

**National Marine Fisheries Service  
Alaska Fisheries Science Center/  
Alaska Regional Office**

# **Regional Impact Analysis User Manual**

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## Table of Contents

Multiregional Social Accounting Matrix (MRSAM) Model Introduction.....	3
Regions and Sectors in the MRSAM.....	6
Regional Economic Modeling Resources .....	7
Recommended Reading List.....	7
The following resources from the literature are recommended reading to help analysts utilize this tool:.....	7
Regional Impact Analysis Web Application Overview .....	8
Accessing the Application .....	8
Viewing the Documentation .....	9
Executing the MRSAM Model .....	9
Executing the Commodity Based Shock.....	11
Executing the Industry Based Shock .....	12
Executing the Combination Commodity/Industry Based Shock .....	14
Choosing the types of shock .....	15
Viewing the Data Results .....	15
Exporting the Data Results.....	16
Copying and Pasting the Tables .....	17
Exporting the Data Tables to Excel .....	17
Example Scenario of a Commodity Based Shock .....	18
Example Scenario of an Industry Based Shock .....	27

# User Manual for the Regional Impact Analysis Web Application

The Regional Impact Analysis web application was developed to assist economists and social scientists working with Alaska fisheries in estimating the economic impacts of changes in fishery policies. This web-based application runs a Multi-Regional Social Accounting Matrix (MRSAM) model. This manual (i) briefly describes the model used (MRSAM model), (ii) outlines the regions and sectors used in the model, (iii) provides useful resources that will be helpful in understanding the model, (iv) gives an overview of the web application, and (v) introduces some example scenarios to guide the users in using the application.

## Multiregional Social Accounting Matrix (MRSAM) Model Introduction

Input-output (IO) models are a fundamental tool for regional economic impact analysis, and calculate the total economic impacts of a change in the final demand. Although IO models are useful, the models cannot evaluate the distributional impacts (on value added, household income, and regional government revenue). Social accounting matrix (SAM) models are an extension of IO models, and overcome this limitation of IO models by evaluating the distributional impacts of policy changes. A SAM is a stylized representation of transactions between accounts or “sectors” in an economy.

An example of a SAM model developed for Alaska fisheries is Seung and Waters (2005). However, this SAM model is a single-region model that can calculate the economic impacts for Alaska only, and therefore, was later extended to develop a multi-regional SAM (MRSAM) model for Alaska fisheries in order to examine multiregional effects of changes in Alaska fisheries on the economies of Alaska, the U.S. West Coast (WC), the rest of the US (RUS) [Seung 2014a; Seung 2014b]. We use this MRSAM model for this web application.

A simplified diagram of an MRSAM table is shown in Fig. A1 while a somewhat more detailed schematic of the MRSAM used for this software is shown in Fig. A2. Sectors making purchases or payments appear in the columns. Sectors selling goods and services or receiving payments are shown in the rows. Transactions occur at the intersections of the columns and rows. Note that each sector in the SAM is represented by both a row account and column account, underlining the fundamental principle of SAM that receipts equal expenditures for each account or sector and for the economy overall.

Types of accounts represented in the MRSAM include: “industries” (producers), “commodities” (goods and services produced), components of “value added” (labor income, capital income and indirect business taxes (IBT)), “households” (income earners and consumers of commodities), “governments” (taxes, transfer payments and purchasers of commodities), “capital account” (savings and purchases of capital goods), and “trade” (imports and exports) accounts.

In defining a SAM model, the accounts are bifurcated into “endogenous” and “exogenous” accounts. Endogenous accounts are the economic machinery of a region and are assumed to be driven by the “exogenous” accounts, which inject money into the region chiefly via demand for exports and investment goods, payments from the federal government, and remittances from foreign households. In

an MRSAM, each region includes a similar set of economic accounts, and endogenous transactions occur not only between accounts in the same region but also between accounts in different regions. For more details on regional economic impact modeling for Alaska fisheries, see the accompanying NOAA Technical Memo (Seung and Miller 2018).

	Alaska (AK)	West Coast (WC)	Rest of U.S. (RUS)	Rest of the World (ROW)
Alaska (AK)	Alaska Economy	WC purchases from AK	RUS purchases from AK	AK Exports
West Coast (WC)	AK purchases from WC	West Coast Economy	RUS purchases from WC	WC Exports
Rest of U.S. (RUS)	AK purchases from RUS	WC purchases from RUS	RUS Economy	RUS Exports
Rest of the World (ROW)	AK Imports	WC Imports	RUS Imports	

Figure A1: Basic MRSAM structure (Waters et al. 2014)

Figure A2: More detailed MRSAM structure (Waters et al. 2014)(See the next page for descriptions of acronyms and abbreviations)

		AK				WC				RUS				ROW		
		Ind	Com	VA	Inst	Ind	Com	VA	Inst	Ind	Com	VA	Inst	Fed	Invest	Exports
AK	Ind		Make													
	Com	Ind Use			Consump		imp from AK				imp from AK			fed demand	inv demand	ROW exports
	VA	fac inc & IBT to AK				fac inc paid to AK				fac inc paid to AK						
	Inst			reg fac income										transfers	remit	
WC	Ind						Make									
	Com		imp from WOC			Ind Use			Consump		imp from WOC			fed demand	inv demand	ROW exports
	VA	fac inc paid to WOC				fac inc & IBT to WOC				fac inc paid to WOC						
	Inst						reg fac income							transfers	remit	
RUS	Ind									Make						
	Com		imp from RUS				imp from RUS			Ind Use			Consump	fed demand	inv demand	ROW exports
	VA	fac inc paid to RUS				fac inc paid to AK				fac inc & IBT to RUS						
	Inst										reg fac income			transfers	remit	
ROW	Fed		tariffs	fac tax	inc tax		tariffs	fac tax	inc tax		tariffs	fac tax	inc tax			fed borrow
	Savings													fed saving		
	Imports		imp from ROW				imp from ROW				imp from ROW					

## Descriptions of acronyms and abbreviations in Figure A2

MRSAM	: multi-regional social accounting matrix
AK	: Alaska
WC	: West Coast
RUS	: rest of US
ROW	: rest of the world
Ind	: industry
Com	: commodity
VA	: value added
Inst	: Institutions
Fed	: federal government
Invest	: investment
Ind Use	: Industry use matrix
fac inc & IBT	: factor income and indirect business tax
Make	: make matrix
imp from	: imports from
reg fac income	: regular factor income
fac tax	: factor tax
Consump	: consumption
inc tax	: income tax
fed demand	: federal government demand
fed saving	: federal government savings
inv demand	: investment demand
remit	: remittances
fed borrow	: federal government borrowing

## **Regions and Sectors in the MRSAM**

In the MRSAM model, the Alaska fisheries industry was represented by eight aggregated components defined using 2004 revenue data sourced from the Alaska Fisheries Information Network (AKFIN, 2013): “Catcher-Processors” (including American Fisheries Act (AFA) pollock CPs, Freezer Longliners, and Amendment 80 (A80) non-pollock trawl CPs), “Trawlers” (catcher vessels with a majority of revenue from trawl gear), “Longliners” (catcher vessels with a majority of revenue from longline gear), “Crabbers” (catcher vessels with a majority of revenue from the crab species group), “Salmon netters” (catcher vessels with a majority of revenue from salmon caught with net or “other” gear), “Other harvesters” (harvesting vessels not falling into any of the prior vessel categories), “Shorebased Processors”, and “Motherships” (non-stationary floating processors). The fish species caught by the CPs and catcher vessels above consists of all major species in Alaska including Atka mackerel, flatfish, Pacific cod, pollock, rockfish, sablefish, crab, halibut, herring, salmon, other finfish, other invertebrate, and other fish.

