

RESEARCH/PD ANNUAL REPORT - FINAL REPORT

2015 annual report - final

Bobbi Hudson

Planning for Sustainable Shellfish Aquaculture: Identifying Current Activities, Public Perceptions, Conflicts, and Compatibilities

R/LME/N-4

Submitted On: 04/20/2016 01:13:36 PM

METRICS & MEASURES

Metric/Measure	Value	Note
Acres of coastal habitat	0	
Fishermen and seafood industry personnel	20	Estimating 10% of growers modifying practices based on information from surveys, etc.
Communities - economic and environmental development	0	
Stakeholders - sustainable approaches	0	
Informal education programs	0	
Stakeholders who receive information	1000	A report summarizing results of the Residential Survey was prepared for local planners and regulators. Its purpose was to provide public perceptions information and recommendations for improving communication about shellfish issues. Presentations detailing research outcomes and recommendations were delivered at regional and national conferences and meetings. Audience members included regulators, shellfish farmers and industry members, citizen groups, educators and policy makers. Meeting sponsors included: Washington Sea Grant; the Pacific Coast Shellfish Growers Association/National Shellfisheries Association Pacific Coast Section; the National Shellfisheries Association; the World Aquaculture Society; and the Shellfish Interagency Permitting Team.
Volunteer hours	0	
P-12 students reached	0	
P-12 educators	0	

REQUESTED INFORMATION

Publications

Public Opinion of Shellfish Farming: A report on the public perception of shellfish aquaculture in select counties in WA, OR & CA

Publication Type: General Public and Advisory Reports, Fact Sheets, Posters, etc.

Publication Year: 2016

Publication Authors:

Publisher Info: Pacific Shellfish Institute, Olympia, WA

Notes: The purpose of this report is to provide public perceptions information and recommendations for improving communication about shellfish issues.

Related URLs: <http://www.pacshell.org/pdf/PublicOpinionOfShellfishFarming.pdf>

Keywords: public perceptions shellfish farming aquaculture marine spatial planning stakeholders

Publication URLs:

Abstract: This research assessed perceptions and behaviors related to shellfish and shellfish farming, and examined what influences social attitudes toward these activities. Results reveal limited knowledge of shellfish aquaculture across the ten-county study region in Washington, Oregon and California. These results indicate a clear opportunity for increased education and outreach regarding shellfish related activities. The most effective means to share information will be television, newspapers and websites, as well as booths at public events. Study results also reveal a considerable level of support for policies supporting shellfish aquaculture and increased domestic seafood production. When questioned if nearshore aquaculture production in their state should be increased, decreased, or stay the same, a preference for increased production outnumbered decreased production by a factor of 4.5 to 1. Survey respondents also recognize the benefits of shellfish aquaculture, especially for providing locally produced seafood, creation of jobs, improving the local and state economy, and relieving pressure on wild fisheries. Proliferation of local and regional shellfish aquaculture support will be necessary to continue to realize these benefits.

Citation: Hudson, Bobbi. 2016. Public Opinion of Shellfish Farming: A report on the public perception of shellfish aquaculture in select counties in Washington, Oregon and California. Pacific Shellfish Institute, Olympia, Washington.

Citation for Coverage:

SG can post PDF online?: Yes

Uploaded File: [Final_Perceptions_Report_for_Distribution.pdf](#)

Shellfish Farming and Your Community Residential Survey

Publication Type: Technical Reports (non-peer-reviewed)

Publication Year: 2013

Publication Authors:

Publisher Info:

Notes: Prepared for: The Pacific Shellfish Institute; Submitted by Thom Allen, Study Director, Social and Economic Sciences Research Center, Washington State University and Danna Moore, Ph.D., Senior Research Fellow, Social and Economic Sciences Research Center, Washington State University

Related URLs:

Keywords:

Publication URLs:

Abstract:

Citation: MARCUS - PLEASE FILL THIS IN FROM ATTACHED REPORT

Citation for Coverage:

SG can post PDF online?:

Uploaded File: [PACS13_Residential_Survey_Data_Report.pdf](#)

Shellfish Farming and Your Community Stakeholder Survey

Publication Type: Technical Reports (non-peer-reviewed)

Publication Year: 2014

Publication Authors:

Publisher Info:

Notes: Prepared for: The Pacific Shellfish Institute; Submitted by Danna Moore, Ph.D., Principal Investigator, Senior Research Fellow, Social and Economic Sciences Research Center, Washington State University and Thom Allen, Study Director, Social and Economic Sciences Research Center, Washington State University

Related URLs:

Keywords:

Publication URLs:

Abstract:

Citation: MARCUS - PLEASE FILL THIS IN FROM ATTACHED REPORT

Citation for Coverage:

SG can post PDF online?:

Uploaded File: [PACS13_Stakeholder_Survey_Data_Report.pdf](#)

Students Supported

No **Students Supported** information reported

Narratives

NOAA SEA GRANT AQUACULTURE RESEARCH PROGRAM FINAL REPORT for Planning for Sustainable Shellfish Aquaculture: Identifying Current

Uploaded File: [NOAA_GIS_FINAL_Report.pdf](#)

Partners This Period

California Sea Grant

Types: Sea Grant Program

Scale: STATE

Notes: Paul Olin

Washington State University (WSU)

Types: Academic Institution

Scale: STATE

Notes: Danna Moore

Northwest Indian Fisheries Commission

Types: Other

Scale: Tribal

Notes: David Fyfe

Taylor Shellfish Company

Types: Industry/Business

Scale: REGIONAL

Notes: Bill Dewey

Washington State Department of Ecology

Types: Government

Scale: STATE

Notes: Brian Lynn

Pacific Coast Shellfish Growers Association

Types: Industry/Business

Scale: REGIONAL

Notes: Margaret Barrette

STANDARD QUESTIONS

Community Hazard Resilience

No **Community Hazard Resilience** information reported

Economic Impacts

Impacts and Accomplishments

(1)

