CHAPTER 3

ECONOMIC IMPACT METHODOLOGY

This section provides an overview of the methodology used in the economic impact analysis to evaluate the effects of EPA's final regulation on commercial and noncommercial aquaculture facilities.

Section 3.1 presents EPA's cost annualization model that calculates the present value and annualized costs that feed into the other analyses. Sections 3.2 and 3.3 address EPA's approach to evaluate impacts to existing commercial and noncommercial facilities. Section 3.4 presents EPA's decision matrix for evaluating economic achievability for the final regulation.

Figure 3-1 illustrates the relationship among the different components of the analysis of commercial facilities. EPA's closure analysis compares the post-tax present value of earnings with and without incremental pollution control costs. Other direct impacts on employment and output are calculated from projected closures as a result of the rule. Additional commercial impacts are assessed using pre-tax annualized costs in a sales test and credit test, and using unannualized capital costs and output from the closure model to evaluate the financial health of the facility. EPA also follows the projected direct impacts from the closure analysis as they expand to affect local communities and the nation.

Figure 3-2 illustrates the relationship among the components for the economic impact analysis of noncommercial facilities. Since there are no tax considerations for these facilities, there is a simplified list of inputs to EPA's cost annualization model. The pre-tax annualized costs are used in a budget test and, where applicable, a user fee test.

Section 3.5 discusses EPA's approach to estimate whether the final rule presents a barrier to entry for new businesses. Finally, Section 3.6 summarizes the market characteristics of the U.S. aquaculture industry.

3.1 COST ANNUALIZATION MODEL

The starting point for the analyses presented in this report is EPA's cost annualization model. The model calculates four types of compliance costs: (1) present value of expenditures, before-tax basis; (2) present value of expenditures, after-tax basis; (3) annualized cost, before-tax basis; and (4) annualized cost, after-tax basis. The cost annualization model for this final regulation follows the methodology described for other effluent guidelines (e.g., see Concentrated Animal Feeding Operations (USEPA, 2002a, Appendix A)). This section provides an overview of the cost annualization model EPA uses for this analysis.

3.1.1 Input Data Sources

The cost annualization model requires several key data inputs for estimating annual costs of compliance with the rule:

Figure 3-1
Commercial Facilities: Economic Analysis Flowchart

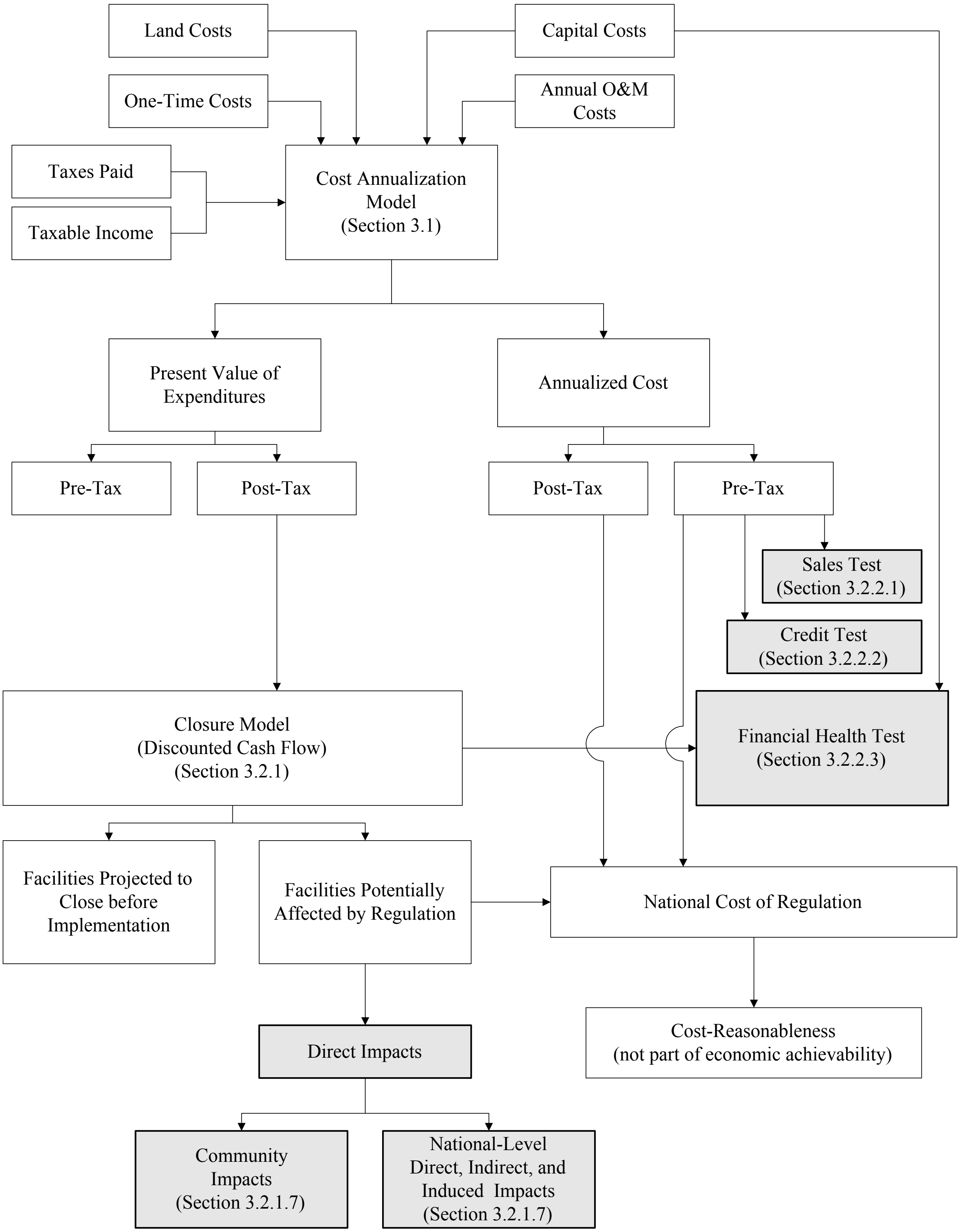
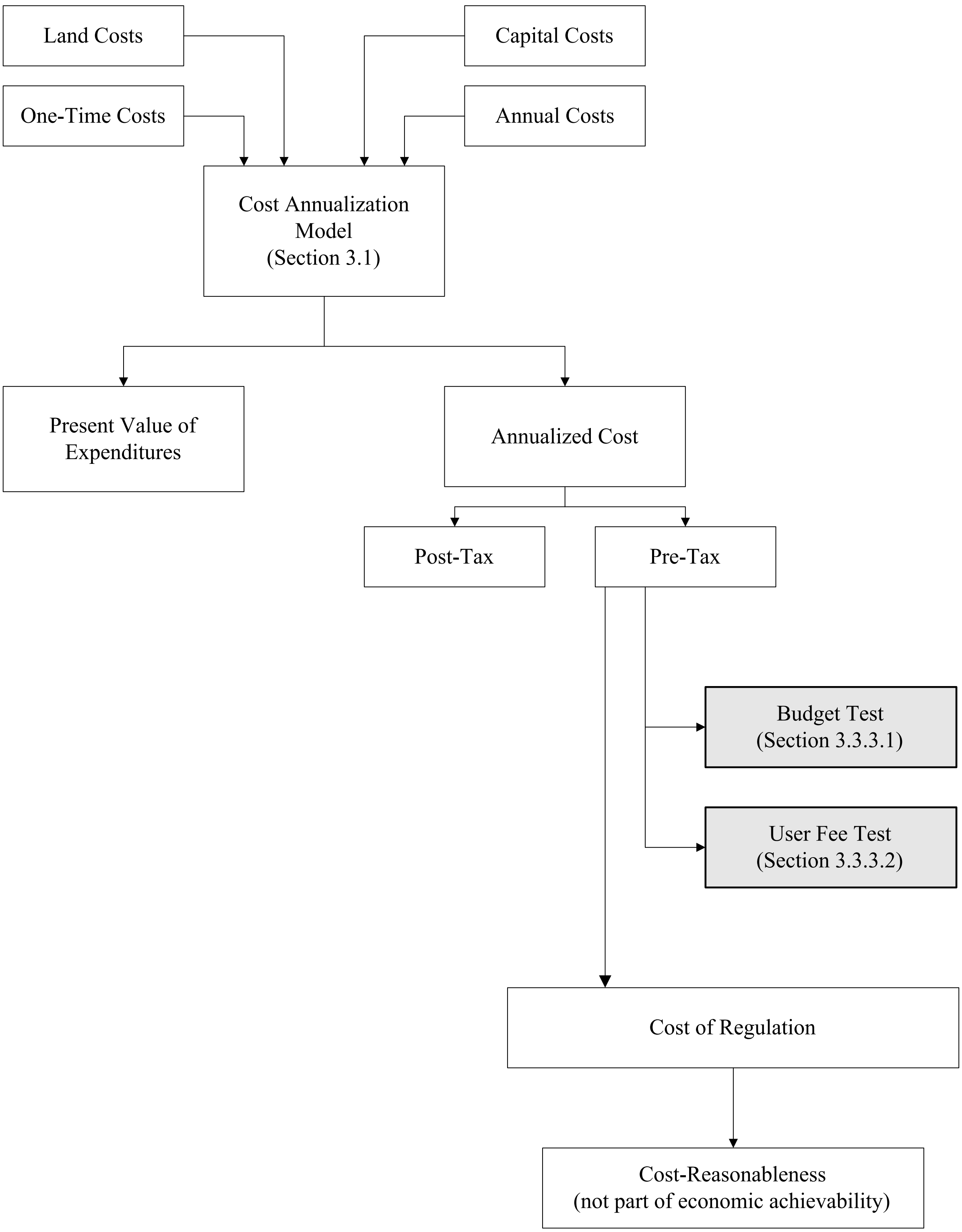


Figure 3-2
Noncommercial Facilities: Economic Analysis Flowchart



- Land costs
- Capital costs
- One-time non-capital costs
- Annual operating and costs (O&M)
- Depreciable life of the asset
- Discount rate
- Marginal tax rate (Federal and State)

EPA's *Development Document* for the final rule provides detailed information on how the Agency developed the *land, capital, one-time non-capital, and O&M* costs that are input in the cost annualization model (USEPA, 2004a). The land cost reflects either the actual cost of purchasing land for additional pollution control measures or the opportunity value of land already owned but must now be put aside for incremental pollution control measures. Land costs are one-time costs that cannot be depreciated. The capital cost is the initial investment needed to purchase and install the structure; it is a one-time cost which can be depreciated. One-time non-capital costs, such as an engineering report cannot be depreciated. The O&M cost is the annual cost of operating and maintaining the incremental pollution control measures. The maintenance component includes capital replacement costs to keep the system running.

The *depreciable life of the asset* refers to EPA's assumption of the time period used to depreciate capital improvements that are made because of the rule. The cost annualization model uses a 10-year period and a mid-year convention (see Section 3.1.2).

EPA's annualization model uses a real *discount rate* of 7 percent, as recommended by the Office of Management and Budget (OMB, 2003). EPA assumes this input to be a real interest rate, and therefore it is not adjusted for inflation.

The *marginal tax rate* used to compute the tax shield depends on the amount of taxable earnings (revenues minus costs including interest) at the regulated entity. Inputs to the cost annualization model to calculate a facility's tax shield include both Federal and State tax rates.

3.1.2 Depreciation Method

EPA examined three alternatives to depreciate capital investments, including Modified Accelerated Cost Recovery System (MACRS), straight-line depreciation, and section 179 of the Internal Revenue Code (USEPA, 2002a). EPA chose to use the MACRS which allows businesses to depreciate a higher percentage of an investment in the early years and a lower percentage in the later years. In contrast, straight-line depreciation writes off a constant percentage of the investment each year. MACRS offers companies a financial advantage over the straight-line method because an aquaculture facility's taxable income may be reduced under MACRS by a greater amount in the early years when the time value of money is greater. EPA also considered using the Internal Revenue Code Section 179 provision to elect to expense up to $100,000 in the year the investment is placed in service, assuming that the investment costs do not exceed $400,000 (PL 108-27, 2003 and IRS, 2003). EPA assumes, however, that this provision is already applied to other investments at the facility.

Under MACRS, the cost of property is recovered over a set period. The recovery period is based on the property class to which your property is assigned. To determine the recovery period of depreciable property, IRS identifies asset classes based on the activity for which the property is being used. EPA has identified the appropriate class for each type of cost and has judged that a 10-year time frame is appropriate for the economic analysis supporting the CAFO regulation and this final regulation. More information is provided in Appendix A of the CAFO rule, (USEPA, 2002a). A 10-year depreciation time frame is consistent with the 10-year property classification of a single-purpose livestock structure, which is defined under IRS Section 168(i)(13)(B) as any enclosure or structure specifically designed, constructed and used for housing, raising, and feeding a particular kind of livestock, including their produce, or for housing the equipment necessary for the housing, rasing, and feeding of livestock (IRS, 1999).

EPA uses a mid-year convention for calculating depreciation. This means that EPA assumes that the capital investment is made at the beginning of the year and the facility goes into operation six months later.

3.1.3 Tax Rates

The cost annualization model uses both Federal and State tax rates as inputs to calculate an average commercial operation's tax shield. (Noncommercial operations have no tax shield). EPA calculated national average state income tax rates of 6.6 percent for corporations and 5.8 percent for individuals (Table 3-1, taken from USEPA, 2002a) and these rates are used in this analysis. Depending upon the survey response, the model calculates the tax shield based on the corporate tax rate for C corporations, personal tax rate for partnerships and proprietorships, and no tax rate for S corporations or Limited Liability Corporations. EPA uses the net present value of after-tax costs for the closure analysis because it reflects the impact the business would actually see in its earnings.