West Coast (WC) region fisheries were similarly grouped into eight aggregated industry categories encompassing harvesters and processors engaged in federal and state managed regional fisheries for the thirteen species caught in Alaska fisheries above plus Pacific whiting. The raw fish caught is

processed in CPs, Motherships, and Shorebased processors. Fisheries in the rest of the US (RUS) region were much more compactly aggregated into only four industry components: “Trawlers”, “Crabbers”, “Other harvesters” and “Shorebased Processors”

In the MRSAM constructed for this study, each region includes 33 endogenous non-fisheries industry sectors, 33 corresponding commodity sectors, three value added accounts, three types of households, and a state-local government account, for a total of 219 (73 x 3) endogenous non-fisheries accounts.

Exogenous accounts that drive economic activity in the model include: demand for foreign exports, demand for investment goods, remittances to regional households, and federal government spending. A more detailed technical description of the MRSAM model is provided in Seung and Miller (2018). The complete sectoring scheme with the detailed MRSAM account structure is available upon request.

## Regional Economic Modeling Resources

The MRSAM, and this application tool, are intended to provide socioeconomic analysts with a tool that can be used to evaluate how Alaska fishery policy actions or other exogenous (environmental or market) shocks will affect the economies of the three regions (Alaska, WC, and RUS). The model will map exogenous shocks through economic pathways to estimate regional economic impacts on industry output (sales), value-added, household income, employment, and the combined state and local government revenue. The base modeling structure of the MRSAM does, however, have several limitations. First, the model captures expenditure patterns for the base year (2004) for which the data set was created. Therefore, users may have to rely on GDP deflator adjustments to estimate impacts in subsequent years. Second, the model uses a fixed commodity input structure based on that present in the base year. Therefore, the analyst must be cognizant that major changes in fishery structure within a fishing sector would necessarily alter expenditure patterns in the present time frame and the model output must be interpreted with care in such cases. For more details on the limitations of the model, see Seung and Miller (2018).

It is expected that analysts that use this tool will first familiarize themselves with pertinent literature (see recommended reading list below). However, one does not need to be an expert in the development of regional economic models to use this tool. Several examples are provided here showing real case scenarios as they may be applied in the model application, along with some of the model output one would generate. It is also recommended that analysts confer with either Dr. Chang Seung, an economist at the Alaska Fisheries Science Center, or with Scott Miller, an economist at the Alaska Regional Office of the National Marine Fisheries Service for assistance with developing impact scenarios appropriate to the policy issue or exogenous shock in question as well as with assistance in using the model and interpreting model output.

### Recommended Reading List

The following resources from the literature are recommended reading to help analysts utilize this tool: Holland, D. and P. Wyeth. 1993. SAM multipliers: their decomposition, interpretation, and relationship to input-output multipliers. Research Bulletin XB 1027. College of Agricultural and Home Economics Research Center, Washington State University.

King, B. 1985. What Is a SAM? Pages 17-51 in Pyatt, G. and J. Round. eds. Social Accounting Matrices: a Basis for Planning, The World Bank.

National Marine Fisheries Service. 2005. A Review of Regional Economic Models for Alaska Fisheries. Alaska Fisheries Science Center Processed Report 2005-01.  
<https://www.afsc.noaa.gov/Publications/ProcRpt/PR%202005-01.pdf>

Seung, C., and E. Waters. 2005. The role of the Alaska seafood industry: a social accounting matrix (SAM) model approach to economic base analysis. *The Annals of Regional Science* 40 (2), 335-350.

Seung, C. 2014(1). Measuring Spillover Effects of Shocks to Alaska Economy: An Interregional Social Accounting Matrix (IRSAM) Model Approach. *Economic Systems Research* 26(2):224-238.

Seung, C. 2014(2). Estimating effects of exogenous output changes: An application of multi-regional social accounting matrix (MRSAM) method to natural resource management. *Regional Science Policy and Practice* 6(2): 177-193.

Seung, C. and S. Miller. 2018. "Regional Economic Analysis for North Pacific Fisheries." NOAA Technical Memo. (Forthcoming)

Waters, E., C. Seung., M. Hartley., and M. Dalton. Measuring the Multiregional Economic Contributions of an Alaska Fishing Fleet with Linkages to International Markets. *Marine Policy* 50: 238-248.

## **Regional Impact Analysis Web Application Overview**

The MRSAM model allows the user to input a series of shock vectors based on species and/or fishery sector, then view and export the resulting effects on fishery and non-seafood industry sales, employment estimates, and other variables. This section gives an overview of the following:

1. Accessing the application
2. Viewing the documentation
3. Executing the MRSAM model
4. Choosing the types of shock
5. Viewing the data results
6. Exporting the data results

For questions or concerns with regards to the Regional Impact Analysis web application, please contact Chang Seung at [chang.seung@noaa.gov](mailto:chang.seung@noaa.gov) or Scott Miller at [scott.miller@noaa.gov](mailto:scott.miller@noaa.gov).

## **Accessing the Application**

The Regional Impact Analysis web application can be run in any HTML5 compatible browser which includes Microsoft Edge, Microsoft Internet Explorer, Google Chrome, Mozilla Firefox, or Safari (MacOS and iOS). Once downloaded to the client machine, the application can run even when disconnected from the Internet.



1. Navigate to the Regional Impact Analysis web application at: <https://nwecon.psmfc.org>

The screenshot shows the header of the web application. On the left, the title "Regional Economic Impact Analysis for North Pacific Fisheries" is displayed. On the right, there is a descriptive paragraph: "This tool is a cooperative project between PSMFC, NMFS' Alaska Regional Office, and NMFS' Alaska Fisheries Science Center, with funding provided by the NMFS Office of Science and Technology." Below the title, a breadcrumb trail reads "Home » Economic Impact Analysis". The main heading "Regional Economic Impact Analysis for North Pacific Fisheries" is followed by a paragraph describing the project's origin in 2015. A second paragraph explains the MRSAM model's capabilities and limitations. At the bottom, two links are provided: "Click here to access the application." and "Click here to read the user's manual."

## Viewing the Documentation

To view the Regional Impact Analysis User Manual, select the appropriate link from the application Home page.

1. Select the **here** link under the menu option "Click **here** to read the user's manual".



The user manual will open in a .pdf format.

## Executing the MRSAM Model

To open the Regional Impact Analysis and execute the MRSAM model, select the appropriate link from the application Home page.

1. Select the **here** link under the menu option "Click **here** to access the application".



This takes the user to the application page.

## Regional Economic Impact Analysis for North Pacific Fisheries

This tool is a cooperative project between PSMFC, NMFS' Alaska Regional Office, and NMFS' Alaska Fisheries Science Center, with funding provided by the NMFS Office of Science and Technology.



[Home](#) » [Economic Impact Analysis](#)

### Regional Economic Impact Analysis for North Pacific Fisheries

Impact Year:  Deflator:

GDP Deflator applies correction to baseline dollars. Select Custom to allow entry of a value in the Deflator input field.

The application allows a run of the model based on the:

- Commodity Based Shock
- Industry Based Shock
- Combination of both the Commodity Based Shock and the Industry Based Shock

In the commodity based shock, the initial shock is applied to commodities (fish species or processed fish). The initial shock in this case is specified as the change in the ex-vessel revenue and the change in first wholesale revenue, for one or more species, resulting from a change in harvest of the species. In the industry based shock, the initial shock is given to industries (fish harvesting and processing sectors). The initial shock in this case is specified as the change in the ex-vessel revenue for a fish harvesting sector (e.g., Trawlers) and the change in first wholesale revenue for a fish processing sector (e.g., Shorebased processors), resulting from a change in the harvest by the fish harvesting sector. The combined commodity and industry shock is used when computing the economic impacts of a fishery management policy that involves changes to both species and fishing sectors.