Type	impact
Title	National Sea Grant Aquaculture research delivers the geospatial and public-opinion data needed for sustainable shellfish aquaculture expansion
Relevance	Shellfish are rich in nutritional, cultural, recreational, economic and ecological value. Aquaculture can meet growing consumer demand but siting decisions are often contentious. To develop aquaculture sustainably, shellfish growers and resource managers must understand public attitudes and perceptions and the spatial relationships between multiple coastal uses.
Response	National Sea Grant-supported researchers assembled 32 GIS map layers, including metadata, showing nearshore growing and harvest areas, relevant infrastructure such as docks and refrigeration, and federal, state and local regulations in Washington, Oregon and California. They surveyed 4,000 residents and 865 government, industry and conservation representatives in 10 coastal counties in the three states regarding two fundamental questions: Do their communities oppose or support shellfish aquaculture? What are the implications of that opposition or support for aquaculture planning and development?
Results	GIS data were incorporated into the Oregon Coastal Atlas and the West Coast Environmental Response Management Application, ensuring that shellfish will be included in spill response. The data also is being incorporated into Washington's and California's ocean use atlases. Surveys elicited many responses and extensive written comments, revealing substantial support for shellfish aquaculture: four-and-a-half times as many respondents favor more nearshore production as do not. These findings have been presented at local, national and international aquaculture forums, and a synopsis was disseminated to 900-plus stakeholders. Armed with this data, growers can plan more proactively — 20 are already modifying their practices based on project results.
Recap	National Sea Grant-supported researchers assessed public attitudes toward shellfish aquaculture and determined there is substantial support for more production.
Comments	

Primary Focus Area	Sustainable Fisheries and Aquaculture
Secondary Focus Areas	Resilient Communities and Economies
Goals	Aquaculture operations and shellfish harvests are safe, environmentally sustainable and support economically prosperous businesses. Coastal communities and economies are vibrant and resilient.
Partners	California Sea Grant Northwest Indian Fisheries Commission Pacific Coast Shellfish Growers Association Pacific Shellfish Institute Taylor Shellfish Company Washington State Department of Ecology Washington State University, Social and Economic Sciences Research Center
	<p>* Type accomplishment * Title Identifying Current Activities and Public Perceptions * Relevance Aquaculture has the potential to significantly contribute toward the growing demand for seafood in the U.S. and abroad. Bivalve shellfish are of particular interest because they provide cultural value, recreation, food, jobs and revenue. Bivalves also play a vital role in maintaining healthy estuaries, cleansing local waters and providing a complex habitat structure for other species. The recent NOAA National Shellfish Initiative and the Washington Shellfish Initiative both demonstrate a state and national commitment to expanding shellfish aquaculture. This project addressed three pressing needs related to planning for and expanding shellfish aquaculture along the West Coast: human use data, social research, outreach and education. Outcomes will help West Coast decision-makers understand the interrelationships among social, economic, and ecological values and multiple uses of ocean and coastal areas. Long-term goals of the project are to enhance ecologically and socially sustainable development of West Coast shellfish aquaculture and increase public understanding and support for shellfish related activities. Research goals directly support the National Oceanic & Atmospheric Administration's (NOAA) National Shellfish Initiative and commitment to state and regional spatial planning and efficient permitting for shellfish aquaculture. * Response This project assembled GIS map layers of shellfish activities in nearshore areas (commercial farms, classified shellfish growing areas, established tribal harvest areas), relevant infrastructure (docks, ramps refrigeration, storage, processing, and export-ready cargo facilities), and federal, state, and local regulations (georegulations) in WA, OR, and CA. Additionally, two separate surveys were prepared to explore two overarching research questions: "Are these communities opposed to or supportive of continued or expanded shellfish aquaculture?" and "What are the implications for aquaculture planning and</p>

development?" The surveys were sent during fall 2013, to 1) residents of ten counties in WA, OR, and CA; and 2) shellfish stakeholders representing federal, state, local government, private industry and conservation groups spanning the three states and the ten counties targeted for the residential survey (#1). * Results Pacific Shellfish Institute (PSI) coordinated with relevant agencies in WA, OR, and CA to gather thirty-two data layers covering shellfish production, recreation and regulatory dimensions. Metadata was created for each layer. When only paper maps or data were available PSI staff converted those resources into a GIS platform. Data has been shared with the Oregon Coastal Atlas, a multi-group project dedicated to disseminating data on Oregon's Coast. Washington and California Ocean Use Atlases are slated to ingest their state specific layers as well. Data were also shared with west coast ERMA's (Environmental Response Management Application) so shellfish resources are included in spill response in Oregon, California and Washington. A summary of the layers combined and created was shared at conferences and in private conversations with stakeholders. Of 4,000 social questionnaires posted to residents in WA, OR, and CA, we achieved a 34% response rate, and an excellent suite of answers for a wide range of issues. Of 865 social questionnaires posted to stakeholders in WA, OR, and CA, we achieved a 25% response rate, and an extensive collection of written responses to a wide range of shellfish farming and tideland usage questions. Study results reveal a considerable level of support for policies supporting shellfish aquaculture and increased domestic seafood production. When questioned if nearshore aquaculture production in their state should be increased, decreased, or stay the same, a preference for increased production outnumbered decreased production by a factor of 4.5 to 1. Survey respondents also recognize the benefits of shellfish aquaculture, especially for providing locally produced seafood, creation of jobs, improving the local and state economy, and relieving pressure on wild fisheries. * Recap This research assessed perceptions and behaviors related to shellfish and shellfish farming, and examined what influences social attitudes toward these activities. Comments Primary Focus Area Healthy Coastal Ecosystems Secondary Focus Areas Resilient Communities and Economies Goals Coastal communities and economies are vibrant and resilient., Coastal communities engage in comprehensive planning and sustainable development. Partners Teri King, WA Sea Grant/University of Washington David Landkamer, OR Sea Grant/Oregon State University Paul Olin, CA Sea Grant/Scripps Institution of Oceanography Danna Moore, WSU Social & Economic Research Center David Fyfe, Northwest