Table 3-1
State Income Tax Rates

State	Corporate Income Tax Rate	Basis for States With Graduated Tax Tables	Personal Income Tax Upper Rate	Basis for States With Graduated Tax Tables
Alabama	5.00%		5.00%	$3,000+
Alaska	9.40%	$90,000+	0.00%	
Arizona	9.00%		6.90%	$150,000+
Arkansas	6.50%	$100,000+	7.00%	$25,000+
California	9.30%		11.00%	$215,000+
Colorado	5.00%		5.00%	
Connecticut	11.50%		4.50%	
Delaware	8.70%		7.70%	$40,000+

State	Corporate Income Tax Rate	Basis for States With Graduated Tax Tables	Personal Income Tax Upper Rate	Basis for States With Graduated Tax Tables
Florida	5.50%		0.00%	
Georgia	6.00%		6.00%	$7,000+
Hawaii	6.40%	$100,000+	10.00%	$21,000+
Idaho	8.00%		8.20%	$20,000+
Illinois	4.80%		3.00%	
Indiana	3.40%		3.40%	
Iowa	12.00%	$250,000+	9.98%	$47,000+
Kansas	4.00%	$50,000+	7.75%	$30,000+
Kentucky	8.25%	$250,000+	6.00%	$8,000+
Louisiana	8.00%	$200,000+	6.00%	$50,000+
Maine	8.93%	$250,000+	8.50%	$33,000+
Maryland	7.00%		6.00%	$100,000+
Massachusetts	9.50%		5.95%	
Michigan	2.30%		4.40%	
Minnesota	9.80%		8.50%	$50,000+
Mississippi	5.00%	$10,000+	5.00%	$10,000+
Missouri	6.25%		6.00%	$9,000+
Montana	6.75%		11.00%	$63,000+
Nebraska	7.81%	$50,000+	6.99%	$27,000+
Nevada	0.00%		0.00%	
New Hampshire	7.00%		0.00%	
New Jersey	7.25%		6.65%	$75,000+
New Mexico	7.60%	$1 Million+	8.50%	$42,000+
New York	9.00%		7.88%	$13,000+
North Carolina	7.75%		7.75%	$60,000+
North Dakota	10.50%	$50,000+	12.00%	$50,000+
Ohio	8.90%	Based on Stock Value	7.50%	$200,000+
Oklahoma	6.00%		7.00%	$10,000+
Oregon	6.60%		9.00%	$5,000+
Pennsylvania	9.90%	1997 and thereafter	2.80%	
Rhode Island	9.00%		10.40%	$250,000+
South Carolina	5.00%		7.00%	$11,000+
South Dakota	0.00%		0.00%	
Tennessee	6.00%		0.00%	
Texas	0.00%		0.00%	
Utah	5.00%		7.20%	$4,000+
Vermont	8.25%	$250,000+	9.45%	$250,000+

State	Corporate Income Tax Rate	Basis for States With Graduated Tax Tables	Personal Income Tax Upper Rate	Basis for States With Graduated Tax Tables
Virginia	6.00%		5.75%	$17,000+
Washington	0.00%		0.00%	
West Virginia	9.00%		6.50%	$60,000+
Wisconsin	7.90%		6.93%	$20,000+
Wyoming	0.00%		0.00%	
Average:	6.61%		5.84%	

Source: CCH, 1999a and 1995.
Basis for rates is reported to nearest $1,000. Personal income tax rates for Rhode Island and Vermont based on federal tax (not taxable income). Tax rates given here are equivalents for highest personal federal tax rate.

3.1.4 Tax Shield Not Included

The cost annualization model does not consider tax shields on interest paid to finance incremental pollution control. The cost annualization model assumes a cost to the operation to use the money (the discount/interest rate), whether the money is paid as interest or is the opportunity cost of internal funding. Tax shields on interest payments are not included in the cost annualization model because it is not known what mix of debt and capital an operation will be used to finance the cost of incremental pollution control and to maintain a conservative estimate of the after-tax annualized cost.

3.1.5 Sample Cost Annualization Spreadsheet

Table 3-2 shows a sample cost annualization worksheet. The same worksheet is used for commercial and noncommercial facilities but with different tax effects. The top of the spreadsheet shows the data inputs described in Section 3.1.1. For the example, sample data for a fictitious survey identification number "XYZ" is read into the calculations. The assumed land, capital, annual O&M, and one-time costs are $1,000, $2,000, $100, and $10, respectively. The facility belongs to a corporation that had earnings before taxes (EBT) of $15,000 in 2001 and paid an average of $700 in annual taxes over 1999-2001. (EBT and average taxes are calculated from detailed questionnaire data for the actual analysis.) The model uses a mid-year convention and this effect will be seen most clearly in Year 1 and Year 11.

Table 3-2
Concentrated Aquatic Animal Production Cost Annualization Model

INPUTS

Survey ID #:	XYZ						
Option Number:						Engineering Inputs	Economic Analysis
	2001	2001					
Land Cost	1000	$1,000.0			Year Dollars	2001	2001
Initial Capital Cost:	$2,000.0	$2,000.0			ENR CCI	1	1
Annual Operation & Maintenance Cost:	$100.0	$100.00					
One-Time Non-Equipment Cost:	$10.0	$10.0	Federal Corp.Tax Table:			Federal Personal Tax Table:	
Real Discount Rate:	7.0%		Taxable Income		Marginal Tax Rate	Taxable Income	Marginal Tax Rate
Corporate Tax Structure	1						
EBT :	$15,000.0		($)			($)	
Taxes Paid (3-yr average):	$700.0		$0		15.0%	$0	15.0%
Marginal Income Tax Rates:			$50,000		25.0%	$25,700	28.0%
Federal	15.0%		$75,000		34.0%	$62,450	31.0%
State	6.6%		$100,000		34.0%	$130,250	36.0%
Combined	21.6%		$10,000,000		35.0%	$250,000	39.6%

Column 1 Year	2 Depreciation Rate	3 Depreciation For Year	4 Tax Shield From Depreciation	5 O&M Cost	6 O&M Tax Shield	7 Cash Outflow	8 Adjusted Tax Shield	9 Cash Outflow After Tax Shields
1	10.00%	$200	$43	$60	$13	$3,060	$56	$3,004
2	18.00%	$360	$78	$100	$22	$100	$99	$1
3	14.40%	$288	$62	$100	$22	$100	$84	$16
4	11.52%	$230	$50	$100	$22	$100	$71	$29
5	9.22%	$184	$40	$100	$22	$100	$61	$39
6	7.37%	$147	$32	$100	$22	$100	$53	$47
7	6.55%	$131	$28	$100	$22	$100	$50	$50
8	6.55%	$131	$28	$100	$22	$100	$50	$50
9	6.56%	$131	$28	$100	$22	$100	$50	$50
10	6.55%	$131	$28	$100	$22	$100	$50	$50
11	3.28%	$66	$14	$50	$11	$50	$25	$25
Sum	100.00%	$2,000	$432	$1,010	$218	$4,010		$3,360
Present Value		$1,572	$339	$737	$159	$3,737		$3,238

	After Tax Shield	Before Tax Shield
Present Value of Incremental Costs:	$3,238	$3,737
Annualized Cost:	$432	$498

Notes: This spreadsheet assumes that a modified accelerated cost recovery system (MACRS) is used to depreciate capital expenditures.
Depreciation rates are from 1995 U.S. Master Tax Guide for 10-year property and mid-year convention.
First Year is not discounted.

The spreadsheet contains numbered columns that calculate the before-and after-tax annualized cost of the investment. Column 1 of Table 1 lists each year of the investment's life span, from its installation through its 10-year depreciable lifetime (shown over years 1 through 11 because a mid-year convention is used).

Column 2 represents the percentage of the capital costs that can be written off or depreciated each year. These rates are based on the MACRS and are taken from the *2000 U.S. Master Tax Guide* (CCH, 1999b). Multiplying these depreciation rates by the capital cost gives the annual amount the operator may depreciate, which is listed in Column 3. In the example, the capital expense results in $200 in depreciation in Year 1 ($2001). EPA uses depreciation expense to offset annual income for tax purposes; Column 4 shows the tax shield provided from the depreciation expense—the overall tax rate times the depreciation amount for the year. The corporation is in the 15 percent Federal tax bracket and a 6.6 percent State tax bracket. The depreciation tax shield is $43 dollars ($200 multiplied by 21.6 percent).

Column 5 is the annual O&M expense plus the one-time non-capital costs. Because of the mid-year convention assumption for depreciation, Year 1 and Year 11 show only 6 months of annual O&M costs or $50. Year 1 O&M also includes the one-time costs of $10 for a total of $60. Years 2 through 10 include annual O&M. Column 6 is the tax shield or benefit provided from expensing the O&M costs.

Column 7 lists the annual cash outflow, or total expenses, associated with the incremental pollution control under the analysis assumptions presented here. Total expenses include land, capital, one-time, and six months of O&M costs (i.e.,$1,000 plus $2,000 plus $10 plus $50 or $3,060).

Column 8 adjusts the sum of entries in Columns 4 and 6 to limit the projected tax shields to the average amount of taxes paid each year. In this example, the corporation has been paying an average of $700 in taxes, so the tax shield shown in Column 8 is not limited. Column 9 is the cash outflow after tax shields (i.e., Column 7 minus Column 8).

In the lower part of Table 3-2, the sum of the depreciation percentages is 100 percent, the sum of the depreciation taken is $2,000, total O&M and one-time costs are $1,010. Total cash outflow over the 10-year period is $4,010, which drops to $3,360 after the tax shields are considered.

EPA calculates the present value (NPV) of the cash outflows as:

$$NPV = v_1 + \sum_{i=2}^{N} \frac{v_i}{(1+r)^{i-1}}$$

where:

$v_1 ... v_n$ = series of cash flows
r = interest rate
n = number of cash flow periods
i = current iteration

EPA transforms the present value of the cash outflow into a constant annual payment for use as the annualized compliance cost. Columns 7 and 9 calculate the annualized cost as a 10-year annuity that has the same present value as the total cash outflow. The annualized cost represents the annual payment required to finance the cash outflow after tax shields. In essence, paying the annualized cost each year and paying the amounts listed in Columns 7 or 9 for each year are equivalent. EPA calculates the annualized cost as follows (where *n* is the number of payment periods):

$$\text{Annualized Cost} = \text{present value of cash outflows} * \frac{\text{real discount rate}}{1 - (\text{real discount rate} + 1)^{-n}}$$

In the Table 3-2 example, the annualized cost is $432 after accounting for the estimated tax shields and $498 without tax shields. There are two ways to calculate post-tax annualized cost. One way is to calculate the annualized cost as the difference between the annuity value of the cash flows (Column 7) and the tax shields (Columns 4 and 6). The second way is to calculate the annuity value of the cash flows after tax shields (Column 9). Both methods yield the same result.

EPA uses the pre-tax annualized cost to calculate the total social cost of the regulation (see Table 4-3) used in the cost-effectiveness and cost-reasonableness calculations. This approach incorporates the cost to industry for the purchase, installation, and operation of additional pollution control as well as the cost to Federal and State government from lost tax revenues. (Every tax dollar that a business does not pay due to a tax shield is a tax dollar lost to the government.) Note also that operation and maintenance costs include the cost of capital replacement. That is, if a component has a 5-year lifetime, the cost estimates for the 10-year period include the costs for two components.

EPA uses the post-tax annualized cost to reflect what a business actually pays to comply with incremental pollution control requirements. The post-tax present value of incremental pollution control costs is subtracted from the present value of forecasted earnings (2005-2015) to calculate post-regulatory value of future earnings in the closure analysis at the enterprise, facility, and company levels. See Section 3.2 for a discussion of the closure analysis and earnings forecast. For noncommercial operations, EPA's analysis assumes there is no difference between the pre-tax and post-tax estimates (i.e., noncommercial operation do not incur Federal or State tax costs).

3.2 COMMERCIAL FACILITIES

3.2.1 Closure Analysis

EPA developed a financial model to estimate whether the additional costs of complying with the final regulation rendered a regulated operation unprofitable. If so, the operation is projected to close as a result of the regulation, leading to impacts such as losses in employment and revenue. This financial model is also referred to as the "closure model" within this report. The closure analysis is performed at three levels:

- Enterprise (where aquaculture is only one of multiple operations at the farm/facility);
- Facility;
- Company (which may operate more than one facility).

For the sake of simplicity, the rest of the discussion of the closure model will use only the term "facility." The model is based on data from the detailed questionnaire (USEPA, 2002b). Facility-specific pairs of cost and revenues for actual aquaculture operations are not available elsewhere.

The closure model uses data and methodologies available to corporate financial analysts. The model compares future earnings with and without the regulation. The closure decision is modeled as:

Post-regulatory status = Present value of future earnings minus the present value of after-tax incremental pollution control costs

The model projects the long-term effects of added pollution control costs on earnings. If the post-regulatory status is zero or less, the facility is projected to close.[1] Although simple in concept, the model incorporates numerous assumptions, including:

- How to calculate earnings (e.g., discounted cash flow or net income)
- Forecasting method(s) for future earnings as determined by prices;
- Time frame for consideration;
- The ability of the industry to pass costs through to consumers; and
- Discount rate (cost of capital)

The question of how to calculate earnings entails a series of other topics, such as cash flow, net income, depreciation, sunk costs, capital replacement and unpaid labor and management. Appendix A contains the detailed discussion required for each of the topics pertaining to earnings.

The rule is scheduled to be promulgated in 2004, so the time frame for the projection is from 2005-2015. EPA's closure analysis therefore compares earnings during 2005-2015 with and without cost of compliance under the final regulation. EPA uses two methods to estimate earnings for the purposes of its closure analysis: cash flow and net income. The difference between the cash flow and net income calculations is depreciation (a non-cash cost). Depreciation is included as a cost in the net income basis but not in the cash flow basis.

For the purposes of this analysis, EPA calculates the difference between gross revenues and total expenses reported in the detailed questionnaire and reduced the value by the estimated Federal and State taxes to calculate net income. EPA then adds the non-cash expense of depreciation (when it was reported in the questionnaire) to net income to calculate cash flow. This approach is consistent with the guidance from the Farm Financial Standards Council (FFSC, 1997) and several business financial references (Brealy and Meyers, 1996; Brigham and Gapenski, 1997; and Jarnagin, 1996). As part of this analysis, EPA examines the possibility of closure under three forecasting methods to project future earnings (see Section 3.2.1.1 below). EPA's forecasting model, like the cost annualization model, uses a real discount rate of 7 percent, as recommended by the Office of Management and Budget (OMB, 2003). EPA assumes this input to be a real interest rate, and therefore it is not adjusted for inflation.