An overview of each will follow.

1. To begin the model run, select the **Impact Year** for which you want to run the model. The year the user chooses will affect the GDP Deflator applied to the base data prior to executing the model.

The user may select one of the pre-calculated GDP deflators for the years, or select **Custom** and insert their own GDP Deflator value in the **Deflator** text box.

**NOTE: the user must check that the correct GDP deflator is selected prior to EVERY new scenario entered into the application.**

**Regional Economic Impact Analysis**

Impact Year: Custom Deflator: 1

GDP Deflator applies correction to baseline dollars.

Commodity Based Shock

	Flatfish-C:	PacCod-C:
	0	0
	Hallibut-C:	Herring-C:
	0	0

## Executing the Commodity Based Shock

1. To execute the MRSAM model using a commodity based shock (i.e., change to the value of the fish species caught), select the radio button to the left of **Commodity Based Shock**.

Note that when doing so, the text boxes for AtkaM-C, Flatfish-C, etc. turn from gray to white, allowing the user to edit the values.

Consult the User Manual for agency guidance on appropriate shock vector values

**Commodity Based Shock**

AtkaM-C: <input type="text" value="0"/>	Flatfish-C: <input type="text" value="0"/>	PacCod-C: <input type="text" value="0"/>	Pollock-C: <input type="text" value="0"/>	Rockfish-C: <input type="text" value="0"/>	Sablefish-C: <input type="text" value="0"/>
Crab-C: <input type="text" value="0"/>	Hallibut-C: <input type="text" value="0"/>	Herring-C: <input type="text" value="0"/>	Othfinfish-C: <input type="text" value="0"/>	Othinvert-C: <input type="text" value="0"/>	Othshfish-C: <input type="text" value="0"/>
Salmonetc-C: <input type="text" value="0"/>	Seafood-C: <input type="text" value="0"/>				

2. For the **Commodity Based Shock**, enter **both** the desired change to the ex-vessel value of the species (e.g., Pollock-C) catch and the desired change to the first wholesale value of the processed fish (**Seafood-C**).

Commodity based shocks are created exogenously, or externally, to the model. This means that the users of the software need to estimate the magnitudes of these shocks before running the model. The commodity based shocks could include such things as a reduction in the Total Allowable Catch (TAC) of a species group due to a decline in the stock. Similarly, a change in allocation of TAC to multiple species groups due to shifting TAC under a harvest cap, such as the 2 million metric ton cap in the Bering Sea and Aleutian Islands (BSAI) groundfish fisheries, could be applied as a commodity shock to each of the affected commodity (species) groups. Alternatively, the effect of a harvest constraint, such as a Prohibited Species Catch cap that results in a species group not being fully harvested, could be analyzed provided the forgone harvest quantity can be estimated.

Commodity shocks are generally composed of two separate shock parameters (numbers). The first is the species group shock (e.g., Pollock-C) and the second is the processed seafood shock. The first shock is measured in terms of the change in total ex-vessel harvest value of the species group. This information may be obtained via a custom query to one or more data repositories within NMFS, the Council, AKFIN, or the State of Alaska, or, in some cases, via published information sources such as the annual Economic SAFE report prepared by the Alaska Fisheries Science Center.

The species group shock, measured at the ex-vessel level, is easily obtained from ex-vessel landings values for catcher vessels delivering to shoreplants due to the ex-vessel transaction being recorded. However, the ex-vessel portion of the commodity shock is not as easily obtained for catcher processors because there is no ex-vessel transaction. In such cases one can

apply the catcher vessel ex-vessel prices per metric ton to estimate a proxy for ex-vessel value to obtain the ex-vessel species shock in the catcher processor sector.

The second shock is the impact to the processed seafood (Seafood-C), and is measured as the change in the first wholesale value arising from change in catch. Estimating this shock requires an estimate of the price of the processed fish per retained round metric ton for the species in question and for the processing sector. The price estimate is multiplied by the change in the quantity in tons of the species caught to obtain the value of the change and that value is entered into Seafood-C. If the shocks are negative to one species group but positive for another, the shock to the processed seafood (Seafood-C) must be a net of the two. For complicated scenarios it is advisable to consult with the AFSC and/or AKRO economists.

Note that the shocks are in millions of dollars. A shock could be a negative impact or a positive impact, as a reduction in TAC in one commodity group in the BSAI may result in an increase in TAC in another commodity group. Both effects can be input into the application. However, there is a potential complication to such a scenario.

It is important to understand that the model calculates only state-level (i.e., the entire State of Alaska) impacts, and does not, at this time, provide sub-state impacts such as the impacts on boroughs and census areas or cities/communities. This is due to data constraints. The analyst may apply commodity shocks for a specific fishing region, such as the Gulf of Alaska (GOA) or BSAI, by estimating a shock specific to the region and inputting the shock(s) to the model application. However, the results calculated from these shocks will represent the impacts to the entire State of Alaska economy, as well as to the U.S. West Coast, and the rest of the U.S. economies but not at the sub-regional or community level. In other words, a commodity shock (e.g, a change in the TAC for a BSAI fishery) in the model will not provide the economic impacts to the individual communities that depend on the BSAI fishery, but rather the economic impacts to the entire State of Alaska, WC, and RUS.

The model will be executed as soon as the user hits Enter, tabs off the active text box, or uses their mouse to scroll down to view the model results.

### Executing the Industry Based Shock

1. To execute the MRSAM model using the industry based shock vectors (i.e., using changes to the harvesting or processing industries), select the radio button to the left of **Industry Based Shock**.

Note that when doing so, the text boxes for each industry sector turn from gray to white, allowing the user to edit the values.

**Industry Based Shock**

CPH-A: <input type="text" value="0"/>	CPP-A: <input type="text" value="0"/>	TRAWLERS-A: <input type="text" value="0"/>	LONGLINERS-A: <input type="text" value="0"/>	CRABBERS-A: <input type="text" value="0"/>	SALMON-A: <input type="text" value="0"/>
OTHERHARVS-A: <input type="text" value="0"/>	MS-A: <input type="text" value="0"/>	SHOREPROC-A: <input type="text" value="0"/>			

2. For the **Industry Based Shock**, the user needs to enter both the change to the ex-vessel value of a harvesting industry (e.g., Trawlers-A) and the change to the first wholesale value of the processing industry (motherships-MS-A and shore processors-SHOREPROC-A if those vessels deliver to both motherships and shoreside processors). In case of catcher-processors, the change in the “estimated” ex-vessel value is applied to CPH-A and the change in the first wholesale value to CPP-A, respectively.

As in the case of commodity based shocks, industry based shocks require the users to estimate the magnitudes of the shocks before running the model. In commodity based shock cases, the analysts enter the changes in ex-vessel and first wholesale values for certain species. In comparison, in the industry based shock case, the analysts need to enter the values for relevant fish harvesting and processing industries.

If there is a change in the ex-vessel value of a fish harvesting industry (Trawlers, Longliners, Crabbers, Salmon Netters, or Other Harvesters), the users need to enter the change into the application. In addition, since the change in landing of raw fish by a fish harvesting industry means a change in the processing activity and the first wholesale value for the processing industries [motherships (MS-A) and shoreside processors (SHOREPROC-A)], the users also need to enter these values for the processing industries. The users of the software need to estimate the changes to the fish harvesting and processing industries before running the model. Users may rely on Commercial Operators Annual Report data to get estimates of both the ex-vessel and first wholesale values of the annual harvest of, for example, pink salmon.