PI Draft

Indian Fisheries Commission Bill Dewey, Taylor Shellfish Brian Lynn, Washington State Department of Ecology ----- * Type impact * Title Planning for Sustainable Shellfish Aquaculture * Relevance Products developed under this project will assist coastal decision-makers identify and understand the status and needs of shellfish aquaculture, and in doing so, support marine spatial planning and coastal vitality in the region. Public opinion and values are vital to resource management. Public perceptions relative to environmental and economic issues play a major role in resource use, development and regulation of natural resource industries. Social research can help decision-makers determine how to best address public perceptions and concerns, as well as to develop effective approaches for public communication and engagement. * Response Public understanding and acceptance of shellfish aquaculture is an essential component of sustaining or expanding the industry along the West Coast. Public acceptance of shellfish activities, including potential for offshore aquaculture, is based on actual and perceived environmental and social concerns. Presentations describing public and stakeholder perception data were delivered at meetings sponsored by: Washington Sea Grant; the Pacific Coast Shellfish Growers Association/National Shellfisheries Association Pacific Coast Section; the National Shellfisheries Association; and the World Aquaculture Association. A synopsis of residential public perceptions survey data, and relevant recommendations, was prepared and disseminated to over 900 stakeholders in Washington, Oregon and California. * Results Recommendations highlight the opportunity for increased education and outreach regarding shellfish related activities. Based on survey results, the most effective means to share information will be television, newspapers and websites, as well as booths at public events. Residential survey results also reveal a considerable level of support for policies supporting shellfish aquaculture and increased domestic seafood production. This information is now in the hands of stakeholders in the region, in order to facilitate local and regional shellfish aquaculture support. * Recap Project results revealed a considerable level of support for policies supporting shellfish aquaculture and increased domestic seafood production, and highlight an opportunity for increased education and outreach regarding shellfish related activities. Comments Primary Focus Area Sustainable Fisheries and Aquaculture Secondary Focus Areas Resilient Communities and Economies Goals Aquaculture operations and shellfish harvests are safe, environmentally sustainable and support economically prosperous businesses., Fisheries are safe, responsibly managed and economically and culturally vibrant., Seafood consumers understand

the health benefits, safety and environmental sustainability of their seafood choices., Coastal communities and economies are vibrant and resilient., Coastal communities engage in comprehensive planning and sustainable development. Partners Teri King, WA Sea Grant/University of Washington David Landkamer, OR Sea Grant/Oregon State University Paul Olin, CA Sea Grant/Scripps Institution of Oceanography Danna Moore, WSU Social & Economic Research Center David Fyfe, Northwest Indian Fisheries Commission Bill Dewey, Taylor Shellfish Brian Lynn, Washington State Department of Ecology

Leveraged Funds

No **Leveraged Funds** information reported

Meetings, Workshops, Presentations

(1)

Type of Event	Public or professional presentation
Description	"Shellfish Farming in the Pacific Northwest: Public and Stakeholder Perceptions" Bobbi Hudson, Thom Allen, Danna Moore; 107th Annual Meeting of the National Shellfisheries Association; March 22-26, 2015 in Monterey, CA
Event Date	03-24-2015
Number of Attendees	300

(2)

Type of Event	Public or professional presentation
Description	"Listening to our Stakeholders: How to Improve Shellfish Aquaculture Information" Bobbi Hudson; 69th Annual Shellfish Growers Conference; September 22-24, 2015 in Hood River, OR
Event Date	09-22-2015
Number of Attendees	275

(3)

Type of Event	Public or professional presentation
Description	"West Coast Shellfish Resources in GIS" Andy Suhrbier; Washington State Shellfish Interagency Permitting (SIP) Team meeting in Lacey, WA
Event Date	08-14-2015

Number of Attendees

30

Tools, Technologies, Information Services / Sea Grant Products

(1)

Description	GIS map layers of shellfish activities in the nearshore, relevant infrastructure, and federal, state and local regulations in WA, OR, and CA.
Developed (in the reporting period)?	No
Used (in the reporting period)?	Yes
Used for EBM?	Yes
ELWD product?	No
Number of managers	2
Description/Names of managers	West Coast and Southwest Environmental Response Management Applications
Reported in previous year?	

NOAA SEA GRANT AQUACULTURE RESEARCH PROGRAM FINAL REPORT

Planning for Sustainable Shellfish Aquaculture: Identifying Current Activities, Public Perceptions, Conflicts and Compatibilities (NA100AR4170057)

Principal Investigator:

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Paul Olin, California Sea Grant Extension; UCSD/Scripps Institution of Oceanography, 133 Aviation Blvd., Suite 109, Santa Rosa, CA 95403; Tel. 707-565-2621; Email: polin@ucsd.edu

OBJECTIVES:

The primary objectives of this project were to:

1. Assemble and add value to existing GIS data layers of shellfish activities, relevant infrastructure and georegulations¹ in Washington, Oregon and California.
2. Design and implement surveys to identify public perceptions of shellfish aquaculture.
3. Provide targeted outreach for coastal decision-makers located in areas with existing or potential for shellfish aquaculture.

RATIONALE:

Aquaculture has the potential to contribute significantly toward the growing demand for seafood in the U.S. and abroad. Shellfish aquaculture, or farming, provides jobs and revenue for coastal communities. Aquacultured oysters, clams and mussels in Washington state alone generates \$185M of economic impact yearly, and provides 2,700 jobs. Furthermore, for every \$1.00 spent by Washington's shellfish industry, \$1.67 of additional spending is generated in the region (Northern Economics, 2013). Oregon's economic impact from shellfish production remains unknown due to inadequate data collection, but industry experts believe the value is between \$10-20 million. In California, total economic impact for the state's bivalve shellfish aquaculture industry is estimated to exceed \$23 million, supporting 280 jobs (Northern Economics, 2013). Shellfish are also integral components of the coastal ecosystem. As ecosystem engineers, shellfish create conditions for other plant and animal species to thrive, and they play a vital role in nutrient cycling of coastal habitats.

¹ Georegulations are principles, rules, or laws, and the geographic representation of the region(s) of applicability.

RESEARCH WORK PLAN & RESULTS

This project's work plan followed the three stated objectives. Each objective was also managed as an individual project task. Results for each task are described below.

1. Assemble and add value to existing GIS data layers of shellfish activities, relevant infrastructure and georegulations in Washington, Oregon and California.

Pacific Shellfish Institute (PSI) coordinated with relevant agencies in Washington, Oregon and California to gather GIS data layers covering shellfish production, recreation and regulatory dimensions. Metadata was created for each layer. When only paper maps or data were available, PSI staff (including an intern hired for this project from the Evergreen State College Masters of Environmental Science program) converted those resources into a GIS platform. Once assembled, data were shared with managers of each of the coastal atlases.