For the purposes of assessing economic achievability, EPA assumes that the costs of the rule are not passed on to consumers. The facility must absorb all increased costs. If it cannot do so and remain in

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[1]EPA assumes that it no longer operates and that closure-related impacts result. In contrast, facilities that are sold because a new owner presumably can generate a greater return are considered *transfers*. Transfers cause no closure-related impacts, even if the transfer was prompted by increased regulatory costs. Transfers are not estimated in this analysis.

operation, all production is assumed lost. EPA's assumption of no cost pass through is a more conservative approach to evaluating economic achievability among regulated entities. In addition, EPA's closure analysis does not incorporate the ability of other facilities to increase production to offset the closure. More information on EPA's rationale for this approach is provided in Section 3.6. (To evaluate market and trade level impacts, however, EPA assumes all costs are shifted onto the broader market level as a way of assessing the upper bound of potential effect; see Section 5.3.)

3.2.1.1 Data Sources for Forecasting Methods

EPA examined four sets of data from various Federal agencies as possible bases for forecasting future earnings for concentrated aquatic animal production facilities. The first set is the agricultural baseline projections developed by USDA. The other three sets of data are historical price data collected by the U.S. Department of Labor, Bureau of Labor Statistics, USDA, and the National Marine Fisheries Service. Each data set is discussed in a separate section below.

***USDA Agricultural Baseline Projections*.** USDA provides long-run baseline projections for the agricultural sector annually through 2013 (USDA, 2003a and USDA, 2004a). In the chapter on U.S. agricultural sector aggregate indicators, the report presents projections for farm income, food prices, and U.S. trade value. The USDA model projects a strengthening in economic growth which results in rising market prices and farm income as well as an improvement in the financial condition of the agricultural sector (USDA, 2003a, page 65; USDA, 2004a, page 62). Table 3-3 and Figure 3-3 reproduce the data from USDA, 2003a, Table 31 and USDA, 2004a, Table 31 for the Consumer Price Index, Food at Home, Fish and Seafood sector for 2000 through 2013 (which includes canned tuna and frozen fish). The data for 2000 through 2002 indicate a downturn consistent with the data from the sources described below and the downturn mentioned in comments by the Joint Subcommittee on Aquaculture (JSA; JSA, 2003). Forecasts begin with a 0.9 percent recovery in 2003 and a 2.5 percent annual increase from 2004 through 2013. Because USDA interprets the rising consumer price index to translate into improved farm income and financial condition, EPA assumes that the prices are rising at a greater rate than costs and that this index might provide a basis for forecasting future earnings for aquatic animal production facilities. EPA also assumes that the market pressures for wild and farmed fish and seafood are comparable due to the substitutability of the products. The USDA projections reflect the 2000-2002 downturn but assume that conditions return to a long-term upward trend such as that visible in the previous decades. However, EPA does not know if a long-term upward trend will return to fish prices. Therefore EPA's forecasting approach incorporates forecasts, using additional sources of data, that do not show long-term upward trends.

Table 3-3
USDA Consumer Food Price Index-Food at Home, Fish and Seafood

	Year													
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Index	190.4	191.1	188.1	189.8	194.5	199.4	204.4	209.5	214.7	220.1	225.6	231.2	237.0	242.9
%Chg	2.8	0.4	-1.6	0.9	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5

Note: 1982-1984 = 100
Source: USDA, 2003a and 2004a.

U.S. Department of Labor, Bureau of Labor Statistics (BLS), Producer Price Index. The U.S. Department of Labor, Bureau of Labor Statistics' Producer Price Index (PPI) are monthly estimates of the average change over time in the selling prices received by domestic producers for their output. The prices included in the PPI are from the first commercial transaction for many products and some services. EPA downloaded two time series from the BLS website for analysis:

- Unprocessed and packaged fish ("Fish PPI")
  Not seasonally adjusted
  Series ID: WPU0223
  1980:1-2003:12

- Shrimp ("Shrimp PPI")
  Not seasonally adjusted
  Series ID: WPU02230501
  1991:1-2003:12

EPA also downloaded Series ID WPU02230101, Salmon, not seasonally adjusted, 1980:1-2002:9. No trend was identified in the data.

Figure 3-4 illustrates the monthly PPI for unprocessed and packaged fish for the period of 1980 through 2004 (BLS, 2004a). Visual inspection, by itself, indicates how prices in the last few years in the sector show a different pattern of behavior than in the preceding decades. This hypothesis is tested below. Figure 3-5 shows monthly PPI for shrimp from 1991 through 2003 (BLS, 2004b). Although the time period is shorter than that seen in Figure 3-4, the recent downturn in producer prices is just as evident.

USDA Trout Price Data. EPA downloaded annual average prices for trout 12 inches or longer from 1994 through 2002 from the USDA web site. These data are reported in USDA's series *Trout Production* (USDA, 2003b). These data are converted to constant dollars using the Consumer Price Index CPI-U (CEA, 2004, Table B-60), see Figure 3-6.[1] The downward trend in producer prices is evident.

National Marine Fisheries Service Price Data. EPA examined a second set of trout price data from the National Marine Fisheries Service, which collects price data for various species and markets. EPA downloaded the monthly average price for fresh boned Idaho trout at the Fulton Fish Market from 1990:1 through 2002:12 (NMFS, 2004). As with the USDA trout data, prices are converted to constant dollars using the Consumer Price Index CPI-U (CEA, 2004). Figure 3-7 shows a pronounced downward trend in prices in recent years leveling off after March 2001.

USDA Trade Adjustment for Farmers, Preferred Price Data. EPA examined the data sources used to support a relatively new USDA program. In August 2002, Congress enacted the Trade Act of 2002 (Public Law 107-210). The Act establishes a new program—Trade Adjustment Assistance for Farmers (TAA). The program is administered by USDA's Foreign Agricultural Service (FAS). FAS published a final rule implementing the program in August 2003 (USDA, 2003c).

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[1]To covert data to a specific year, multiply the datum by the ratio of the CPI-U values for the appropriate years. For example, CPI-U (2001) = 179.1 and CPU-U (1994) = 148.2; $100 in 1994 dollars converts to $120.9 in 2001 dollars (i.e., 100 * 179.1/ 148.2).

Under the program, a group of at least three agricultural commodity producers submits a petition to FAS. FAS reviews the petition and, if acceptable, publishes a notice in the *Federal Register* that the petition has been received. Another part of USDA, the Economic Research Service (ERS), conducts a market study to verify the decline in prices, the potential impact of imports, etc., and reports the findings back to FAS. FAS then determines whether the petitioners are eligible for trade adjustment assistance. Assistance takes two forms: technical expertise and cash benefits. More information of the program is available in the rulemaking record (ERG, 2004a).

FAS maintains a registry for petitions at http://www.fas.usda.gov/itp/taa/registry.htm. As of January 2004, FAS had received 11 petitions from salmon, shrimp, catfish and crayfish farmers in the U.S. Of these petitions, 7 had been approved as eligible for trade adjustment assistance. With the exception of some of the denied petitions, price data submitted with petitions are not publicly available. EPA follows FAS methodology regarding the order of preference for data sources for the purposes of developing its forecasting methods:

- The preferred source of data are from USDA National Agricultural Statistics Service (NASS). Therefore, EPA's forecasts use NASS price data for trout, a major commodity considered under the rule.

- EPA and FAS use National Marine Fisheries Service (NMFS) data when NASS data are not available. EPA examined both NASS and MMFS trout price data when developing its forecasts.

- TAA petitions examine six years of data (the current year and the previous five years). EPA projections are made on the basis of time series data that reflect 24, 12, and 9 years of data for Fish PPI, Shrimp PPI, and NASS Trout prices, respectively.

EPA's forecasting model, therefore, broadly adheres to USDA's approach under its Trade Adjustment Assistance for Farmers program. EPA uses USDA's preferred source for price data (i.e., NASS) and uses longer time series (9 to 12 years compared to TAA's use of six years of data).

3.2.1.2 Forecasting Methods

The USDA agricultural baseline projections provide one forecasting method. Given the other data in Section 3.2.1.1, however, EPA decided to develop alternate forecasts to serve as counterpoints to USDA's projections for fish and seafood prices. Section 3.2.1.2 describes the process used to fit trends to the historical data.[2] Forecasts developed from these data, then, are simple extrapolations of recent trends.

All data are converted to constant dollars, where necessary. For time series data with monthly observations, EPA converts the series to a 12-month centered moving average to smooth away any seasonal variation. EPA identified no cyclicality in the data beyond seasonality.

Figure 3-8 shows the monthly Producer Price Index for unprocessed and packaged fish ("Fish PPI"). The thin jagged line is the raw data also shown in Figure 3-4. The smoothed data are shown by a

[2] All regressions were done in E-Views and are significant at a 0.01 level or better.

thin continuous line. The data series appears to have points in time where the slope of the trend seems to change. EPA conducted the Chow Breakpoint Test multiple times in the regions where the underlying slopes seemed to change in order to logically break the time series (Kennedy, 1998). The Chow Breakpoint Test compares the sum of squares between a restricted and unrestricted model. In the breakpoint test, the unrestricted model allows the slope coefficient to be different before and after the suggested breakpoint period. EPA tested a series of candidate breakpoints and selected the one with the largest F-statistic to serve as the point where the slope of the trend changed. A dummy variable indicating the later period of the trend and a crossproduct of the dummy and the time variable were added as independent variables to the trend regression to allow the latter part of the trend line to have a different intercept and slope than the earlier part. In this way, a simple ordinary least squares regression could estimate a kinked trend line.[3]

EPA's examination of the Fish PPI appear to exhibit three different slopes during the 23 year period so a middle set of dummies and cross-products was added allowing the trend line to have three different slopes. The kinked dotted line shown in Figure 3-8 is the fitted trend. That is, the trend line PPI for unprocessed and packaged fish appears to have three different slopes during the January 1980 through December 2003 period. As shown, the downward slope for the period after December 1999 levels off in 2002 and 2003.

The Chow Breakpoint Test was performed on the BLS shrimp data (Shrimp PPI), USDA trout data, and the NMFS Fulton Fish Market price data. Figure 3-9 is the counterpart to Figure 3-5; i.e., is shows the raw shrimp PPI data, the 12-month smoothed average, and the fitted trend. The price breakpoint for this species is at the end of 1997. Figures 3-10 and 3-11 show the two data sets for trout prices. The USDA data show a continual downward trend while the Fulton fish market data level off through 2001 through 2003.

3.2.1.3 Index For Use in Projecting Future Earnings

The trends fitted in Section 3.2.1.2 provide forecasting equations to project future price levels. The methods for forecasting future earnings are implemented with facility-specific questionnaire data. The price level forecasts are converted into an index with 2001 as the base period because this is the most recent year for which data were collected in the detailed questionnaire. The earnings forecast is assumed to begin in 2005 and end in 2015, coinciding with EPA's schedule for promulgating this final regulations.

Figure 3-12 illustrates the forecasting indices. The base year for the index is 2001 and the thin unbroken line is the 100 grid line. The solid line with the stars is USDA's baseline projection. EPA believes these forecasts are optimistic. USDA's projections are the only forecast EPA found that show prices increasing over the long term. The other forecasts show downward trends with the Shrimp PPI showing the steepest downward slope (see Figure 3-12). While all the forecasts are simple trend lines, the forecasts developed using historical fish prices recognize that the trend may have changed in the recent past. The usual caveats about reliance on simple trend projection apply, however, similar caveats apply to

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[3]Other techniques are available to accomplish similar ends, such as spline regression and the use of squared or cubed terms to estimate a Taylor series equation, however, EPA was not concerned with assessing the continuity of the prediction function and had no reason to examine more than single-point changes in slope, i.e. kinks, rather than curves.

the official USDA forecast which appears to dismiss recent changes in the market place. In effect, Figure 3-12 suggests that, if the market for fish has changed, the industry may face for financial difficulties regardless of any potential costs of additional pollution control resulting from the rulemaking effort.

3.2.1.4 Selected Projection Methods for Future Earnings

The broad difference between the USDA projections and the other forecasting methods depends on whether or not recent changes in the marketplace are temporary or permanent. While more detailed modeling of the markets for various species might be feasible, the results would likely be within the range bounded by the USDA and EPA projections.

Another possibility is that the data collected in the detailed questionnaire for 1999 through 2001 reflect conditions among the surveyed businesses that are projected to continue into the future. That is, the future looks like the recent past and a 3-year average provides a naive baseline for projecting future earnings. Again, the projections using this method would likely result in estimates that are generally– but not always– between those of USDA and EPA projections.

For the purposes of this analysis, EPA uses three forecasting methods for its facility closure analysis. One forecasting method uses USDA projections, starting with 2001 earnings. A second forecasting method uses an EPA projection, starting with 2001 earnings. This approach incorporates the PPI for shrimp, USDA's trout prices, and the Fish PPI for all other species.[4] For example, if a facility raises a 50:50 mix of trout and another species, the forecast is based on a weighted average of the indices. The third forecasting method uses average of 1999-2001 earnings. The base year for the index is 2001, which is the starting year for the first two projection methods. Table 3-4 shows a list of the indices that EPA uses for its closure model.

