

Impacts on employment and overall wealth are very important, as are changes in a community's identity as a fishing community, and its perspective on the future of fishing-related activities. Social relationships such as the role of kinship and the aggressiveness of competition also affect the quality of life in the community.

Key idea: Social and cultural realities do not react to changes in such predictable ways. The people that are using the resource in specific ways now may have to change how they use the resource because of the management plan. There is no way of knowing if these will be the same people who will benefit from any recovered fish stock. Social and cultural impact statements focus on the here and now - what is going to happen to these people in this place if this regulation is promulgated. We cannot predict, for good or for ill, what might happen ten years down the road because the communities are going to be different places. This means that social and cultural impact assessments have an inherent underappreciation of conservation. More value is placed on what exists right now than what might be in the future because we are looking at what people are using, talking about, and giving meaning to in the present.