Washington data layers were shared with the Washington Department of Ecology (Ecology), manager of Washington's Digital Coastal Atlas. During this project's performance period, the Washington Department of Health (WDOH, the agency that manages water quality certification for shellfish harvest areas) underwent a significant update of their GIS and launched the layers for public viewing. PSI collaborated with WDOH during the data

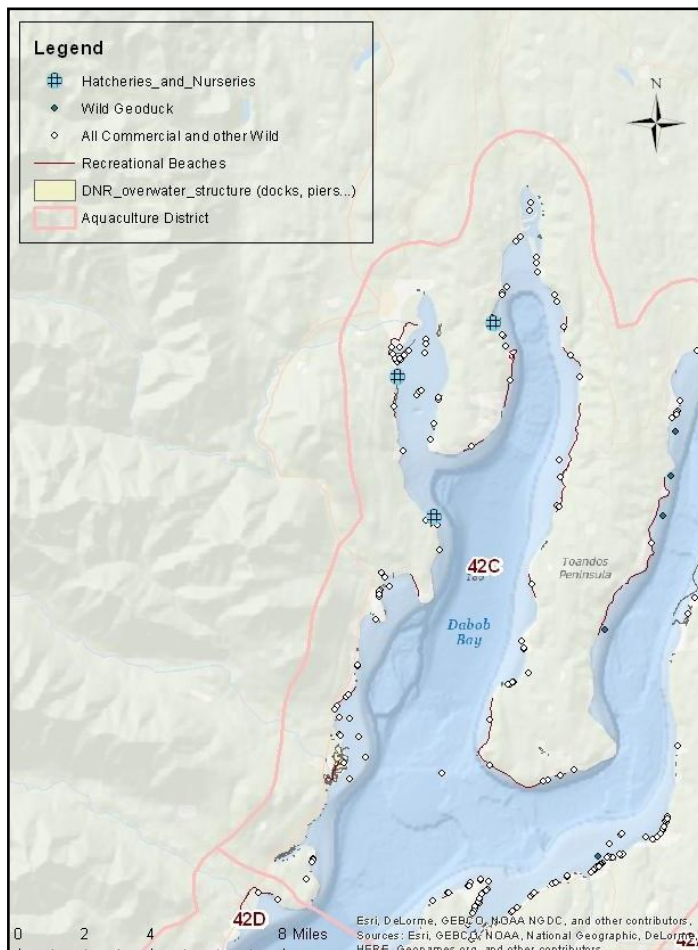


Figure 1. Example of GIS layers assembled for WA.

launch and incorporated WDOH data and recommendations to the package of GIS layers provided to Ecology for Washington's Coastal Atlas. The Oregon Coastal Atlas, a multi-group project dedicated to disseminating data on Oregon's Coast, received the Oregon data layers. Similarly, California shellfish layers were shared with NOAA for upload to the California Ocean Use Atlas.

Finally, PSI shared all commercial shellfish data layers with the West Coast and the Southwest Environmental Response Management Applications (ERMA). By doing so, shellfish resources are now specifically included in spill response in Washington, Oregon and California. ERMA is a password-protected application used by first responders and commercial shellfish company contact information is now directly imbedded, as metadata, for rapid response to potential oil spill events in marine areas of the three states.

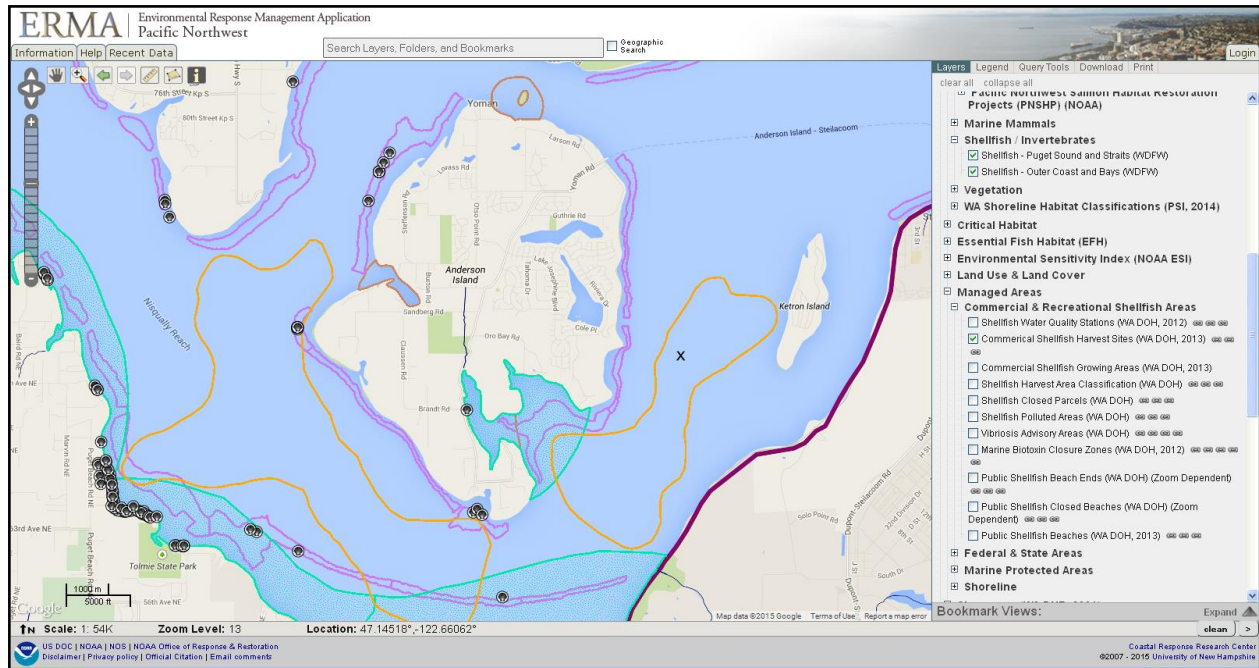


Figure 2. The West Coast Environmental Response Management Application (ERMA).