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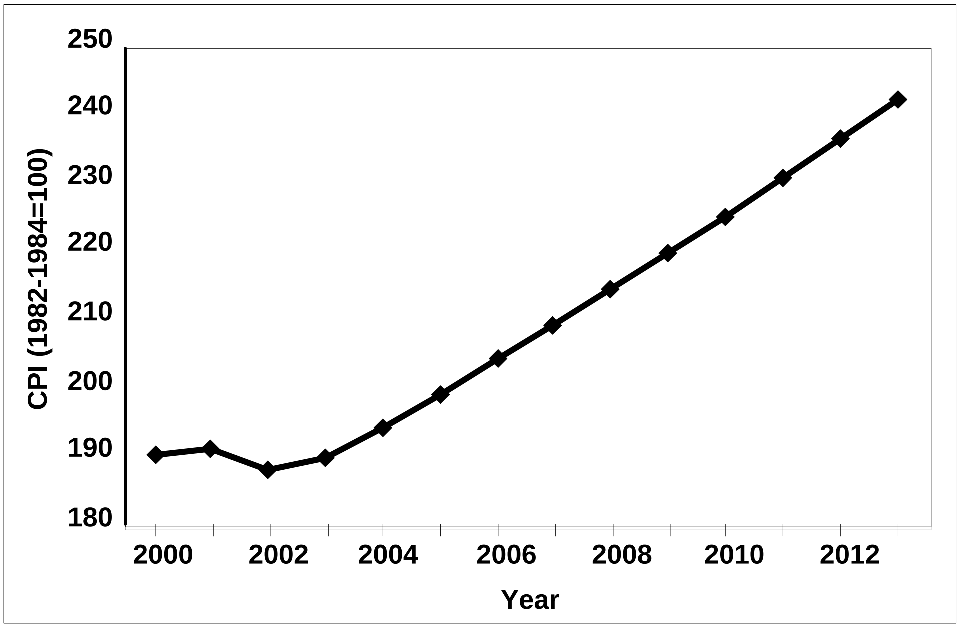
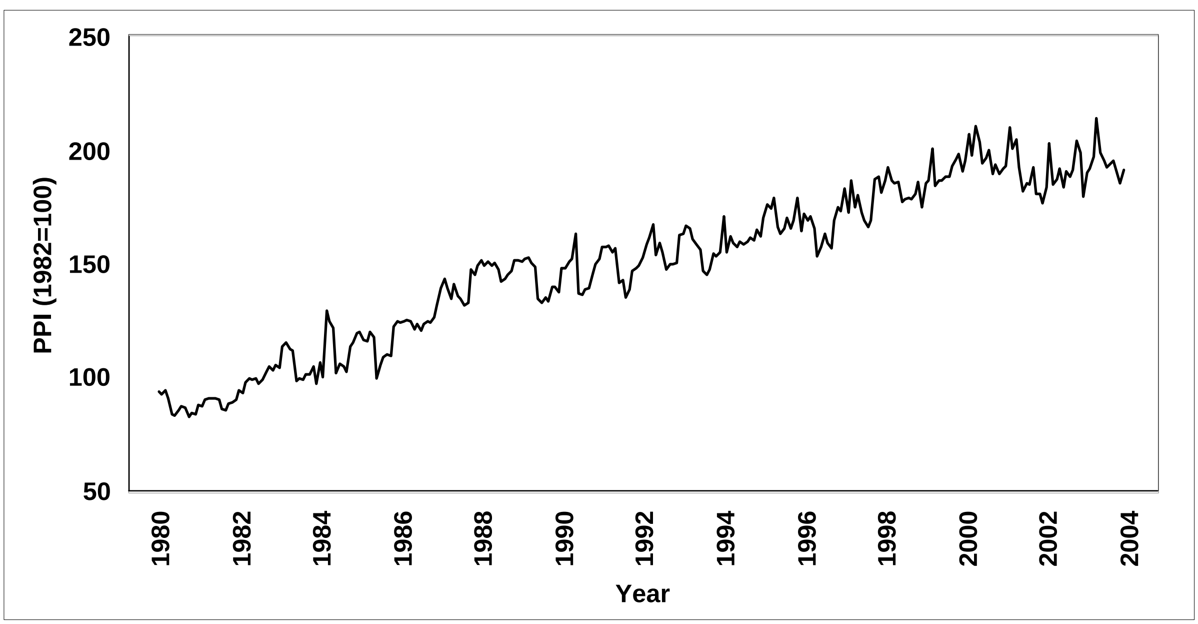
[4]USDA price data are available for catfish and trout. Most catfish, however, are raised in ponds, which is a production method outside the scope of the rulemaking.

Figure 3-3
Annual USDA Consumer Food Price Index-Food at Home
Fish and Seafood



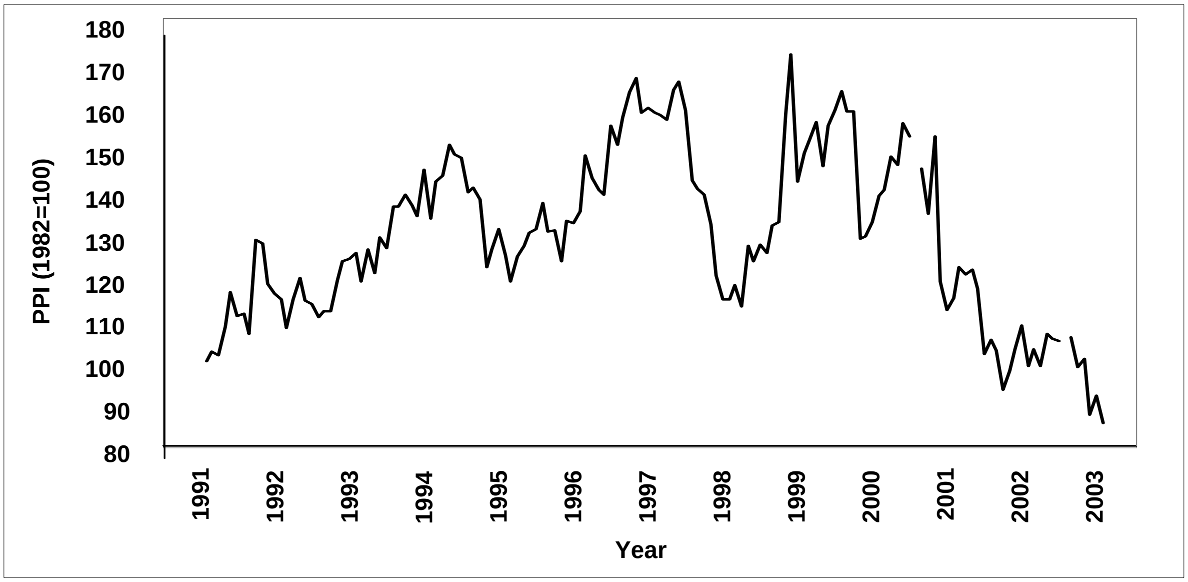
Source: USDA, 2003a and 2004a.

Figure 3-4
Unprocessed and Packaged Fish-Monthly PPI



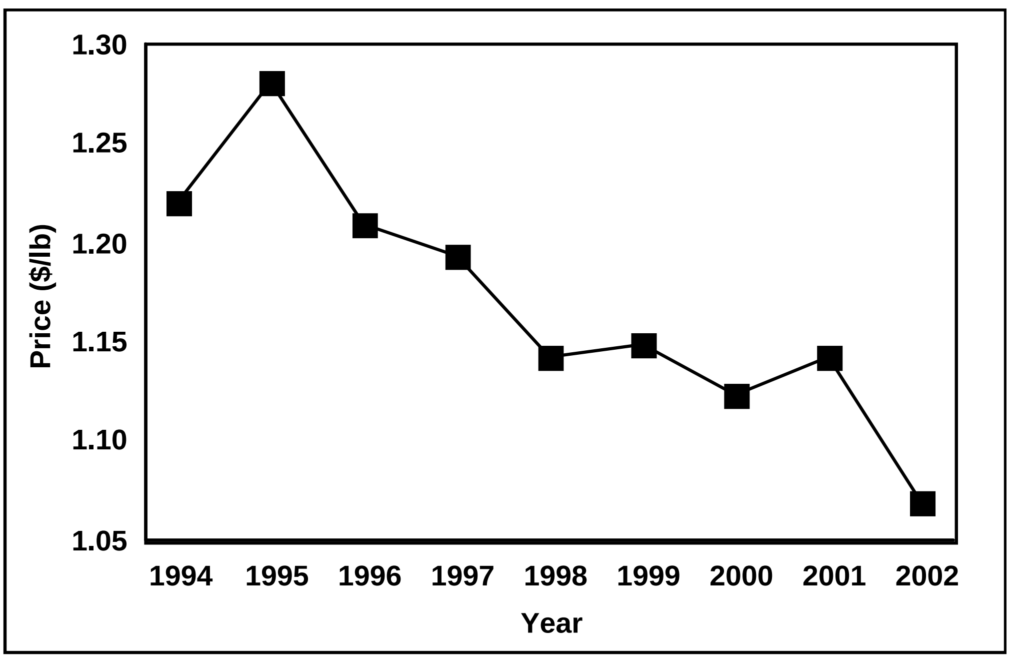
Source: BLS, 2004a.

Figure 3-5
Shrimp-Monthly PPI



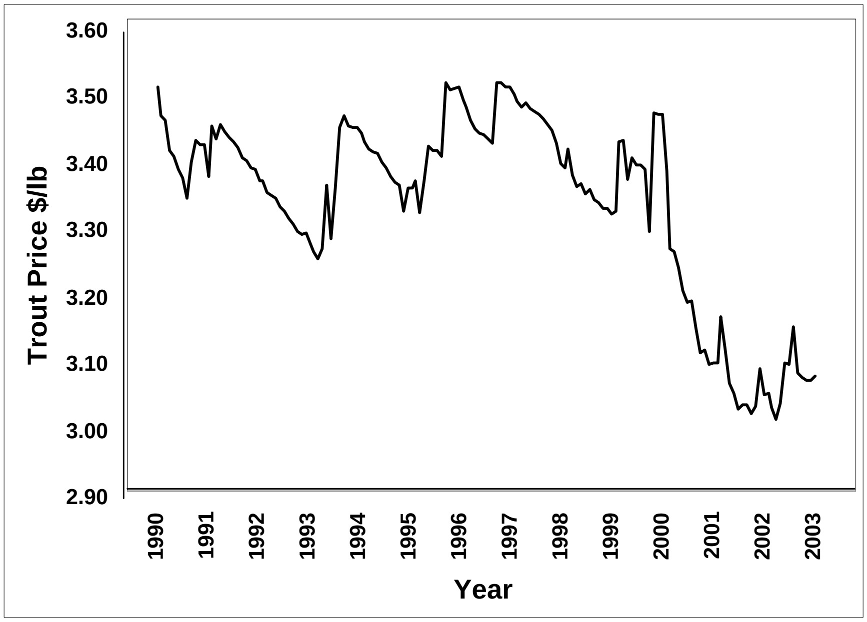
Source: BLS, 2004b.

Figure 3-6
Food Size Trout-Sales of Fish 12" or Longer
Annual U.S. Average Price per Pound



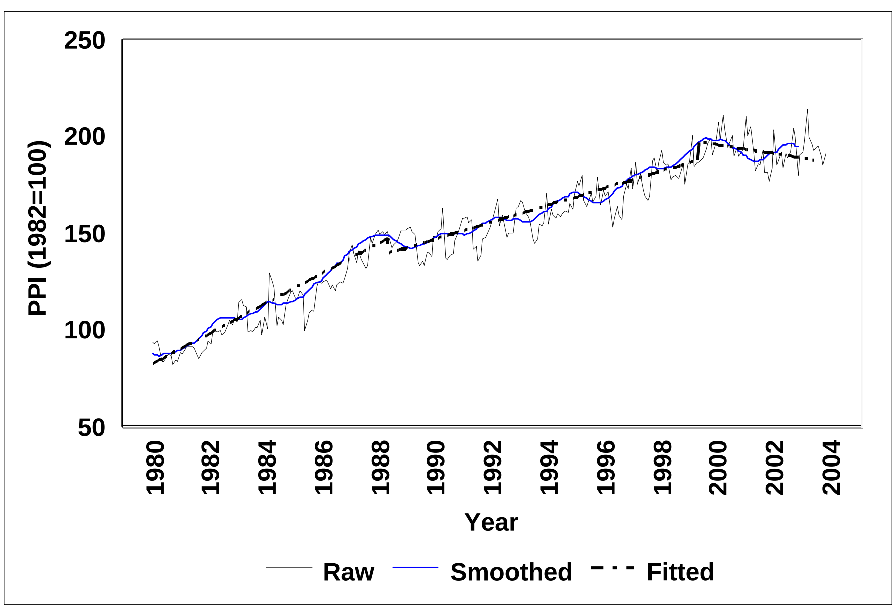
Source: USDA, 2003b.

Figure 3-7
Fulton Fish Market-Fresh Boned Idaho Trout
Monthly Price per Pound



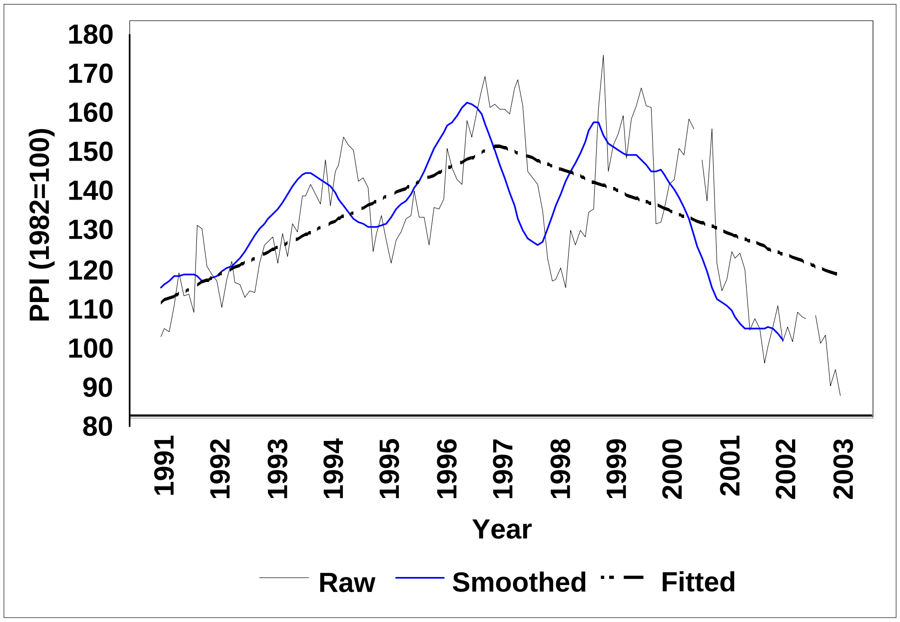
Source: NMFS, 2004.