Special care should be taken when applying shocks to catcher processor sector. The Catcher Processor sector is composed of two different activities – a harvesting component and processing component. The MRSAM model treats these two activities separately (CPH-A and CPP-A) and so the model application needs the shock to the sector to be split out for harvesting (or ex-vessel value) and processing (or first wholesale less ex-vessel value to capture the net value accounted for by processing activity). For example, if the change in the first wholesale value for the CP sector is \$100 and if the change in the “estimated” ex-vessel value of the raw fish processed in the sector is \$30, the two shock numbers are derived as \$30 for shock to CPH-A and \$70 (=100-30) for shock to CPP-A, respectively. The users will need to enter these two numbers.

3. The model will be executed as soon as the user hits Enter, tabs off the active text box, or uses their mouse to scroll down to view the model results.

## Executing the Combination Commodity/Industry Based Shock

In some cases, the users may need to evaluate the economic impacts from a management policy that involves applying shocks to both commodities and industries (such as change in TAC for a species and restrictions placed on the activity of a fishing industry). In this case, the users may choose to use the both types of approaches simultaneously.

1. To execute the MRSAM model based on the combination of commodity and industry based shock vectors, select the radio button to the left of **Both**.

Note that when doing so, the text boxes for the Commodity Based Shocks (AtkaM-C, Flatfish-C, etc.) and the Industry Based Shocks (CPH-A, CPP-A, etc.) turn from gray to white, allowing the user to edit the values.

Consult the User Manual for agency guidance on appropriate shock vector values

**Commodity Based Shock**

AtkaM-C: <input type="text" value="0"/>	Flatfish-C: <input type="text" value="0"/>	PacCod-C: <input type="text" value="0"/>	Pollock-C: <input type="text" value="0"/>	Rockfish-C: <input type="text" value="0"/>	Sablefish-C: <input type="text" value="0"/>
Crab-C: <input type="text" value="0"/>	Hallibut-C: <input type="text" value="0"/>	Herring-C: <input type="text" value="0"/>	Othfinfish-C: <input type="text" value="0"/>	Othinvert-C: <input type="text" value="0"/>	Othshfish-C: <input type="text" value="0"/>
Salmonetc-C: <input type="text" value="0"/>	Seafood-C: <input type="text" value="0"/>				

**Industry Based Shock**

CPH-A: <input type="text" value="0"/>	CPP-A: <input type="text" value="0"/>	TRAWLERS-A: <input type="text" value="0"/>	LONGLINERS-A: <input type="text" value="0"/>	CRABBERS-A: <input type="text" value="0"/>	SALMON-A: <input type="text" value="0"/>
OTHERHARVS-A: <input type="text" value="0"/>	MS-A: <input type="text" value="0"/>	SHOREPROC-A: <input type="text" value="0"/>			

**Both**    Note: Great care must be taken to avoid double counting if this selection is made.    [Export To Excel](#)

2. For the **Combination Shock**, the user must enter:
  - a. Changes in the ex-vessel values of one or more species
  - b. Overall change in the first wholesale value of the processed fish (Seafood-C)
  - c. Changes in the ex-vessel values of one or more sectors or industries
  - d. Changes in the first wholesale values of one or more processing industries (CPP-A, MS-A, and SHOREPROC-A)

**Warning: Great care must be taken to avoid double counting when performing the combination Commodity/Industry Based Shock.**

3. When applying both commodity based and industry based shocks, the users must make sure that any commodity shock cannot be also modeled as an industry sector shock because that would double count the impacts.

The model will be executed as soon as the user hits enter, tabs off the active text box, or uses their mouse to scroll down to view the model results.

In reality, however, there are not many fishery management policies that require using the combined commodity and industry based shock. For a complicated scenario that involves implementation of a combined commodity and industry based shock, it is advisable to consult with the AFSC and/or AKRO economists.

## Choosing the types of shock

Users can choose between commodity based, industry based, and the combined commodity and industry shocks, depending on several factors. If, for example, the fishery management policy directly alters the amount of harvest of a species caught by different fish harvesting industries, they may want to use commodity based shock approach. On the other hand, if the management action directly changes the level of fishing activity of a certain fish harvesting industry, which may change the catch of more than one species, the users may want to use industry based shock approach.

Choosing one or the other type of shocks depends also on how reliable the initial shock estimates are. Suppose that, for a certain policy, the users have estimated two different sets of shocks – one for commodity based shocks and the other for industry based shocks. Then, if the users believe that the commodity based shock estimates are more reliable than industry based shock estimates, they may want to use the former to get more reliable impact results and vice versa. An important caveat is that the MRSAM model assumes that a fixed percentage of the total harvest of a species (i.e., the harvest by all fishing industries or vessel types) is caught by a fish harvesting industry, and that the amount of a fish species caught by a fish harvesting industry is a fixed percentage of the industry’s total catch. These percentages are given in the MRSAM which is based on 2004 data.

## Viewing the Data Results

As noted, the model is executed as soon as the user removes focus from the text boxes. Then, all data tables pertaining to the following impact results are displayed by default:

- a. Baseline Data
- b. Economic Impacts on industry output and employment to the seafood Industries
- c. Economic Impacts on industry output and employment to the non-seafood Industries
- d. Economic Impacts on value added, household income, and state and local government revenue

However, the user has the ability to toggle the screen view of these data tables by selecting and de-selecting the displayed sources. The image below illustrates active check boxes located just above Table A (Baseline Data), and Table B (Impacts), indicating that all data tables are turned on for viewing. The user may turn any of these output tables off by unchecking the check boxes.

Display:  Baseline  Economic Impact  Nonseafood Impact  Nonseafood Employment

Table A Baseline Data			
Industry	Alaska	West Coast	Rest of US
INDUSTRY OUTPUT (\$million)			
HARVESTING			
Catcher/processor-harvesting	287.4	10.1	0.0
Trawl CVs	232.3	64.3	226.8
Longliners	247.7	22.3	0.0

Table B Economic impacts from shocks to commodities (quantity change)			
Industry	Alaska	West Coast	Rest of US
INDUSTRY OUTPUT (\$million)			
HARVESTING			
Catcher/processor-harvesting	-19.8	0.0	0.0
Trawl CVs	-6.4	0.0	0.0
Longliners	-2.1	0.0	0.0

Depending on the shocks selected, the tables displayed and exported will differ somewhat. The following tables are available:

- **All Shocks**
  - Table A: Baseline Data
  - Table A.1: Baseline Non-seafood output by industry
  - Table A.2: Baseline Non-seafood employment by industry
- **Commodity Based Shocks**
  - Table B - Economic Impacts (quantity change)
  - Table C - Economic Impacts (percent change)
  - Table B.1 - Economic Impacts on Non-seafood Output by industry (quantity change)
  - Table B.2 - Economic Impacts on Non-seafood Employment by industry (change in # of jobs)
- **Industry Based Shocks**
  - Table D - Economic Impacts (quantity change)
  - Table E - Economic Impacts (percent change)
  - Table D.1 - Economic Impacts on Non-seafood Output by industry (quantity change)
  - Table D.2 - Economic Impacts on Non-seafood Employment by industry (change in # of jobs)
- **Combination of Commodity and Industry Based Shocks (Both)**
  - Table F - Economic Impacts (quantity change)
  - Table G - Economic Impacts (percent change)
  - Table F.1 - Economic Impacts on Non-seafood Output by industry (quantity change)
  - Table F.2 - Economic Impacts on Non-seafood Employment by industry (change in # of jobs)

## Exporting the Data Results

The users have two options for acquiring the results from the Regional Impact Analysis web application:

1. Copy and paste the table from the web application screen directly into their document
2. Export the results to an unformatted MS Excel document for further manipulation



## Copying and Pasting the Tables

Once the MRSAM model has been executed and the results viewed in the application, the users can copy and paste the formatted tables one-by-one into their MS Word or other document for use in their analyses.