In addition to sharing of the GIS data with each of the three state's Coastal Atlases, a summary of the combined and created layers were shared at regional and national conferences, agency meetings, and in private conversations with stakeholders. One such stakeholder presentation occurred at a meeting of the state of Washington's Shellfish Interagency Permitting (SIP) team in late 2015. The SIP team is an interagency group tasked with developing and implementing a model permitting program to improve timeliness of shellfish permit decisions in Washington State, while also ensuring regulatory compliance, increase consistency of responses and avoid redundancy in the process. SIP team products are designed to assist shellfish farm and restoration permit applicants in navigating the application process, in joint consultation with natural resource agencies and tribes. The SIP team is one element of the Washington Shellfish Initiative. A list of members and SIP products can be found at: www.ecy.wa.gov/programs/sea/aquaculture/sip.html.

2. Design and implement surveys to identify public perceptions of shellfish aquaculture.

Task 2 activities were designed to assess current perceptions and behaviors related to shellfish and shellfish culture in 10 coastal communities (6 in Washington and 2 each in Oregon and California) and to examine what influences social attitudes toward these activities. Surveys were designed to answer the following research question: Are these coastal communities opposed to or supportive of continued or expanded shellfish aquaculture, and what are the implications for aquaculture planning efforts? Research sub-questions included:

- 1) *How do these communities understand, value, and respond to shellfish aquaculture?*
- 2) *What factors/sources influence social attitudes and values related to shellfish aquaculture?*

- 3) *What are the information and planning needs of these communities?*
- 4) *What kinds of outreach activities might be most effective at improving public awareness of the values and needs of sustainable shellfish aquaculture?*

An Advisory Committee comprised of local, state, and federal resource managers, planners, and industry representatives was assembled by PSI to guide survey development. Involvement of the Advisory Committee from the onset of the project leveraged substantial experience these individuals have working with coastal communities and captured information needed by coastal planners and decision-makers. Washington State University's (WSU) Social and Economic Sciences Research Center (SERC) worked closely with project partners to apply a survey-based methodology for assessing public perceptions of shellfish and shellfish culture. The approach for this task included two distinct surveys: 1) a residential survey of a random sample of households in the 10 targeted coastal communities; and 2) a mixed mode survey of stakeholder groups located within these same communities. The approach to each of these is described below.

Survey Methods

Both the residential and stakeholder surveys were administered online. For the community survey, postal contacts were initially sent to randomly selected households to direct the residents to an online survey. Households were sent one postcard reminder, and households that still did not respond were mailed a paper version of the survey. The approach yielded 652 surveys completed online, and an additional 598 paper surveys mailed in. For the stakeholder survey, individuals were contacted via email and directed to the online survey. Two follow up emails were sent, two weeks apart, to individuals that did not respond to the initial email invitation. The result of this approach was a total of 257 completed or partially completed surveys.

For both surveys, questionnaires and survey materials were pre-tested to ensure that accurate and usable information would be produced. Proper procedures for voluntary participation, informed consent, safeguards for confidentiality, and other human subject considerations were followed in implementing these surveys. The survey introduction to respondents also indicated that participation was voluntary and that all data collected would be maintained as confidential and anonymous. SERC produced a final dataset without identifiers so that it is not possible for anyone to associate the sample information with the survey results.

Residential Survey

The population for this survey consisted of all residential households within the 10 county study area. Genesys Sampling Inc. identified a total of 862,187 households, and selected a random sample of 4,000 to distribute surveys to. The layout of each question was designed using Tailored Design Method (TDM) protocols, which maximizes comprehension and ease of navigation for both online and paper surveys. The questionnaire consisted largely of closed-ended and numeric questions but some open-ended questions were included to provide qualitative information on issues. Of 4,000 social questionnaires posted to residents in WA, OR, and CA, we achieved a 34% response rate (Table 1), and an excellent suite of answers for a wide range of issues.

Table 1. Summary statistics for the Residential Survey within the ten county study region.

Study Area	Sample Size	Completed Surveys	Response Rate	Sample Error	Households in Area
Total Study Area	4,000	1,250	34%	±3%	862,187
<i>Washington Study Area</i>	2,400	770	35%	±4%	640,462
Skagit	400	129	34%	±9%	51,473
Kitsap	400	131	36%	±9%	107,367
Pacific	400	150	42%	±9%	15,547
Thurston	400	125	33%	±9%	108,182
Pierce	400	109	29%	±9%	325,375
Mason	400	126	35%	±9%	32,518
<i>Oregon Study Area</i>	800	282	38%	±6%	48,952
Tillamook	400	145	39%	±9%	18,359
Coos	400	137	37%	±9%	30,593
<i>California Study Area</i>	800	198	26%	±7%	172,773
Humboldt	400	103	27%	±9%	61,559
Marin	400	95	24%	±9%	111,214

Table 2. Frequency of stakeholder response by region.

Stakeholder Region	Completed Surveys
Total	254
<i>Washington State</i>	12
Skagit	32
Kitsap	43
Pacific	24
Thurston	19
Pierce	20
Mason	12
<i>Oregon State</i>	13
Tillamook	23
Coos	24
<i>California State</i>	4
Humboldt	10
Marin	18

Stakeholder Survey

The population for this survey consisted of shellfish industry stakeholders in each of the ten counties, plus various individuals representing state-level government agencies or organizations within either California, Oregon or Washington. The stakeholders included business leaders, public interest groups and government agencies, and targeted groups who were likely to be the most affected by shellfish activities. Examples include restaurant organizations, seafood retailers, economic development councils, local Chambers of Commerce, elected officials, tribes, natural resource agencies, environmental organizations, commercial and recreational fishing interests, coastal landowners, and tourism groups. A sample of 865 names were collected by PSI and provided to WSU's SERC for survey execution. Up to three emails were sent to each stakeholder, briefly describing the survey, and directing recipients to the online

survey platform managed by SERC. From the 865 stakeholders invited to participate, 254 responded to the survey (Table 2), yielding a 25% response rate overall.