Figure 3-8
Unprocessed and Packaged Fish-Monthly PPI



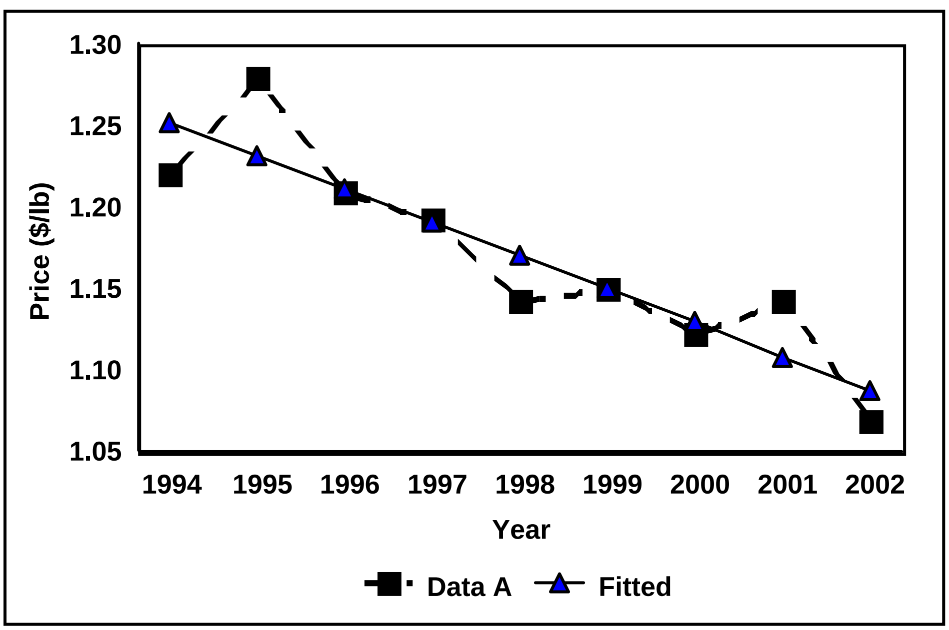
Source: BLS, 2004a, smoothed and fitted by EPA.

Figure 3-9
Shrimp Monthly PPI



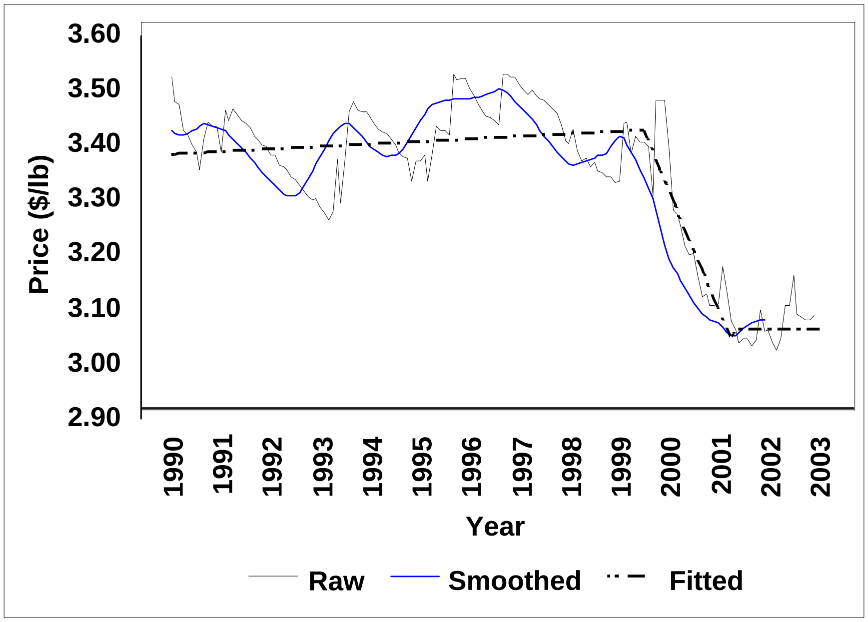
Source: BLS, 2004b, smoothed and fitted by EPA**.**

Figure 3-10
Food Size Trout-Sales of Fish 12" or Longer: Annual U.S. Average Price per Pound



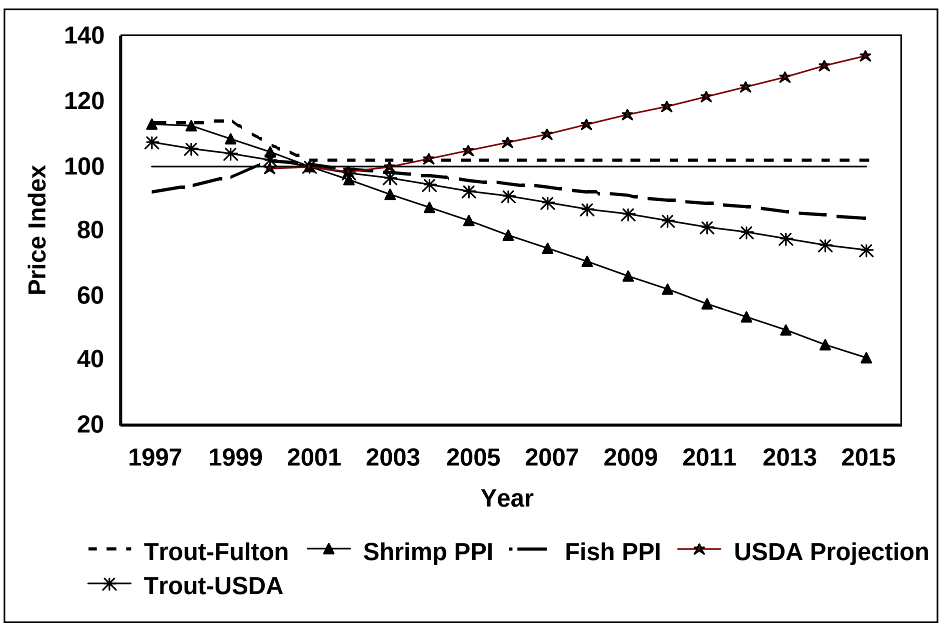
Source: USDA, 2003b, fitted by EPA.

Figure 3-11
Fulton Fish Market-Fresh Boned Idaho Trout: Monthly Price per Pound



Source: NMFS, 2004, smoothed and fitted by EPA.

Figure 3-12
Forecasting Price Indices



Source: EPA estimates.

Table 3-4
Forecasting Indices

Year	Trout		Shrimp	Fish	USDA
	Fulton	USDA	PPI	PPI	Projection
2001	101.71	100.00	99.98	100.77	100.0
2002	101.71	98.15	95.77	99.58	98.4
2003	101.71	96.29	91.55	98.39	99.8
2004	101.71	94.44	87.32	97.20	101.8
2005	101.71	92.58	83.10	96.01	104.3
2006	101.72	90.73	78.88	94.82	107.0
2007	101.72	88.88	74.66	93.63	109.6
2008	101.72	87.02	70.43	92.43	112.3
2009	101.72	85.17	66.21	91.24	115.2
2010	101.72	83.32	61.99	90.05	118.1
2011	101.72	81.46	57.77	88.86	121.0
2012	101.72	79.61	53.54	87.67	124.0
2013	101.72	77.75	49.32	86.48	127.1
2014	101.72	75.90	45.10	85.29	130.3
2015	101.72	74.05	40.88	84.10	133.5

Sources: EPA estimates.

3.2.1.5 Pre-Regulatory Financial Conditions and Baseline Closures

EPA's closure analysis begins with an evaluation of the pre-regulatory financial condition of each in-scope facility. With three forecasting methods, there are three ways to evaluate a facility's future financial condition. If a facility's post-regulatory value is negative, the facility is flagged as a failure and assigned a score of "1" for that forecasting method. A facility, then, may have a score ranging from "0" to "3", failing under none to all forecasting methods. Several conditions may lead to a facility having a score of "2" or "3" under pre-regulatory conditions:

- The company does not record sufficient information at the facility-level for the closure analysis to be performed.

- The company does not assign costs and revenues that reflect the true financial health of the facility. Two important examples are cost centers and captive facilities, which exist primarily to serve other facilities under the same ownership. Captive facilities may show revenues, but the revenues are set approximately equal to the costs of the operation. (Cost centers have no revenues assigned to them).

- The facility appears to be in financial trouble prior to the implementation of the rule.

Under the first two conditions, the impacts analysis defaults to the company level because that is the decision-making level. For example, earnings data are held at the company level, not the facility level or the company has intentionally established facilities that will not show a profit but exist to serve the larger organization (e.g., cost centers or "captive" facilities). In either case, EPA does not have sufficient information to evaluate impacts at the facility level as a result of the rule.

The third condition identifies a facility with complete facility-level financial information and no confounding factors (i.e., it is not a captive or start-up facility) to obscure the financial condition of the facility. If the facility is unprofitable prior to the regulation, the company may decide to close the facility. This is likely to occur before the implementation of the rule to avoid additional investments in an unprofitable facility. The projected closure of a facility that is unprofitable prior to incurring costs associated with a regulatory action should not be attributed to the regulation. For the purposes of this analysis, EPA considers such facilities to be "baseline closures" and are not analyzed further.

This approach is consistent with established EPA practice. In the proposed rule and Notice of Data Availability, EPA characterizes baseline conditions using existing compliance levels and treatment in place (USEPA, 2002c and 2003). This approach is consistent with past effluent guidelines and EPA's Guidelines for Preparing Economic Analyses (USEPA, 2000a, Section 5.3.2) and Office of Management and Budget (OMB) guidelines. OMB guidelines state that "... the baseline should be the best assessment of the way the world would look absent the regulation ...It maybe reasonable to forecast that the world absent the regulation will resemble the present." (OMB, 2003). This means that if a facility already has option components in place by 2001 (the most recent year in the detailed questionnaire), EPA does not assign costs for those components to the facility. For example, if a facility has primary settling (a component that occurs in all options under consideration), it would not be expected to incur the costs for primary settling.

Similarly, EPA guidance indicates that facilities are not financially viable prior to the regulation, the closure of these facilities should not be attributed to the rule or meeting water quality criteria (USEPA, 2000a, p. 154 and EPA, 1995). These facilities are considered "baseline closures" (see Section 3.2.1.5 of this report). Costs for these facilities are not included in the cost of the rule (because the facilities are likely to close before the costs must be implemented); similarly, the pollutant removals associated with incremental pollution control for these facilities are not included in the cost-reasonableness or cost-effectiveness analyses.

Although the forecasting methods might be generalized as pessimistic, average, and optimistic, the pre- (and post-) regulatory status of a facility does not rest entirely on the results of the average forecast. Two of the forecasting methods start with 2001 data. If this was a good year, it is possible for both the pessimistic and optimistic forecasts to result in long-term positive earnings. If the same facility showed losses for 2000 and 1999, it is possible for the average forecast to result in long-term negative earnings. The reverse also holds. Of the 101 commercial facilities in this final regulation, the average forecast method did not coincide with the baseline status in 13 cases (i.e., the average forecasting method did not determine the baseline status for all facilities).

EPA performed a preliminary investigation of the baseline conditions for the industry. Of the 101 commercial facilities estimated to be within the scope of the rule, 32 are projected to be baseline failures. The number of facilities that can be analyzed for impacts of the rule is 69 facilities and all of them incur costs under the rule. Table 3-5 summarizes the baseline financial condition of the regulated aquaculture facility. Because the final regulation does not place different requirements for different production levels, the counts are not subcategorized by production size.

Table 3-5
Number and Types of Facilities in EPA's Economic Analysis for the Final Regulation

Production System	Owner	Estimated Number of Facilities		
		In-Scope	Baseline Closures	In Analysis and Cost Totals [1]
Flow Through and Recirculating	Commercial	82	24	58
	Noncommercial	139	NA	139
Net Pen	Commercial	19	8	11
	Noncommercial	0	NA	0
Alaska	Noncommercial	2	0	2
Total	Commercial	101	32	69
	Noncommercial	141	NA	141

Totals may not sum due to rounding. Earnings measured by cash flow.
NA: not applicable.
[1] In analysis counts are calculated by taking the number of in-scope facilities then subtracting out baseline closures.

EPA conducted an additional assessment of its baseline closure analysis and resultant baseline failures. Of the 32 facilities, 4 could not report financial data to EPA because of a recent change in ownership. Of the remaining 28, 18 reported 3 years of negative earnings in the questionnaire and none appeared to be start-up operations. The remaining 10 facilities have at least one year of positive earnings. For these facilities 2001 was a negative year. This is consistent with industry comments received by EPA.

EPA's closure analysis is based on cash flow as a measure of earnings and the three forecasting methods described above. Appendix A provides additional detailed discussions of several financial parameters used (or not used) to calculate earnings. The EPA survey collected financial data as reported in tax forms, so the discussion of earnings follows business terminology rather than agricultural economics terminology.

EPA performed several sensitivity analyses on the forecasting method. The first analysis used net income as a measure of earnings. The difference between net income and cash flow is depreciation. Depreciation is a non-cash cost and is excluded as a cost from cash flow and included as a cost when calculating net income. When net income is the measure of earnings, the number of baseline failures increases to 43, i.e., an additional 10 facilities cannot be analyzed for impacts. The second analysis considered any non-zero closure score in the main analysis as a closure. Under this assumption 34 facilities are considered baseline closures. The third and fourth analyses move the starting year for the forecasts to 2000 and compare the number of baseline failures under cash flow and net income projections. The year 2000 was, in general, a more profitable year for the industry than 2001 (see Figures 3-5 through 3-11). As expected, the number of facilities projected to be unprofitable prior to the rule drops from 32 to 27 for cash flow. The 10 facilities identified earlier with at least one year of positive earnings, but negative earnings for 2001 remain open when 2000 is the start year for the forecasts. Similarly, the number of facilities projected to be unprofitable prior to the rule drops from 43 to 40 under net income.