1. Execute the MRSAM Model
2. Locate the desired table in the web application and highlight the table using your mouse or keypad
3. Right-click and select **Copy**
4. Navigate to document
5. Right-click and **Paste**

Table F Economic impacts from shocks to BOTH commodities and industries (quantity change)			
Industry	Alaska	West Coast	Rest of US
<b>INDUSTRY OUTPUT (\$million)</b>			
<b>HARVESTING</b>			
Catcher/processor-harvesting	-19.8	0.0	0.0
Trawl CVs	-6.4	0.0	0.0

The above image is a partial example of the copy/paste that inserts a formatted version of the table directly into an MS Word document. One could also use a snipping tool to capture output and paste it to MS Word. Full table output will be shown in the examples below.

## Exporting the Data Tables to Excel

After the results have been executed and the results viewed in the application, the user can export all of the relevant data tables to a non-formatted MS Excel file. For the list of relevant data tables exported by applied shock, see ***Viewing the Data Results***.

1. Execute the MRSAM Model
2. Select **Export to Excel** triggering the browser download
3. Open and view the downloaded file in MS Excel

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U		
1	Impact Ye: 2004	Deflator:	1		Note: We assume that the employment in each industry has not changed since 2004. However, all the values (in million dollars) in the initial MRSAM table are adjusted																	
2																						
3	AtkaM-C	Flatfish-C	PacCod-C	Pollock-C	Rockfish-C	Sablefish-C	Crab-C	Halibut-C	Herring-C	Othfinfish	Othinvert	Othshfish	Salmonet	Seafood-C								
4	Shock Vec	0	0	0	-70	0	0	0	0	0	0	0	0	0	0	-30						
5																						
6	Table A Baseline Data				Table B Economic impacts from shocks to commodit				Table C Economic impacts from shocks to commodities (percentage change)													
7	Industry	Alaska	West Coast	Rest of US	Industry	Alaska	West Coast	Rest of US	Industry	Alaska	West Coast	Rest of US										
8	INDUSTRY OUTPUT (\$million)				INDUSTRY OUTPUT (\$million)				INDUSTRY OUTPUT (\$million)													
9	HARVESTING				HARVESTING				HARVESTING													
10	Catcher/p	287.4	10.1	0	Catcher/p	-30.8	0	0	Catcher/p	-10.7	0	0										
11	Trawl CVs	232.3	64.3	226.8	Trawl CVs	-38.8	0	0	Trawl CVs	-16.7	0	0										
12	Longliners	247.7	22.3	0	Longliners	-0.1	0	0	Longliners	-0.1	0	0										
13	Crabbers	145.5	136.1	95.5	Crabbers	0	0	0	Crabbers	0	0	0										
14	Salmon ne	179.8	18	0	Salmon ne	-0.1	0	0	Salmon ne	0	0	0										
15	Other han	124.1	178.5	1002.5	Other han	-0.3	0	0	Other han	-0.3	0	0										
16	TOTAL HAF	1216.8	429.2	1324.8	TOTAL HAF	-70.1	0	0	TOTAL HAF	-5.8	0	0										
17	PROCESSING				PROCESSING				PROCESSING													
18	Catcher/p	902.4	46.3	0	Catcher/p	-9.4	0	0	Catcher/p	-1	0	0										
19	Mothershi	227.7	32.3	0	Mothershi	-2.4	0	0	Mothershi	-1	0	0										
20	Shorebase	1749.1	2883.8	7903.6	Shorebase	-18.1	0	0	Shorebase	-1	0	0										
21	TOTAL PRC	2879.2	2962.4	7903.6	TOTAL PRC	-29.9	0	0	TOTAL PRC	-1	0	0										
22																						
23	SEAFOOD	4096	3391.7	9228.4	SEAFOOD	-100	0	0	SEAFOOD	-2.4	0	0										
24																						
25	NON-SEAF	47143.6	3781916	20664329	NON-SEAF	-76.8	-23.3	-85.4	NON-SEAF	-0.2	0	0										
26																						
27																						
28	TOTAL ALL	51239.6	3785307	20673557	TOTAL ALL	-176.8	-23.3	-85.4	TOTAL ALL	-0.3	0	0										
29																						
30	EMPLOYMENT (# of jobs)				EMPLOYMENT (# of jobs)				EMPLOYMENT (# of jobs)													
31	HARVESTING				HARVESTING				HARVESTING													
32	Catcher/p	2652	93	0	Catcher/p	-284	0	0	Catcher/p	-10.7	0	0										
33	Trawl CVs	966	838	2956	Trawl CVs	-161	0	0	Trawl CVs	-16.7	0	0										
34	Longliners	5340	759	0	Longliners	-3	0	0	Longliners	-0.1	0	0										

The above image is an example of the downloaded MRSAM Output opened in MS Excel. Note that the MS Excel file also includes the impact year and GDP deflator, along with the values for both the commodity and industry shock vector inputs.

### Example Scenario of a Commodity Based Shock

The total economic value of Alaska seafood production is determined within a world market where prices are directly affected by trade volume, inventory, supply, demand, as well as exchange rates and events in the world banking systems. In 2008, Pacific cod prices were, by some accounts, at an all-time high with strong outlook for even higher prices in 2009. However, late in 2008, a series of banking failures in the U.S. and subsequently in Iceland affected the cod markets negatively. European buyers could not get financing to purchase new inventory and cod prices fell by over 50%.

The 2009 price collapse in cod market resulted in dramatic declines in the landed value of Alaska caught Pacific Cod. Total ex-vessel value, all regions and all gear types combined as reported in the 2010 Economic SAFE report, dropped from \$275.6 million to \$127 million or a negative shock to the Pacific cod commodity group of \$148.6 million. The reported total first wholesale value of that catch was \$458.7 million in 2008 but had fallen to \$281.4 by 2009. That decline represents a drop in first wholesale value of \$177.3 million. Therefore, the two numbers to be entered for the commodity based shock are -\$148.6 million and -\$177.3 million for PacCod-C and Seafood-C, respectively. The tables below show the model estimates of impact due to these shocks. Model output within the application also includes base data and percentage impacts. However, what is shown here are the actual numerical impacts.

**Caveat:** IO and SAM (or MRSAM) models assume that prices are fixed, and that the relationship among all the economic variables is linear, meaning that a change in industry output always leads to a proportional change in the use of an input. First, the assumption of fixed prices implies for economic impact analysis of fisheries that a reduction in TAC for a certain species means an equivalent reduction in the ex-vessel value (which is the initial shock given to the model) when the price of the species is normalized to one. Second, regarding the proportionality of input use, a decline in the ex-vessel (or first wholesale value) arising from lowered price of a species may not necessarily decrease the use of inputs proportionally or may not decrease input use at all if the TAC is fixed at a pre-specified level. This is because the use of inputs is proportional to the quantity of fish caught, not to its ex-vessel value. Therefore, when a change in the ex-vessel value is not caused by a change in TAC or the quantity of fish caught but by a change in the price of a species as in the above example, the model results should be interpreted with care. Specifically, the impacts calculated for this example are overestimated to some extent. Users need to be aware of this caveat whenever they simulate shocks that involve changes in the ex-vessel or first wholesale value caused by a price change.