Analysis of Survey Results

Analysis of survey results was completed by SERC. The complete reports, *Shellfish Farming and your Community Residential Survey (2013)* and *Shellfish Farming and your Community Stakeholder Survey (2014)*, were delivered to PSI and are available, electronically, to any

interested party upon request. (These project deliverables were also submitted to Sea Grant.) Analysis of the survey results began with descriptive and exploratory statistics, and progressed to correlational and crosstabular comparisons and statistics. Comparisons were made among the 10 counties, as appropriate, as well as analyzing the entire dataset of combined results. Population weights were included with the datasets, for the residential survey, to ensure that results properly reflect the 10 counties included in the surveys. Survey responses were analyzed on a community, state, and regional level, and organized around the following themes:

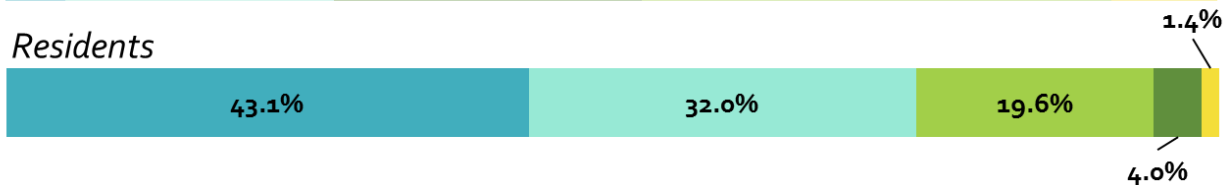
- Community knowledge of shellfish and shellfish aquaculture
- Perceived impacts of shellfish aquaculture
- Sources of information
- Behavior (consumption patterns, recreation, etc.)
- Trust in government and the shellfish aquaculture industry
- Preferred methods for increasing communication

Additional analysis, especially visual display of the data, was completed by PSI for Task 3 deliverables (description to follow in Task 3 section) and for numerous presentations at regional and national conferences. In general, residential survey results revealed that citizen knowledge of shellfish farming is limited, with 43.1% stating they are not at all familiar with shellfish aquaculture, while stakeholders were moderately familiar (Figure 3). In most of the counties surveyed more than 75% of the household ate shellfish, with the majority eating them every few months to once a month. When asked to rate various benefits of shellfish farming, respondents’ selected “greatest benefit” associated with “Providing locally produced seafood” (59.8%). Creation of jobs and improving the local and state economy were also highly ranked responses, and among stakeholders surveyed, more than half of the respondents rated the importance of shellfish aquaculture for creating and maintaining jobs as “very important” or “extremely important”. Also of notable importance was the frequency with which jobs and water quality were included in written responses querying the probable positive impact of shellfish aquaculture expansion.

Stakeholders



Residents



■ Not at all familiar ■ Slightly familiar ■ Moderately familiar ■ Very familiar ■ Extremely familiar

Figure 3. Stakeholder and Residential Survey responses to the question: “How familiar are you with the practice of shellfish aquaculture?”

Open-ended question responses were examined by PSI for themes, and to select responses that characterized recurring themes. Examples that articulated suggestions for increased communication, trust in government and the shellfish aquaculture industry, and perceived negative and positive impacts of shellfish aquaculture, were provided during presentations

at regional meetings and conferences. Word clouds were also created for select open-ended questions. Word clouds give greater prominence to words that appear more frequently, in this case responses to a single survey question (Figure 4) organized by the following:

- Type of group the stakeholder represented (government or non-government), and
- Views regarding the impacts of shellfish aquaculture (positive or negative)

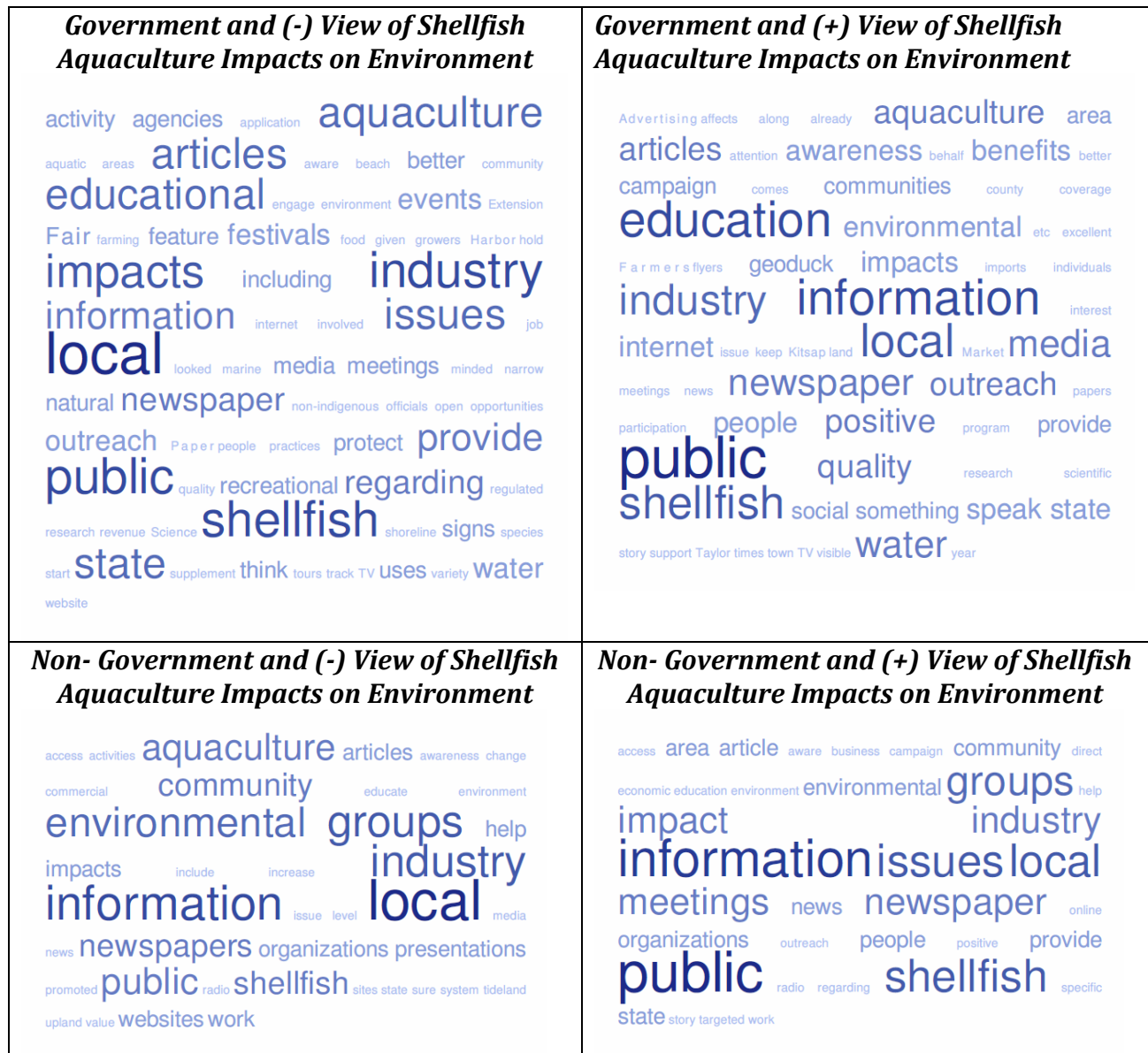


Figure 4. Word clouds created from Stakeholder Survey responses to the question: “What could be done to improve public awareness of shellfish aquaculture issues in your organization’s operational area?” Responses were grouped as captioned.