3.2.1.6 Projecting Facility Closures under the Final Regulation

Closure is the most severe impact that can occur at the facility-level and represents a final, irreversible decision in the analysis. The decision to close a facility affects the business owner, its workers, communities, and stockholders. When considering whether to terminate a business, the business will likely investigate several business forecasts and several methods of valuing their assets. Not only all data, assumptions, and projections of future market behavior would be weighed in the corporate decision to close a facility, but also the uncertainties associated with the projections. When examining the results of several analyses, the results are likely to be mixed. Some indicators may be negative while others indicate that the facility can weather the current difficult situation. A decision to close a facility is likely to be made only when the weight of evidence indicates that this is the appropriate path for the company to take. Thus EPA uses more than one forecasting method in the closure analysis.

EPA's analysis approximates financial decision-making patterns when determining when a facility would close. A score of "1" (implying negative earnings under only one of three forecasting methods) may result from an unusual year of data. When the score is "2" or "3", however, EPA considers that the weight of the evidence indicates poor financial health. EPA believes that this scoring approach represents a reasonable and conservative method for projecting closures. That is, a facility must show long-term financial health (e.g., a score of "0" or "1") prior to the incurrence of incremental pollution control cost and long-term unprofitability (e.g., a score of "2" or "3") after the incurrence of those costs.[5]

Facility closure represents a final, irreversible decision in the analysis. EPA estimates direct impacts from facility closures as the loss of all employment, production, exports, and revenue associated with the facility. This is an upper bound analysis, i.e., illustrating the worst effects because it does not account for other facilities increasing production or hiring workers in response to the closure of the first facility. The losses are aggregated over all facilities to estimate the national direct effect of the regulation.

3.2.1.7 National (Direct and Indirect) and Community Impacts

Impacts on aquaculture facilities affected by this final regulation are considered direct effects. Impacts due to reductions in production and employment by facilities that close are considered indirect effects. Induced effects are overall changes in household and business spending due to direct and indirect effects. The U.S. Department of Commerce's Bureau of Economic Analysis (BEA) tracks these effects both nationally and regionally in large "input-output" tables, published as the Regional Input-Output Modeling System (RIMS II) multipliers (DOC, 1996 and 1997). EPA uses the multipliers for the RIMS II industry number 1.0302 (miscellaneous livestock) because it includes all of SIC 0273. For this

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[5] EPA's approach of not analyzing facilities with negative net earnings under "2" or "3" of the forecasting methods before they incur pollution control costs (i.e., baseline closures) is consistent with EPA guidance (USEPA, 2000a, EPA 240-R-00-003, p. 154).

analysis, EPA calculates direct and indirect impacts with the national-level final-demand multipliers. "Final demand" refers to the value of the sale to the final consumer of the product, a measure of change in production in the target industry. "Total" means that the multiplier includes direct, indirect, and induced economic effects. Total final demand multipliers show the relationship between the change in final demand in the target industry and change in output, earnings, or jobs in the whole regional economy. "Output" refers to overall production. It is what is measured by the Gross Domestic Product.

EPA uses national final demand multipliers for output and employment because they include direct, indirect, and induced effects. For this analysis, the national-level final demand multipliers for miscellaneous livestock are output ($3.7163 per $1) and employment (45.2228) full-time equivalents per $1 million in output in 1992 dollars.[6] For example, for every $1 million in output lost due to the projected closure of a regulated facility, nearly $3.8 million in output and 45 jobs are lost nationwide. When a facility is projected to fail as a result of the rule, EPA estimates the loss in output associated with facility closure, converts the loss to 1992 dollars with the Producer Price Index (CEA, 2004), and then use the RIMS II multipliers to estimate national level impacts.

If a facility is projected to close, all employment at the facility is considered lost. EPA evaluates the community impacts of facility closure by examining the increase in 2001 unemployment rate for the county in which the facility is located (BLS, 2003c). The increase in unemployment is calculated by adding the facility's employment to the county unemployment numbers and then recalculating the unemployment rate.

3.2.2 Other Regulatory Impact Criteria

In addition to its closure analysis, EPA also conducts additional analyses to assess potential effects on existing businesses. This includes an analysis of additional moderate impacts using a sales test, an evaluation of financial health using an approach similar to that used by USDA, and an assessment of possible impacts on borrowing capacity.

3.2.2.1 Sales or Revenue Test

To assess whether there are additional moderate impacts to facilities, EPA uses a sales test to compare the pre-tax annualized cost of the final rule to the 2001 revenues reported for facilities that passed the baseline closure analysis. EPA considers that facilities show additional moderate impacts if they are not projected to close but incur compliance costs in excess of 5 percent of facility revenue.

The threshold values EPA uses for its sales test (3 percent, 5 percent, and 10 percent) are those the Agency has determined to be appropriate for this rulemaking and are consistent with threshold levels used by EPA to measure impacts of regulations for other point source dischargers. EPA has used 1 percent and 3 percent sales test benchmarks to screen for potential impacts in many small business analyses (e.g., USEPA, 2000b, 2000c, 1997, and 1994). These benchmarks are only screening tools, but do support EPA's contention that a sales test of less than 3 percent generally indicates minimal impact.

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[6] Employment multipliers are based on 1992 data, hence the loss in output needs to be in 1992 dollars.

The 5 percent threshold value that EPA uses for its sales test indicating potential "moderate" impacts are those the Agency has determined to be appropriate for this rulemaking and are also consistent with threshold levels used by EPA to measure impacts of regulations for other point source dischargers. For the final effluent guideline for Concentrated Animal Feeding Operations (CAFO), EPA defined farm operations with sales tests exceeding 5 percent but less than 10 percent as likely to incur moderate impacts (assuming simultaneously, positive cash flow or net income and acceptable debt to asset ratios), and, correspondingly, EPA defined farm operations with sales tests exceeding 10 percent as likely to indicate 'stressful' impacts (i.e., vulnerable to closure). For more information, see Section 3.4.1.

3.2.2.2 Credit Test

An additional test that EPA performs is a credit test that calculates the ratio of the pre-tax annualized cost of an option and the after-tax Maximum Feasible Loan Payment (MFLP) (i.e., 80 percent of after-tax cash flow). EPA identified any company with a ratio exceeding 80 percent of MFLP as affected under this test (i.e., the test threshold is actually 64 percent of the after-tax cash flow). These assumptions lend conservatism to the credit test.

While the closure analysis is performed at the enterprise, facility, and company levels, the credit test is performed at the company level only because this is the level at which financial institutions make their determination. The credit test population is the count of companies identified in the detailed questionnaire. Because the sample was drawn on facility characteristics, the survey weights apply to the facilities but not the companies that own them.

Based on the several measures used by USDA, EPA developed a method to examine whether a bank would lend a farm/company the amount needed to cover the costs of incremental pollution control. Like the financial health test, the credit test is performed with company-level data.

USDA notes that "Lenders generally require that no more than 80 percent of a loan applicant's available income be used for repayment of principal and interest on loans." (USDA, 2000a, p. 19). EPA considers the income available for debt coverage as the after-tax cash flow.[7] EPA chose the after-tax cash flow for 2001 (typically, the worst year in the questionnaire data) for the farm or company as the starting point for the credit test. For sole proprietors, EPA collected data for aquatic animal production from Schedule F or Schedule C from the IRS tax forms submitted with a proprietor's Form 1040. EPA intentionally did not request information from the proprietor's Form 1040 (the Agency specifically excluded the collection of off-farm income data). EPA multiplied the after-tax cash flow by 80 percent to obtain the proxy for USDA's "maximum feasible loan payment." EPA then calculated the ratio of the pre-tax annualized cost for an option to the after-tax MFLP. A more accurate, but less conservative, comparison would be the ratio of the after-tax annualized cost to after-tax MFLP, however, we assume a bank would be conservative and compare the pre-tax cost to the MFLP. As an additional measure of conservatism, EPA identified any facility with a ratio exceeding 80 percent as an impact (i.e., the test threshold is actually 64 percent of after-tax cash flow).

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[7]The USDA definition for income for debt coverage is (net farm income + off-farm income + depreciation + interest - estimated income tax payments - family living expenses). EPA does not include off-farm income (a plus) or estimated family expenses (a negative); these are considered to off-set each other. EPA did not add interest back into the calculation.

3.2.2.3 Financial Health

EPA also calculates impacts on financial health at the company level using USDA's 2 x 2 matrix (four-state) categorization of financial health based on a combination of net cash income and debt/asset ratio (i.e., favorable, marginal solvency, marginal income, and vulnerable). EPA considers any change in categorization an impact of the final regulation.

Like the credit test, the financial health test is performed at the company level only, because of the requirement for a complete balance sheet. USDA's Economic Research Service (ERS) developed a financial performance measure that evaluates the combines effects of profitability and solvency (USDA, 2000a). Profitability is measured by a positive or negative income while solvency is measured by a debt/asset ratio. For this analysis, EPA uses the debt/asset ratio of 40 percent as the divider (USDA, 2000a). This results in a four-part classification for farm financial health:

- Favorable: positive income and debt/asset no more than 40 percent
- Marginal income: negative income and debt/asset no more than 40 percent
- Marginal solvency: positive income and debt/asset more than 40 percent
- Vulnerable: negative income and debt/asset more than 40 percent

For consistency with the closure model, EPA considers a company to have positive income if the present value of forecasted after-tax cash flow is positive in two or three forecasting methods.[8]

3.2.2.4 Other Financial Data and Criteria

EPA also considered other financial data and methodological approaches. In both cases, however, these data and methodological approaches were either not compatible with EPA's data and methodological needs or were deemed to be inconsistent with EPA's established guidelines for conducting regulatory analyses, or where not completed in time for consideration by EPA for this final rulemaking (given the Agency's notice and comment requirements).

University of Rhode Island Benchmarks. This project attempts to collect financial benchmark information for the aquaculture industry by researchers at the University of Rhode Island (URI) (Duguay, 2003). Professor Robert Comerford of URI, one of the principal investigators on the project, provided EPA with a draft copy of the report (Comerford and Rice, 2004).

Because the geographic area of interest is the Northeast and Rhode Island in particular, the large majority of the returned questionnaires represent oyster farms. Although the work is an impressive start on collecting benchmark financial data for use by the financial community, the URI data primarily represent production systems outside the scope of the rule. EPA notes one consistency between the URI data and EPA's projections on baseline financial conditions. Specifically, EPA's data show a substantial portion of aquaculture facilities do not report profits. Comerford and Rice (2004) also report that six of 15 respondents reported a profit in 2002 (40 percent) while 69 of the 101 in-scope commercial facilities (68 percent) are projected to be profitable.

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[8]The USDA approach uses a single year of data.

Engle et al. study of U.S. Trout Operations. Prior to EPA's proposed regulations in 2002, various land grant university researchers participating in the JSA/AETF[9] indicated that they would be providing the Agency with enterprise budgets that could be used in an economic analysis. In March, 2004, EPA received a draft manuscript of an economic analysis based on several enterprise budgets for review (Engle et al, 2004). This study, referred to here as the "Engle study," reports that many aquaculture facilities already operate under consecutive years of negative profits and that EPA's regulation would further result in negative net returns at many regulated facilities, driving operators out of business.

The approach adopted in the study reflects an average representative facility (as opposed to a facility-specific analysis). For the purposes of assessing baseline financial conditions, this representative model approach differs markedly from EPA's facility-level approach as noted below.

The Engle study does not remove operations that show negative returns pre-regulation. Traditional EPA practice is to remove "baseline closures" from its regulatory analyses.

The Engle study uses collected financial data from its survey of trout operators in North Carolina and Idaho, including data from operations with negative returns, to compile representative farm financial budgets. The analytical approach the Engle study uses to analyze these average model budgets consists of a representative farm approach. Instead, EPA uses a facility-based approach, using financial data collected from it's detailed survey to analyze facility-level impacts for each facility type reflected in EPA's detailed survey for this rule. The approach used in the Engle study shows poor financial conditions, on average, because the sample includes financial data from non-viable firms (e.g., it includes what EPA would consider to be "baseline closures" in the averaging process).

The Engle study estimates financial conditions at regulated operations that includes cost estimates for "unpaid" labor. EPA's analysis does not account for unpaid labor because the Agency's detailed survey indicates that few (3 of an estimated 101 in-scope commercial facilities) report unpaid labor costs. EPA conducts sensitivity analyses of its results to account for potential unpaid labor costs among the three facilities that report such costs and the results reveal no additional impacts due to the rule. Because the Engle study accounts for unpaid labor costs using an average representative farm model approach, EPA believes that the resultant baseline financial conditions are artificially low.

EPA believes its facility-level approach, using actual financial data as reported in its detailed survey of regulated facilities, provides a more realistic picture of the baseline financial conditions at these facilities.

The Engle study approach also differs markedly from EPA's in its accounting of expected compliance costs and its evaluation of regulatory impacts. Specifically, the Engle study does not account for operations that are already complying with the expected regulatory options; nor does it account for existing "treatment-in-place" of various technologies at these facilities (i.e., the Engle study accounts for total economic costs regardless of what's already at the operation). EPA's facility-level approach utilizes the Agency's detailed survey information to determine facilities that either do not discharge wastewater to waters of the U.S. (and so would not incur any costs under the final regulation) or have some "treatment-in-place." Therefore, EPA's analysis reflects the expected "incremental" costs of complying with the final regulation, accounting for what the regulated facility already has in-place. EPA believes this

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9 Joint Subcommittee on Aquaculture's Aquaculture Effluents Task Force (see Section 2.1 of this report).

facility-level approach provides a more representative picture of the regulatory impacts existing facilities will incur as a result of complying with the final regulation, and therefore a better representation of economic achievability.

More information is available in the rulemaking record (USEPA, 2004a; ERG, 2004b; Tetra Tech, Inc., 2004). EPA's Response to Comments document provides additional detail.