Table B, Economic impacts from shocks to commodities (quantity based), is shown below for this shock scenario. One can see how the shocks affect the harvesting and processing sectors in terms of industry output in millions of dollars. It is important to note that, in the base year, a very small portion of Seafood-C is produced (processed) by non-processing (fish harvesting) industries (trawlers, longliners, crabbers, salmon netters, and other harvesters). So the impacts on the harvesting industries are slightly more than the initial commodity shock because these industries produce some processed seafood in addition to harvesting.<sup>1</sup> On the other hand, the impacts on the processing industries are slightly less than the initial shock to Seafood-C. This difference occurs because the initial shock is commodity based but the results are reported in terms of industry output. Adding 148.6 to 177.3 equals 325.9, and is equal to the shock sum of 149.4 and 176.5. That is, the sum of initial commodity shocks is the sum of the initial industry impacts. This difference only occurs when applying a commodity shock and does not occur when the shock is exclusively industry based. Following the output impacts are impacts to employment, value added, household income, and state and local government revenue. The tables also provide the impacts to Alaska, the West Coast, and the Rest of the United States.

As discussed previously, the model will provide a series of other output tables. Table C would convert the output of Table B to percent of base data format. Table A1 provides baseline non-seafood industry output, and table A2 provides base line non-seafood industry employment data. Table B1 provides the economic impacts on non-seafood industry output, by sector, from shocks to commodities, while table B2 provides those impacts in terms of employment. As with all output tables the model output includes impacts to Alaska, the West Coast, and the Rest of the United States, as the three regions in the multiregional SAM. Sample output for tables B1, and B2 is shown below.

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<sup>1</sup>The harvesting sectors' production of processed seafood represents the direct sales of processed fish by harvesting vessels to consumers.

<b>Table B Economic impacts from shocks to commodities (quantity change)</b>			
<b>Industry</b>	<b>Alaska</b>	<b>West Coast</b>	<b>Rest of US</b>
<b>INDUSTRY OUTPUT (\$million)</b>			
<b>HARVESTING</b>			
Catcher/processor-harvesting	-89.1	0.0	0.0
Trawl CVs	-28.7	0.0	0.0
Longliners	-9.3	0.0	0.0
Crabbers	-8.3	0.0	0.0
Salmon netter	-2.7	0.0	0.0
Other harvesters	-11.4	0.0	0.0
<b>TOTAL HARVESTING</b>	<b>-149.4</b>	<b>0.0</b>	<b>0.0</b>
<b>PROCESSING</b>			
Catcher/processor-processing	-55.3	0.0	0.0
Motherships	-14.0	0.0	0.0
Shorebased processors	-107.2	0.0	0.0
<b>TOTAL PROCESSING</b>	<b>-176.5</b>	<b>0.0</b>	<b>0.0</b>
<b>SEAFOOD TOTAL</b>	<b>-325.9</b>	<b>0.0</b>	<b>0.0</b>
<b>NON-SEAFOOD TOTAL</b>	<b>-226.1</b>	<b>-69.8</b>	<b>-253.6</b>

<b>Table B Economic impacts from shocks to commodities (quantity change)</b>			
<b>Industry</b>	<b>Alaska</b>	<b>West Coast</b>	<b>Rest of US</b>
<b>TOTAL ALL INDUSTRIES</b>	-552.0	-69.8	-253.6
<b>EMPLOYMENT (# of jobs)</b>			
<b>HARVESTING</b>			
Catcher/processor-harvesting	-733	0	0
Trawl CVs	-106	0	0
Longliners	-178	0	0
Crabbers	-105	0	0
Salmon netter	-24	0	0
Other harvesters	-376	0	0
<b>TOTAL HARVESTING</b>	-1,522	0	0
<b>PROCESSING</b>			
Catcher/processor-processing	-455	0	0
Motherships	-252	0	0
Shorebased processors	-821	0	0
<b>TOTAL PROCESSING</b>	-1,528	0	0
<b>SEAFOOD TOTAL</b>	-3,050	0	0

<b>Table B Economic impacts from shocks to commodities (quantity change)</b>			
<b>Industry</b>	<b>Alaska</b>	<b>West Coast</b>	<b>Rest of US</b>
<b>NON-SEAFOOD TOTAL</b>	-1,634	-442	-1,575
<b>TOTAL ALL INDUSTRIES</b>	-4,685	-442	-1,575
<b>VALUE ADDED (\$million)</b>			
Labor income	-139.5	-35.3	-74.1
Capital income	-106.5	-19.7	-54.9
Indirect business tax	-12.8	-3.1	-10.5
<b>TOTAL VALUE ADDED</b>	-258.8	-58.1	-139.6
<b>HOUSEHOLD INCOME (\$million)</b>			
Low	-7.0	-2.3	-4.7
Medium	-59.9	-15.8	-31.4
High	-78.1	-21.0	-52.8
<b>TOTAL HOUSEHOLD INCOME</b>	-145.0	-39.1	-88.9
<b>STATE AND LOCAL GOV'T (\$million)</b>			
<b>TOTAL STATE AND LOCAL GOV'T REVENUE</b>	-21.1	-5.7	-17.7

<b>Table B.1 Economic Impacts on Non-seafood Industry Output from Shocks to Commodities (\$million, quantity change)</b>			
<b>Industry</b>	<b>Alaska</b>	<b>West Coast</b>	<b>Rest of US</b>
AGRI-A	-1.1	-0.4	-1.0
OIL_GAS-A	-20.1	-0.3	-3.7
OTHMIN-A	-0.5	-0.0	-0.8
MINSERVS-A	-0.5	-0.0	-0.1
UTILITIES-A	-7.4	-1.5	-3.5
CONSTR-A	-2.7	-0.8	-2.9
WOOD-A	-0.2	-0.2	-0.6
OTHFOOD-A	-0.0	-0.0	-0.1
OTHMANU-A	-7.0	-11.6	-51.1
REFINED-A	-26.5	-3.2	-6.2
WHOLESALE-A	-7.5	-2.8	-16.7
AIRTRAN-A	-1.8	-0.2	-1.1
WATERTRAN-A	-0.4	-0.1	-0.2
OTHTRAN-A	-4.9	-1.3	-5.0
FOODST-A	-3.0	-0.6	-1.5
OTHRETAIL-A	-20.3	-4.3	-10.4
INFO-A	-7.5	-5.5	-14.0

<b>Table B.1 Economic Impacts on Non-seafood Industry Output from Shocks to Commodities (\$million, quantity change)</b>			
<b>Industry</b>	<b>Alaska</b>	<b>West Coast</b>	<b>Rest of US</b>
FIN_INS-A	-20.3	-5.2	-39.9
REALEST-A	-12.1	-4.6	-13.3
PROFSERVS-A	-12.8	-6.8	-16.3
MGTSERVS-A	-1.0	-0.9	-6.0
SUPPORT-A	-3.1	-2.0	-7.7
WASTEMGT-A	-0.3	-0.3	-0.6
EDUSERVS-A	-1.3	-0.6	-2.9
HEALTHSERV-A	-16.7	-4.3	-14.4
ENTSERVS-A	-2.1	-1.0	-2.5
LODGING-A	-1.5	-0.5	-1.3
EAT_DRINK-A	-6.3	-1.6	-5.3
REPAIRSERV-A	-7.6	-1.1	-3.7
OTHSERVS-A	-5.5	-1.4	-4.2
MISC-A	-16.2	-4.9	-11.1
SLGOVI-A	-8.0	-2.0	-5.6
FEDGOVI-A	0.0	-0.0	0.0
<b>NON-SEAFOOD TOTAL</b>	<b>-226.1</b>	<b>-69.8</b>	<b>-253.6</b>