The majority of the respondents to the Stakeholder Survey were from government agencies (62%) and nonprofit organizations (20%) (Figure 5). A majority of respondents also selected that they had “some involvement” in saltwater tideland policy issues and commercial activities, which indicated that targeted individuals had been adequately

selected for the Stakeholder Survey. These stakeholders overwhelmingly (54%) rated the shellfish industries environmental stewardship as “good”.

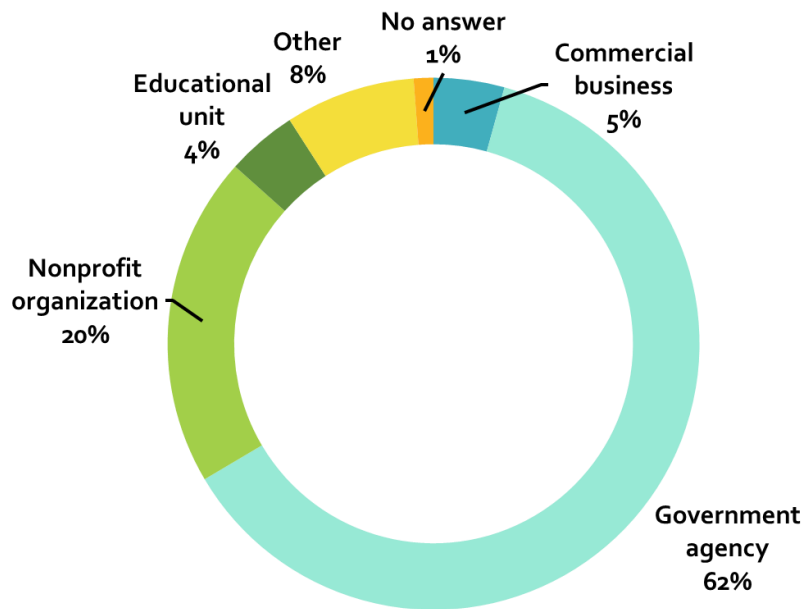


Figure 5: Stakeholder responses to “Which of the following best describes your organization or agency?”

From the residential respondents, assessing the public perception of the environmental impact of shellfish aquaculture was one of the key goals of this project. The results show that most of the Residential Survey respondents said the “didn’t know” (37.6%) what impact shellfish aquaculture had on the environment, while 19.5% thought the impacts were “somewhat positive”. When grouped for the entire study area, the most frequent response (47.9%) was that shellfish aquaculture farms neither enhance nor detract from the scenery of coastal areas.

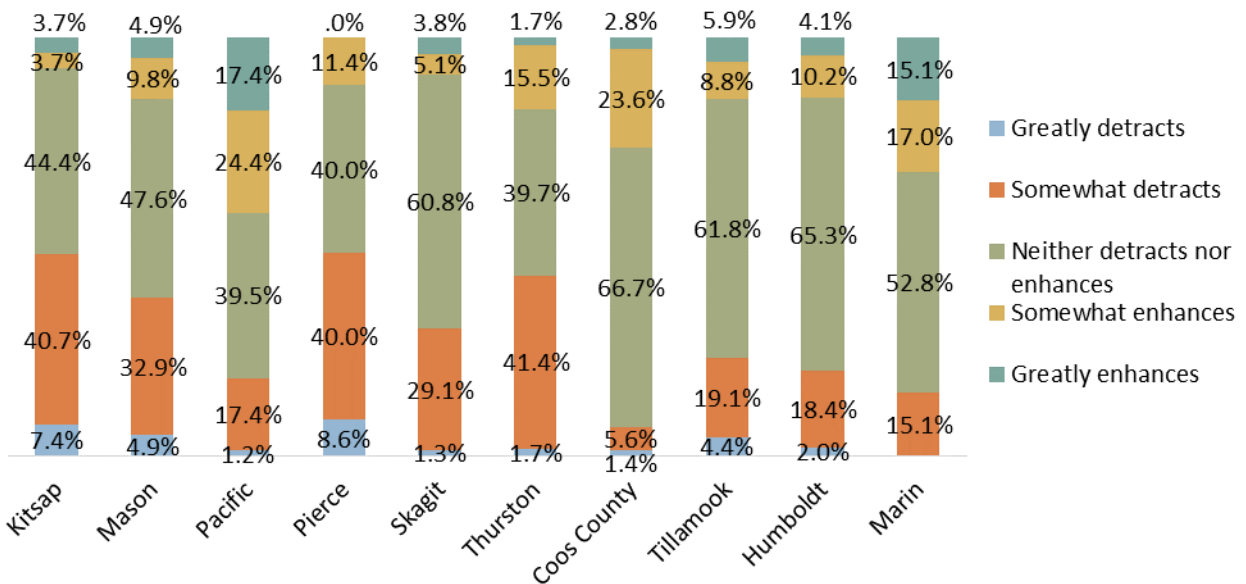


Figure 6. How much do shellfish farms enhance or detract from the scenery of coastal areas?

When analyzed by county, in all counties except Washington’s Thurston and Pierce counties, the majority of responses indicated that farming “Neither detracts nor enhances” the scenery (Figure 6). In these two counties an equal (40.0%) or slightly greater (41.4%) percentage of respondents felt shellfish farms “Somewhat detracts” from the scenery of

coastal areas. This contrasts to areas with the highest proportion of “Somewhat enhances” responses, which were Pacific County Washington (24.4%), Coos County Oregon (23.6%) and Marin County California (17.0%).