Other issues raised in the Engle study are as follows. In particular, the study notes the financial hardship faced by regulated facilities and that producers regularly remain in operation despite consecutive years of negative income (e.g., because of certain non-economic factors as to why producers remain in business, such as lifestyle choice, farm operation as also home, inter-generational transfer of farm, and off-farm income supplementing family income). The study implies that EPA's regulatory analysis should consider sunk costs and include an allowance for capital replacement (in addition to including a proxy cost to reflect unpaid family labor and management). EPA's regulatory analysis addresses these cost items as follows. More detailed information is available in Appendix A of this report and also in EPA's responses to public comment.

- EPA believes that sunk costs paid out of capital (as opposed to financing) already occurred and, therefore, are not incremental cash flows. They should not affect future investment or the economic viability of the existing firm. Therefore, EPA excludes this category of sunk costs from the closure analysis. Sunk costs that are financed have interest, and this interest is included in interest payments reported in the income statements.[10]

- EPA includes costs for capital replacement as they occur within the depreciation and interest payments reported on an income statement. When EPA uses its net income calculations, capital replacement costs (as approximated by financial depreciation, in addition to interest payments captured in cash flow) are considered in the closure analysis. Capital replacement costs that are capitalized and not expensed are reflected in the asset, debt, and equity components of the balance sheet as appropriate. Past capital replacement costs are represented in the farm financial health measures and credit tests that are based on balance sheet data. When estimating compliance costs, EPA includes replacement costs for pollution control capital. EPA's cost estimates include all capital expenditures (whether initial or replacement) that are projected to occur within the 10-year analytical time frame.

Finally, the Engle study also raises issues associated with aquaculture entity's difficulty obtaining access to credit and limits to borrowing capacity given high absolute debt levels at these facilities. Aquaculture producers are characterized by high fixed and capital costs, and lenders are typically reluctant to issue loans to implement control treatments (since these are generally non-productive). Also lenders may attach a "risk premium" to the loan for specialty crops that effectively raises the interest rate.

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[10] Question C6 of the detailed questionnaire asked the respondent to identify total expenses and individual expense items, such as interest payments (mortgage and other interest payments). Interest payments reflecting sunk costs are therefore included in total expenses for the facility and are therefore included in EPA's cash flow and net income analyses. The logic check for the questionnaire accepted the responses as long as total expenses exceeded the sum of individual items. That is, even if a respondent did not break out individual cost items, all interest payments for the facility would be included in total expenses.

EPA notes that similar issues were raised on an Agency rulemaking on the final CAFO regulation. For that rule EPA received no recommendations on possible approaches to deal with these issues as part of its analysis. Similarly for this final regulation, EPA did not receive any recommendations on how to address high debt levels and access to capital constraints among regulated facilities. EPA received no comments about its tests of borrowing capacity or financial health used in the analysis.

3.3 NONCOMMERCIAL FACILITIES

EPA initiated its consideration of the economic impacts on noncommercial facilities by reviewing the decisionmaking process where public hatcheries have been closed (Section 3.3.1). Section 3.3.1.1 discusses the National Fish Hatchery System while Section 3.3.1.2 focuses on State hatcheries in Alaska, Oregon, and Washington. Section 3.3.2 examines public reactions to potential hatchery closures and the role of user fees in funding state hatcheries. Section 3.3.3 reviews the two tests developed for analyzing the potential economic impacts of the rule on noncommercial facilities. Section 3.3.4 reviews the analysis for Alaska nonprofit organizations.

3.3.1 Closures of Noncommercial Facilities

3.3.1.1 National Fish Hatchery System

In 1999, the Fish and Wildlife Service (FWS) asked the federally chartered Sport Fishing and Boating Partnership Council to undertake a review of the role and mission of the National Fish Hatchery System (NFHS). The special report, entitled *Saving a System in Peril*, was published in 2000 (SFBPC, 2000). The report noted that, at that time, the NFHS had a maintenance backlog of about $300 million and that one out of every four hatchery personnel positions were vacant. The report highlights NHFSs role in three areas. These include: (1) Federal mitigation obligations, (2) restoring and maintaining native fisheries, and (3) recovery of threatened and endangered aquatic species.

Other recommendations (mostly in SFBPC, 2000, Attachment 5) include the following. First, hatcheries not needed to meet current or redirected program needs should be considered candidates for closure or transfer to States. Second, hatcheries should be evaluated for consolidation without loss in quality, production, or genetic diversity. Third, States should assume full management and financial responsibility for stocking public inland waters within their boundaries. Fourth, FWS should recoup all fish production costs for mitigation projects from the party or parties responsible for the development project.

FWS is acting on the report recommendations. Some recent closures include two facilities in Washington State and one in Arizona. The Willard NFH, Washington hatchery is scheduled to close in the spring of 2005. Thomas (2004) reports that the hatchery is operated with Mitchell Act funds[11] and Congress cut 2004 Mitchell Act funds by $1.1 million. The cuts are split among FWS and the State fish agencies in Washington and Oregon. The Eagle Creek NFH, Washington facility is scheduled for a reduction in coho salmon production (Thomas, 2004). At the Willow Beach NFH, Arizona facility, weekly releases of rainbow trout are scheduled to stop after March 2003 while facility is closed for

[11] A 1938 law that addresses compensating for fish losses caused by Columbia River dams.

raceway rehabilitation. It is reported that the hatchery will re-open with a focus on an endangered species (razorback suckers) and not trout stocking for recreation (Kimak, 2002).

3.3.1.2 State Hatchery Closures and Potential Closures

For the final rule, EPA collected information on how U.S. Fish and Wildlife Service (FWS) and State agencies make decisions about operating or closing public hatcheries. Much of this consists of information of actual State hatchery closures and/or potential closures. In particular, EPA obtained information on hatchery closings in three States—Alaska, Oregon, and Washington.

- **Alaska.** Heard (2003) reports that 13 Alaskan hatcheries closed since the program's inception. The closures occurred from 1979 (Fire Lake and Starrigawan) through 1998 (Eklutna) The reasons for the closures include: disease or genetic concerns for protecting wild stocks, avoiding major disease consequences in hatcheries, other biological concerns in the hatchery, management concerns over mixed stock fisheries, and cost efficiencies or other economic issues. Heard documented these closures, in part, to rebut an opinion that most "hatcheries, once built, continue to operate indefinitely, regardless of whether they achieve objectives and reach performance goals (Hilborn, 1999)..." (cited in Heard, 2003).

- **Oregon.** In September 2002, the Oregon Department of Fish and Wildlife announced plans to close four hatcheries: Cedar Creek, Elk River, Salmon River, and Trask River. Across-the-board budget cuts for all state agencies triggered the planned closures. The criteria for selecting the hatcheries to be closes included: source of funding (The four hatcheries are 100 percent General Fund supported), deferred maintenance costs at those facilities, costs of operations, and the cost of upgrading the facilities to meet new state and federal discharge permit requirements (ODFW, 2002a).

  The next day, the Oregon legislature approved a plan that shifted monies within different funds that—with conservative spending and good license sales—avoided the hatchery closures (ODFW, 2002b). All four hatcheries are listed on the ODFW web site with an "updated October 3, 2003" date (ODFW, 2003a).

  Prior to the September announcement, ODFW detailed the potential program cuts and held town meetings to discuss the public's reaction to the reduction in services (ODFW, 2002c and 2002d). The public meetings supported a fee increase but that the increase needs to support a specific purpose/service. The department announced the license and tag fees for the 2004 hunting and fishing seasons. The resident anglers have a $5.00 increase in the cost of an annual fishing license. The new cost is reported as $24.75, indicating a 20 percent increase (i.e., from $19.75 to $24.75). This is the first increase in fees in four years and the news release specifies that the fees will enable ODFW "to continue to support the public's priorities: hatcheries..." (ODFW, 2003b)

  Potential hatchery closures are not a new topic in Oregon. In 2000, ODFW proposed to close the Nehalem hatchery. ODFW attempted to reduce the range of impacts to fisheries by choosing a hatchery that was less diverse and less complex than others

(Nandor, 2000). The Nehalem hatchery is still on the ODFW hatchery list (ODFW, 2003a).

- **Washington.** Washington hatcheries are undergoing major reorganization based on the recommendations of the Puget Sound and Coastal Washington Hatchery Reform Project (LLTK, 2002; HSRG, 2002; McClure, 2002). A goal of the project is to protect and encourage the Puget Sound and coastal salmon stocks listed as threatened under the Endangered Species Act. One finding is that closure of some hatcheries and reduced production at others may benefit the survival of both native and hatchery fish. Among the 2002 recommendations are included: closing the McAllister Creek hatchery on the Nisqually River due to poor fish survival, disease transfer issues, and water quality (HRSG, 2002). (McClure, 2002 notes that the MacAllister Creek hatchery was one of three already scheduled for closure due to state budget cuts.) Closure identified as part of the Governor's 2002 supplemental budget (MRSC, 2002). The 2002 recommendations also include discontinuing hatchery programs for certain salmonids at Dungeness, Garrison Springs, Fox Island, Minter Creek, and Tulip Bay (MRSC, 2002). Seven other facility closures or possible closures in Washington may include: Fox Island, Sol Soc, Coulter Creek, Hurd Creek, Issaquah, and Percival Cove hatcheries.

- **Fox Island** net pens closed July 2001 (HSRG, 2002).

- **Naselle** Hatchery. The Washington Department of Fish and Wildlife (WDFW) budget lists the reasons for the possible closure of this hatchery as (1) a history of operational inefficiencies, (2) does not support a unique brood stock for the recovery of threatened salmonid stocks, and (3) low fish utilization (WDFW, 2003). Apalategui, 2003 notes that the hatchery rearing ponds are settling, cracking, and clogging with sediment and that the fish collection system allows the mingling of wild and hatchery stock. Potential closure is also noted in the Governor's budget summary (WA, 2003; MRSC, 2002).

- **Sol Duc** Hatchery. Proposed for closure in WDFW, 2003 budget which states that this will impact commercial and recreational fisheries in the Strait of Juan de Fuca but to a lesser degree than the closure of other hatcheries or hatchery programs. Potential closure is also listed in MRSC, 2002 but not WA, 2003.

- **Coutler Creek** Hatchery. Listed as possible closure in WA, 2003. HRSG, 2002 recommends that the chinook salmon releases be discontinued and that it would review the hatchery's role in yearling coho releases later. The report also notes that the site meets NPDES discharge levels but does not have a pollution abatement pond. Not listed as possible closure in WDFW, 2003 or MRSC, 2002.

- **Hurd Creek** Hatchery. Listed as possible closure in WA, 2003 and Kamb, 2003. Not listed as possible closure in WDFW, 2003 or MRSC, 2002. HRSG, 2002 notes that it is a satellite hatchery supporting the Dungeness hatchery. Kamb, 2003 mentions that Hurd Creek's captive brood program was scheduled to end in June 2004 and that HRSG recommended that the program be replaced with alternative methods.

- **Issaquah** Salmon Hatchery. Originally scheduled for closure in the early 1990's, the public formed a community group (FISH: Friends of the Issaquah Salmon Hatchery) and expanded the mission to include education as well as raising fish. However, the educational program means that the hatchery is more expensive to operate and the hatchery is listed as a possible closure (Goodman, 1997 and Holt, 2003).

- **Percival Cove** Hatchery. The Washington Department of Ecology notified WDFW that is would not renew a discharge permit for aquaculture operations after April 2002 when that year's crop was released. The reasoning is the nutrient-laden fish food contributes to the phosphorus impairment of Capitol Lake (Dodge, 2002). The site is not on the list of WDFW hatcheries currently available on the department's web site (WDFW, 2004).

3.3.1.3 Summary

Based on EPA's review of public hatchery closures, EPA is conducting its analysis under the following assumptions.

First, public hatcheries close and it is therefore prudent to examine impacts of additional costs on public or noncommercial facilities.

Second, the reasons for closure vary widely. It may result from cuts to specific sources of funds (e.g., Mitchell Act funds and the Willard National Fish Hatchery or General Funds for Oregon hatcheries.). It may result from refocusing a program's mission and goals (e.g., toward Endangered Species Act concerns and away from recreational uses in the Federal and Washington State hatchery systems). Closure may also result from water pollution from aquaculture activities (e.g., Percival Cove in Washington), but those costs are not the primary reason for closure.

Third, the Federal hatchery system does not have user fee income. The refocusing of the Federal program on mitigation, native species, and endangered species is consistent with other suggestions that states should assume full management and financial responsibilities for stocking public fishing waters (SFBPC, 2000, p. 44). Therefore, inclusion of these facilities in the user fee test might be somewhat misleading. This is why the results were presented in three categories: no user fee, needed increase above a threshold, and needed increase below a threshold. On the other hand, the recommendations include FWS recouping all production costs for mitigation projects from the party responsible for the development project (SFPBC, 2000, p. 20). Were mitigation the only goal for the Federal hatchery system, we could assume a 100 percent cost-pass-through of any added pollution control costs once the recommendation is implemented.

3.3.2 State Hatcheries and User Fees

The reaction of the Oregon public to the possible closure of some state hatcheries, particularly the willingness to pay increased fees to keep them open (see Section 3.4.1.2), led EPA to investigate user fees and recent increases seen in user fees. A web search indicated that user fee increases do not happen every year and so the Agency compiled case studies where states increased fishing license fees.

EPA found seven recent examples of increases in fishing license fees: Pennsylvania, Nevada, New York, Oregon, South Carolina, Texas, and Wisconsin. Following are details on these examples:

- **Pennsylvania** compiled a history of user fees in response to a proposed increase (Table 3-6; PF&BC, 2003a). The gap between increases ranges from three to 20 years. The increases range from 20 percent to 50 percent. The PA Fish and Boat Commission proposed an increase from $16.25 to $20.00 for 2004, a 23 percent increase (PF&BC, 2003b). It is not clear whether this change will pass through the legislature.

- **Nevada** proposed a $5 increase in resident fishing licenses to be collected during the 2004 fiscal year (Sun, 2003). The increase would raise the price from $20 to $25, or 25 percent. Not only did this price increase go through, but the fee was raised an additional 16 percent to $29 for the 2004-2005 season (Henderson, 2004).

- **New York** enacted an increase from $14 to $19 (36 percent) for a resident fishing licence for the 2002-2003 season (NY, 2003).