<b>Table B.2 Economic Impacts on Non-seafood Industry Employment from Shocks to Commodities (change in # of jobs)</b>			
<b>Industry</b>	<b>Alaska</b>	<b>West Coast</b>	<b>Rest of US</b>
AGRI-A	-3	-4	-8
OIL_GAS-A	-26	-1	-4
OTHMIN-A	-3	-0	-2
MINSERVS-A	-2	-0	-0
UTILITIES-A	-11	-1	-4
CONSTR-A	-18	-5	-22
WOOD-A	-1	-1	-4
OTHFOOD-A	-0	-0	-0
OTHMANU-A	-26	-24	-112
REFINED-A	-11	-0	-1
WHOLESALE-A	-49	-14	-86
AIRTRAN-A	-7	-1	-4
WATERTRAN-A	-1	-0	-0
OTHTRAN-A	-30	-10	-46
FOODST-A	-46	-8	-22
OTHRETAIL-A	-293	-50	-152
INFO-A	-27	-15	-34

<b>Table B.2 Economic Impacts on Non-seafood Industry Employment from Shocks to Commodities (change in # of jobs)</b>			
<b>Industry</b>	<b>Alaska</b>	<b>West Coast</b>	<b>Rest of US</b>
FIN_INS-A	-101	-21	-167
REALEST-A	-72	-24	-75
PROFSERVS-A	-121	-48	-110
MGTSERVS-A	-6	-4	-25
SUPPORT-A	-48	-32	-129
WASTEMGT-A	-2	-1	-3
EDUSERVS-A	-26	-10	-47
HEALTHSERV-A	-195	-44	-163
ENTSERVS-A	-44	-14	-28
LODGING-A	-17	-4	-13
EAT_DRINK-A	-103	-29	-94
REPAIRSERV-A	-47	-11	-34
OTHSERVS-A	-117	-27	-83
MISC-A	-42	-8	-13
SLGOVI-A	-139	-31	-89
FEDGOVI-A	0	-0	0
<b>NON-SEAFOOD TOTAL</b>	<b>-1,634</b>	<b>-442</b>	<b>-1,575</b>

## Example Scenario of an Industry Based Shock

### Pink Salmon Disaster of 2016

In 2016, a projected large run of pink salmon did not materialize in Alaskan waters. Impacts were felt statewide with COAR data (ADF&G) showing a decline of \$92.18 million in ex-vessel harvest value from 2015 to 2016. Further, first wholesale value declined by a total of \$377.7 million. These shocks (\$92.18 million and \$377.7 million) were entered into the SALMON-A and the SHOREPROC-A shocks, respectively, and the output of that simulation is provided below.

These shocks, when carried through the model, result in impacts to all seafood and non-seafood sectors in Alaska of \$712 million, while total impacts on the West Coast and Rest of US are approximately \$88 million and \$308 million, respectively. There is a loss of 731 Alaska harvesting jobs, all in the salmon netter sector, and another 2,595 jobs are lost in the Alaska shorebased processing sector. Additionally, 508 jobs are lost in the West Coast non-seafood sector, and another 1,713 jobs are lost in the Rest of US.

Impacts to value added (labor income, capital income, and indirect business taxes) totals \$319 million in Alaska, \$75 million in the West Coast, and \$167 million in the Rest of the US. Household income fell by \$192 million in Alaska, with an additional loss of \$52 million and \$107 million in the West Coast and Rest of the US, respectively. State and local government revenue declined by \$25 million in Alaska, by \$7 million in the West Coast region, and \$21 million in Rest of the US.

Table D Economic impacts from shocks to industries (quantity change)			
Industry	Alaska	West Coast	Rest of US
<b>INDUSTRY OUTPUT (\$million)</b>			
<b>HARVESTING</b>			
Catcher/processor-harvesting	0.0	0.0	0.0
Trawl CVs	0.0	0.0	0.0
Longliners	0.0	0.0	0.0
Crabbers	0.0	0.0	0.0
Salmon netter	-92.2	0.0	0.0

<b>Table D Economic impacts from shocks to industries (quantity change)</b>			
<b>Industry</b>	<b>Alaska</b>	<b>West Coast</b>	<b>Rest of US</b>
Other harvesters	0.0	0.0	0.0
<b>TOTAL HARVESTING</b>	-92.2	0.0	0.0
<b>PROCESSING</b>			
Catcher/processor-processing	0.0	0.0	0.0
Motherships	0.0	0.0	0.0
Shorebased processors	-377.7	0.0	0.0
<b>TOTAL PROCESSING</b>	-377.7	0.0	0.0
<b>SEAFOOD TOTAL</b>	-469.9	0.0	0.0
<b>NON-SEAFOOD TOTAL</b>	-242.0	-88.4	-308.1
<b>TOTAL ALL INDUSTRIES</b>	-711.9	-88.4	-308.1
<b>EMPLOYMENT (# of jobs)</b>			
<b>HARVESTING</b>			
Catcher/processor-harvesting	0	0	0
Trawl CVs	0	0	0
Longliners	0	0	0
Crabbers	0	0	0

<b>Table D Economic impacts from shocks to industries (quantity change)</b>			
<b>Industry</b>	<b>Alaska</b>	<b>West Coast</b>	<b>Rest of US</b>
Salmon netter	-731	0	0
Other harvesters	0	0	0
<b>TOTAL HARVESTING</b>	<b>-731</b>	<b>0</b>	<b>0</b>
<b>PROCESSING</b>			
Catcher/processor-processing	0	0	0
Motherships	0	0	0
Shorebased processors	-2,595	0	0
<b>TOTAL PROCESSING</b>	<b>-2,595</b>	<b>0</b>	<b>0</b>
<b>SEAFOOD TOTAL</b>	<b>-3,326</b>	<b>0</b>	<b>0</b>
<b>NON-SEAFOOD TOTAL</b>	<b>-1,770</b>	<b>-508</b>	<b>-1,713</b>
<b>TOTAL ALL INDUSTRIES</b>	<b>-5,096</b>	<b>-508</b>	<b>-1,713</b>
<b>VALUE ADDED (\$million)</b>			
Labor income	-199.6	-47.5	-90.1
Capital income	-104.8	-23.7	-64.7
Indirect business tax	-14.9	-4.0	-12.5
<b>TOTAL VALUE ADDED</b>	<b>-319.2</b>	<b>-75.2</b>	<b>-167.4</b>

<b>Table D Economic impacts from shocks to industries (quantity change)</b>			
<b>Industry</b>	<b>Alaska</b>	<b>West Coast</b>	<b>Rest of US</b>
<b>HOUSEHOLD INCOME (\$million)</b>			
Low	-9.2	-3.1	-5.7
Medium	-79.0	-20.9	-38.0
High	-103.3	-27.7	-63.5
<b>TOTAL HOUSEHOLD INCOME</b>	-191.5	-51.6	-107.2
<b>STATE AND LOCAL GOV'T (\$million)</b>			
<b>TOTAL STATE AND LOCAL GOV'T REVENUE</b>	-25.3	-7.4	-21.2

Table D1, below, provides the impacts of these shocks on non-seafood industry output in each of the three regions. The non-seafood industries in Table D1 are based on sectors that are defined within the model. See Table 4 of the technical memo for definitions of each seafood and non-seafood industry sector. The web application has a list of non-seafood industries. What is perhaps most striking in this output is that impacts to the rest of the US of \$308 million are larger than those for Alaska and the West Coast, and that those impacts are largest in the other manufacturing (\$69 million) and financial/insurance (\$46 million) sectors. This is not surprising for two reasons. First, a large percentage of the inputs used in Alaska fisheries (including salmon fisheries) are from the Rest of US. Second, the Rest of US economy is much larger than the Alaska economy, which means that the multiplier effects occurring in the rest of US are much larger. For example, about 45% of the other manufacturing commodity used in Alaska industries, including the salmon netter industry, is obtained from the rest of US while about 48% of finance/insurance commodity used in Alaska industries is from the rest of US.