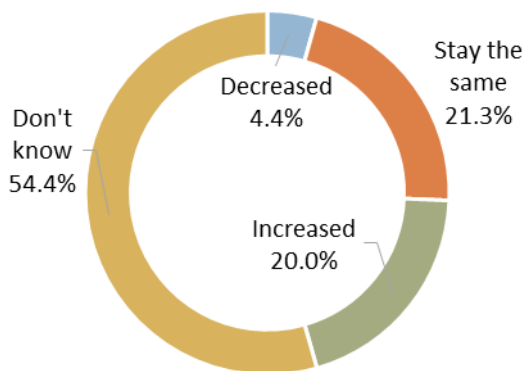


Figure 7. Do you think nearshore shellfish aquaculture production in your state should be...?

When questioned if nearshore aquaculture production in their state should be increased, decreased, or stay the same, (Figure 7) opinions were similar across the study region. Respondents in the entire study population were 4.5 times more likely to support an increase in nearshore shellfish production than those wanting production to decrease in their state (20.0% to 4.4%). Another one-fifth of respondents (21.3%) felt production should stay the same.

When asked if the information received about shellfish was mostly negative, neutral, or mostly positive, the largest segment of responses (41.7%) corresponded with having never received information about shellfish aquaculture (Figure 8). Overall, both the Residential Survey and the Stakeholder Survey provided valuable information with which to develop recommendations for improving communication about shellfish issues, and provide targeted outreach for coastal decision-makers (Task 3).

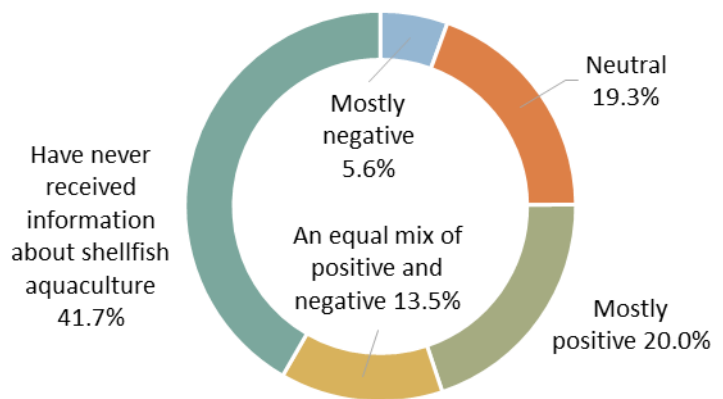
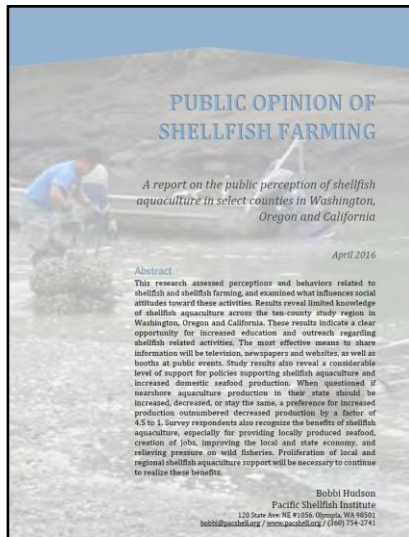


Figure 8. Is the information you receive about shellfish aquaculture mostly negative, neutral, or mostly positive?

3. Provide targeted outreach for coastal decision-makers located in areas with existing or potential for shellfish aquaculture.

Appropriate siting and expansion of shellfish aquaculture will need to proceed with regard to both environmental and economic impacts, and will require public interest and support. Task 3 activities were based on the premise that public opinion and values are vital to resource management, and that public perceptions relative to environmental and economic issues play a major role in resource use, development and regulation of natural resource industries. Public acceptance of shellfish activities, including potential for offshore aquaculture, is based on actual and perceived environmental and social concerns. The results of the social research conducted in Task 2 can therefore help decision-makers determine how to best address public perceptions and concerns, as well as to develop effective approaches for public communication and engagement. For these reasons, Task 3 activities were designed to effectively and concisely share Task 2 survey results.

A report summarizing results of the Residential Survey was prepared for local planners and regulators. Its purpose was to provide public perceptions information and recommendations for improving communication about shellfish issues. The report, titled



Public Opinion of Shellfish Farming: A report on the public perception of shellfish aquaculture in select counties in Washington, Oregon and California (Figure 9) was promoted on the PSI website (www.pacshell.org), and distributed to a wide variety of shellfish stakeholders in Washington, Oregon and California. All 865 individuals who had been invited to participate in the Stakeholder Survey were also sent a link to the report. The report includes sections on: shellfish aquaculture and coastal communities; social dimensions of resource management; communities surveyed; survey response; community knowledge of shellfish aquaculture; influence of waterfront property ownership; perceived benefits and impacts from shellfish aquaculture; support for shellfish aquaculture development; information sources and preferences; and a brief discussion of population demographics.

Figure 9. Task 3 report cover.

The report describes a clear need for increased education and outreach surrounding shellfish related activities. The basis for the assertion is the limited knowledge of shellfish aquaculture among residents in the ten-county study region. Recommendations for the most effective means to share information are also provided, based on residents' stated preference: television, newspapers and websites, and booths at public events. In contrast, the report also highlights the considerable level of support for policies supporting shellfish aquaculture and increased domestic seafood production. It also highlights residents' recognition of the benefits of shellfish aquaculture, specifically toward providing locally produced seafood, creation of jobs, improving the local and state economy, and relieving pressure on wild fisheries. As a final point, the report articulates that: "Proliferation of local and regional shellfish aquaculture support will be necessary to continue to realize these benefits."

In addition to the report described above, presentations detailing the outcomes of both Tasks 1 and 2 were delivered at regional and national conferences and meetings. Audience members included regulators, shellfish farmers and industry members, citizen groups, educators and policy makers. Meeting sponsors included: Washington Sea Grant; the Pacific Coast Shellfish Growers Association/National Shellfisheries Association Pacific Coast Section; the National Shellfisheries Association; the World Aquaculture Society; and the Shellfish Interagency Permitting Team. Requests for additional presentations have been made, but are not yet scheduled. In conclusion, it is anticipated that the information and recommendations developed through this research grant will continue to be shared and utilized in the future.

Citation: Northern Economics, Inc. 2013. *The Economic Impact of Shellfish Aquaculture in Washington, Oregon and California*. Prepared for Pacific Shellfish Institute.