Table D.2 provides these impacts in terms of jobs lost and shows that Alaska based non-seafood sector jobs decline by 1,770, while the rest of the US jobs decline by 1,713. The greatest impacts to employment in non-seafood sectors in Alaska occurred in Other Retail (342) and Health Services (231). The greatest impacts to employment in Other Retail is due primarily to the fact that the commodity

from Other Retail is the third most important (in value) input used in Salmon Netter industry and the employment to output ratio for the industry is relatively high. The result that Health Services suffers the second largest decrease in employment among Alaska industries due to the pink salmon disaster indicates the importance of using a SAM model such as the MRSAM model in this application. This result would not be obtained if an input-output model were used. Base year data indicate that the Salmon Netter industry does not use any Health Services directly. Health Services are consumed by the household sector, the income of which consists mainly of factor income derived from labor income and capital income from both seafood industries (including Salmon Netter industry) and non-seafood industries. Base-year data from the MRSAM indicates that households in Alaska spend the largest percentage (17%) of their disposable income on Health Services. An input-output model fails to capture the effects of a change in an industry activity (here, the pink salmon disaster) on factor income and the effects of the change in factor income on household income and expenditures, such as the expenditures on Health Services. Because the MRSAM model used in this application captures the effects on household expenditures, the model produced the result that the pink salmon disaster decreases household expenditures on Health Services and therefore reduces the employment in the Health Services sector significantly.

<b>Industry</b>	<b>Alaska</b>	<b>West Coast</b>	<b>Rest of US</b>
AGRI-A	-1.3	-0.5	-1.2
OIL_GAS-A	-10.5	-0.3	-3.6
OTHMIN-A	-0.7	-0.0	-1.0
MINSERVS-A	-0.2	-0.0	-0.1
UTILITIES-A	-11.4	-1.9	-4.4
CONSTR-A	-3.0	-1.0	-3.4
WOOD-A	-0.2	-0.3	-0.8
OTHFOOD-A	-0.0	-0.0	-0.1
OTHMANU-A	-10.1	-15.8	-68.5
REFINED-A	-10.5	-2.6	-6.0

<b>Table D.1 Economic Impacts on Non-seafood Industry Output from Shocks to Industries (\$million, quantity change)</b>			
<b>Industry</b>	<b>Alaska</b>	<b>West Coast</b>	<b>Rest of US</b>
WHOLESALE-A	-7.6	-3.7	-18.8
AIRTRAN-A	-2.4	-0.3	-1.3
WATERTRAN-A	-0.5	-0.1	-0.2
OTHTRAN-A	-5.7	-1.6	-6.0
FOODST-A	-3.0	-0.7	-1.8
OTHRETAIL-A	-26.3	-5.6	-12.8
INFO-A	-9.6	-7.0	-17.2
FIN_INS-A	-22.7	-6.5	-46.2
REALEST-A	-11.8	-5.6	-15.4
PROFSERVS-A	-13.5	-8.0	-19.3
MGTSERVS-A	-1.1	-1.2	-7.3
SUPPORT-A	-3.5	-2.5	-9.2
WASTEMGT-A	-0.4	-0.3	-0.7
EDUSERVS-A	-1.7	-0.7	-3.7
HEALTHSERV-A	-22.0	-5.6	-17.8
ENTSERVS-A	-2.7	-1.2	-3.0
LODGING-A	-1.8	-0.7	-1.6



<b>Table D.1 Economic Impacts on Non-seafood Industry Output from Shocks to Industries (\$million, quantity change)</b>			
<b>Industry</b>	<b>Alaska</b>	<b>West Coast</b>	<b>Rest of US</b>
EAT_DRINK-A	-8.2	-2.1	-6.5
REPAIRSERV-A	-11.8	-1.6	-4.9
OTHSERVS-A	-6.5	-1.8	-5.1
MISC-A	-21.4	-6.4	-13.5
SLGOVI-A	-9.6	-2.6	-6.7
FEDGOVI-A	0.0	-0.0	0.0
<b>NON-SEAFOOD TOTAL</b>	<b>-242.0</b>	<b>-88.4</b>	<b>-308.1</b>

<b>Table D.2 Economic Impacts on Non-seafood Industry Employment from Shocks to Industries (change in # of jobs)</b>			
<b>Industry</b>	<b>Alaska</b>	<b>West Coast</b>	<b>Rest of US</b>
AGRI-A	-3	-4	-9
OIL_GAS-A	-12	-0	-4
OTHMIN-A	-4	-0	-2
MINSERVS-A	-1	-0	-0
UTILITIES-A	-15	-1	-5
CONSTR-A	-19	-6	-24

<b>Table D.2 Economic Impacts on Non-seafood Industry Employment from Shocks to Industries (change in # of jobs)</b>			
<b>Industry</b>	<b>Alaska</b>	<b>West Coast</b>	<b>Rest of US</b>
WOOD-A	-1	-1	-4
OTHFOOD-A	-0	-0	-0
OTHMANU-A	-34	-30	-135
REFINED-A	-4	-0	-1
WHOLESALE-A	-45	-16	-87
AIRTRAN-A	-8	-1	-4
WATERTRAN-A	-1	-0	-0
OTHTRAN-A	-31	-11	-50
FOODST-A	-42	-9	-24
OTHRETAIL-A	-342	-59	-168
INFO-A	-31	-17	-37
FIN_INS-A	-101	-24	-174
REALEST-A	-63	-26	-78
PROFSERVS-A	-115	-51	-117
MGTSERVS-A	-6	-5	-27
SUPPORT-A	-49	-35	-138
WASTEMGT-A	-2	-1	-3

<b>Table D.2 Economic Impacts on Non-seafood Industry Employment from Shocks to Industries (change in # of jobs)</b>			
<b>Industry</b>	<b>Alaska</b>	<b>West Coast</b>	<b>Rest of US</b>
EDUSERVS-A	-31	-11	-53
HEALTHSERV-A	-231	-52	-181
ENTSERVS-A	-51	-16	-31
LODGING-A	-19	-4	-14
EAT_DRINK-A	-120	-35	-102
REPAIRSERV-A	-65	-14	-41
OTHSERVS-A	-125	-31	-89
MISC-A	-50	-9	-15
SLGOVI-A	-149	-36	-96
FEDGOVI-A	0	-0	0
<b>NON-SEAFOOD TOTAL</b>	<b>-1,770</b>	<b>-508</b>	<b>-1,713</b>

Many more comparisons can be made using the outputs from the model. This discussion of impacts simply provides a flavor of what an analyst might wish to cover and could be similarly developed for the commodity based shock shown above. In addition, the analyst may wish to work with these numbers in the excel output file to facilitate development of bar charts to compare the magnitude of these impacts. Impacts in percentage terms can be displayed in pie charts as well. It is up to the analyst to use the output to create analytical documents to describe scenarios of shocks within the model.

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