- **Oregon** raised its resident fishing fees by $5.00 per license in 2003. The new cost is reported as $24.75, indicating a 20 percent increase (i.e., from $19.75 to $24.75). This is the first increase in fees in four years and the news release specifies that the fees will enable ODFW "to continue to support the public's priorities: hatcheries..." (ODFW, 2003b).

- **South Carolina** increased the price of a resident combination hunting and fishing license from $20 to $25 for the 2003-2004 season. This is a 25 percent increase (Charleston, 2003).

- **Texas** increased resident fishing license fees from $19 to $23 in 2003 (Texas, 2003a and 2003b). In January 2004, Texas created a new freshwater fishing stamp with a $5 price, resulting in a freshwater fishing license cost of $28 for residents (Texas, 2004). Texas, then, instituted two price increases of 22 percent to 24 percent each within two years.

- In **Wisconsin**, the governor proposed raising the annual cost of a resident fishing license from $14 to $20, but the legislature trimmed the new cost to $17 (Chaptman and Jones, 2003). In other words, the governor proposed a 43 percent increase but the legislature accepted only a 21 percent increase.

The conclusion EPA draws from this information is that discrete user fee increases in excess of 20 percent are common. Increases as high as 36 percent have occurred in recent years.

Table 3-6
History of Pennsylvania Fishing License Fees

Year	Years Between Changes	Resident Fishing License	Change (%)	Trout/Salmon Stamp	Total Resident Cost for All Fish[1]
1922		$1.00			$1.00
1928	6	$1.50	50%		$1.50
1948	20	$2.00	33%		$2.00
1954	6	$2.50	25%		$2.50
1957	3	$3.25	30%		$3.25
1964	7	$5.00	54%		$5.00
1974	10	$7.50	50%		$7.50
1979	5	$9.00	20%		$9.00
1983	4	$12.00	33%		$12.00
1991	9	$12.00		$5	$17.00
1996	5	$16.25	35%	$5	$21.25
2003?	7				

[1]Excluding agent fees.
Source: PB&FC, 2003a.

Table 3-7 shows a list of 2003 resident state fishing license fees. These data show what an increase of $3 to $5 per license (typical of the raises mentioned above) would look like as percentages of the resident license fee. On a national basis, these fee hikes range from about 20 percent to 35 percent.

Table 3-7
2003 Resident Fishing License Fees

State	Resident License Fee 2003	Percent Increase over 2003 Fee		
		$3.00	$4.00	$5.00
Alabama	$9.50	32%	42%	53%
Alaska	$15.00	20%	27%	33%
Arizona	$18.00	17%	22%	28%
Arkansas	$10.50	29%	38%	48%
California	$30.70	10%	13%	16%
Colorado	$20.25	15%	20%	25%

State	Resident License Fee 2003	Percent Increase over 2003 Fee		
		$3.00	$4.00	$5.00
Connecticut	$20.00	15%	20%	25%
Delaware	$8.50	35%	47%	59%
District of Columbia	$7.00	43%	57%	71%
Florida	$13.50	22%	30%	37%
Georgia	$9.00	33%	44%	56%
Hawaii	$5.00	60%	80%	100%
Idaho	$23.50	13%	17%	21%
Illinois	$13.00	23%	31%	38%
Indiana	$14.25	21%	28%	35%
Iowa	$11.00	27%	36%	45%
Kansas	$18.50	16%	22%	27%
Kentucky	$15.00	20%	27%	33%
Louisiana	$9.50	32%	42%	53%
Maine	$22.00	14%	18%	23%
Maryland	$10.50	29%	38%	48%
Massachusetts	$27.50	11%	15%	18%
Michigan	$14.00	21%	29%	36%
Minnesota	$18.00	17%	22%	28%
Mississippi	$9.00	33%	44%	56%
Missouri	$11.00	27%	36%	45%
Montana	$17.00	18%	24%	29%
Nebraska	$16.00	19%	25%	31%
Nevada	$21.00	14%	19%	24%
New Hampshire	$35.00	9%	11%	14%
New Jersey	$22.50	13%	18%	22%
New Mexico	$18.50	16%	22%	27%
New York	$19.00	16%	21%	26%
North Carolina	$15.00	20%	27%	33%
North Dakota	$11.00	27%	36%	45%
Ohio	$15.00	20%	27%	33%
Oklahoma	$12.50	24%	32%	40%
Oregon	$19.75	15%	20%	25%
Pennsylvania	$17.00	18%	24%	29%
Rhode Island	$18.00	17%	22%	28%

State	Resident License Fee 2003	Percent Increase over 2003 Fee		
		$3.00	$4.00	$5.00
South Carolina	$10.00	30%	40%	50%
South Dakota	$21.00	14%	19%	24%
Tennessee	$21.00	14%	19%	24%
Texas	$19.00	16%	21%	26%
Utah	$26.00	12%	15%	19%
Vermont	$20.00	15%	20%	25%
Virginia	$12.50	24%	32%	40%
Washington	$21.90	14%	18%	23%
West Virginia	$11.00	27%	36%	45%
Wisconsin	$14.00	21%	29%	36%
Wyoming	$16.00	19%	25%	31%
Average	$16.34	21%	28%	35%

Source: PF&BC, 2003c.

3.3.3 Economic Tests

On the basis of the information EPA collected on noncommercial facility closures and on State user fees (Sections 3.3.1 and 3.3.2), the Agency developed two tests for evaluating the impacts of increased pollution control costs on noncommercial facilities. These are the budget test and an analysis of potential user fee increases.

3.3.3.1 Budget Test

The budget test compares the pre-tax annualized costs to the operating budget for the facility. As part of EPA's quality control process, the Agency examined the costs for part-time labor, full-time labor, and management as reported in Part B of the questionnaire with the total operating budget reported in Part C. Seven facilities reported labor and management costs that exceeded the operating budgets reported in Part C. A comment included with one of the facility surveys noted that the operating budget value did not include full-time labor or management. Presumably, part-time labor is considered a variable operating cost. For these seven facilities, EPA added the full-time labor and management costs to the reported operating costs.

For the 2002 Proposal, EPA assumed three different threshold values to evaluate an implied revenue test for noncommercial facilities: 3 percent; 5 percent, and 10 percent (see USEPA, 2002c and 2002d). EPA also requested comment on its approach and also recommendations on how to evaluate regulatory impacts to noncommercial facilities, including comment on its an implied revenue test threshold assumptions (USEPA, 2002c and 2003). EPA received no comments on its an implied revenue test and thresholds.

For the purposes of this analysis, EPA assumes a 5 percent and 10 percent threshold value as an indicator of potential financial impacts at noncommercial facilities. Accordingly, costs For more information about justification for these levels, see Section 3.4.1 and 3.4.2. These facilities would be affected by the final regulation unless they are able to raise user fees to cover these costs. As a supplemental analysis, EPA's analysis also considers how many government facilities that fail a given threshold can recover increased costs through funds from user fees (Section 3.3.3.2).

The use of these benchmark values is consistent with threshold values established by EPA in previous regulations for other point source dischargers. For more information, see Section 3.4.2.

3.3.3.2 User Fee Analysis

As part of a supplemental analysis, EPA also examines the ability of State-owned hatcheries to recoup compliance costs through increases in funding derived solely from user fees. This analysis is based on EPA's examination of the ability of State-owned hatcheries to recoup compliance costs through increases in funding derived solely from user fees.

All States and the District of Columbia have fishing license fees for residents. The license fees are not raised every year even though costs increase through inflation. Instead, when fees are raised or a fish stamp instituted, the raise or new fee is usually a round number such as $3, $5, or $10. A $3 to $5 hike in State fishing license fees translates into an increase in fees of about 20 percent to 35 percent.

The basis for this analysis is as follows. Part C of the detailed survey asked the respondent for the portion of the budget due from user fees, such as angler licenses, commercial fishing licenses, car vanity plates, and special purpose stamps. EPA examined the number of facilities that could pass through increased costs to the public through increased user fees and, where user fees were already in place, the size of the increase needed to cover the incremental costs. If the facility reports no revenue from user fees it is classified as no increase possible. Based on information presented in Table 3-7, user fee increases between 20 and 35 percent are not uncommon when they occur. Although all States report having fishing license fees, if a state hatchery reports no funding from user fee sources, EPA considers that facility to be unable to recoup increased costs through increased funding from user fees.

EPA believes that State facilities that receive user fee funds are those that are heavily invested in stocking streams for recreational angling (i.e., user fees are used to supply the fish that users catch). The availability of user fees might demonstrate additional flexibility in meeting additional costs, such as facilities that are facing higher compliance costs; these might be given access to user fee funds. As such, access to user fees might indicate greater flexibility to absorb additional costs associated with EPA's final regulation. The examples presented in this report of increases in user fees that States might be willing to adopt (e.g., ranges from 20 percent to 35 percent increase in a given year for States for which we were able to obtain data since 1980) demonstrates that States do in fact have the capacity to seek out additional funds, part of which goes to fish rearing facilities. EPA concludes, therefore, that States have demonstrated capacity to plan for increased costs, including potential compliance costs.

3.3.4 Alaska Nonprofits

Alaskan facilities perform ocean ranching where salmon smolts are released to the ocean. The members of the non-profit corporation are allowed to harvest adult fish that return to that region. These are reported as operator revenue. In addition, nonprofit hatcheries may allow region permit holders to vote for a self-imposed "enhancement tax" on the value of fish caught in that region (i.e., by member and non-member fishermen). EPA analyzed the impact of potential costs on Alaska nonprofit facilities by comparing the pre-tax analyzed cost to reported salmon revenues for 2001 in Alaska (2002). That is, grants, enhancement tax revenue, and income from miscellaneous sources such as visitor centers are excluded from the comparison.

3.4 EPA DECISION MATRIX FOR ECONOMIC ACHIEVABILITY

In general, effluent limitations guidelines represent the best economically achievable performance of facilities in the industrial subcategory or category ("Best Available Technology Economically Achievable" or "BATEA").[12] The Clean Water Act establishes BAT as a principal national means of controlling the direct discharge of toxic and nonconventional pollutants. The factors considered in assessing BAT include the cost of achieving BAT effluent reductions, the age of equipment and facilities involved, the process employed, potential process changes, non-water quality environmental impacts including energy requirements, economic achievability, and such other factors as the Administrator deems appropriate. The Agency retains considerable discretion in assigning the weight to be accorded these factors. Generally, EPA determines economic achievability on the basis of total costs to the industry and the effect of compliance with BAT limitations on overall industry and subcategory financial conditions. As with BPT, where existing performance is uniformly inadequate, BAT may reflect a higher level of performance than is currently being achieved based on technology transferred from a different subcategory or category. BAT may be based upon process changes or internal controls, even when these technologies are not common industry practice.

EPA's assessment of economic achievability for the final Concentrated Aquatic Animal Production (CAAP) regulation is complicated by the division of impacts across public and private facilities; as such, a single measure of economic achievability is not feasible. EPA's decision process for this final regulation is described below.

3.4.1 Commercial Facility Impacts

The primary measure of achievability for regulated commercial facilities is EPA's facility closure analysis. Secondary measures of moderate economic impacts include the sales or revenue tests, assuming a 5 percent criterion for a ratio of annual compliance cost to annual revenue, along with other measures of financial health and borrowing capacity (see Section 3.2.2). EPA also considers accompanying indirect and induced impacts on regional and national output and employment, given the results of its facility closure analysis.

[12] Sec. 304(b)(2) of the CWA

The 5 percent threshold value that EPA uses for its sales test indicating potential "moderate" impacts are those the Agency has determined to be appropriate for this rulemaking and are also consistent with threshold values established by EPA in previous regulations. Generally, EPA's analyses have assumed that sales tests less than 5 percent indicate compliance costs that are achievable (see, for example USEPA 1994). Other analyses have assumed the same threshold but have further assumed that ratio values in excess of 5 percent may constitute moderate impacts, taking into consideration other factors (USEPA 2000b, and 1997). Sales impacts were assessed separately from those impacts that may make a facility vulnerable to closure. For the final effluent guideline for Concentrated Animal Feeding Operations (CAFO), EPA defined farm operations with sales tests exceeding 5 percent but less than 10 percent as likely to incur moderate impacts (assuming simultaneously, positive cash flow or net income and acceptable debt to asset ratios), and, correspondingly, EPA defined farm operations with sales tests exceeding 10 percent as likely to indicate 'stressful' impacts (i.e., vulnerable to closure). For more information, see EPA's Economic Analysis supporting the final CAFO regulations; EPA, 2002a.

For the purposes of assessing economic achievability, EPA assumes that the costs of the rule are not passed on to consumers, see Section 3.6 for a more detailed discussion.

3.4.2 Noncommercial Facility Impacts

Measures of achievability for regulated public facilities are restricted to the ratios of annual compliance costs to annual operating budgets, given the limited financial data and information on how to evaluate public facilities. EPA modeled the budget test, in part, on the sales test and chose the same thresholds to represent moderate and adverse impacts. In a sales test, the denominator in the ratio is sales (i.e., cost plus profit). In a budget test, the denominator is cost. Hence, a budget test is likely to be more stringent than a comparable sales test because of the absence of profit in the denominator.

For the purposes of this analysis, EPA assumes that those facilities that face costs exceeding 10 percent of their budget would be adversely affected by the final regulation, unless they are able to raise user fees to cover these costs. Operations where costs exceed 5 percent are considered to experience moderate impacts. EPA believes the 5 percent threshold value is reasonable given that noncommercial facilities obtain their operating revenues through Federal and State budget processes, which tend to more predictable year-to-year. Noncommercial facilities are also less susceptible to variability in overall market conditions that affect commercial operations. The use of a 10 percent benchmark as indicating possible adverse affects is also consistent with that assumed by EPA in previous regulations for commercial facilities (e.g., final CAFO regulations, see EPA, 2002a).

3.5 BARRIER-TO-ENTRY FOR NEW OPERATIONS

New Source Performance Standards (NSPS)[13] reflect effluent reductions that are achievable based on the best available demonstrated control technology. New facilities have the opportunity to install the best and most efficient production processes and wastewater treatment technologies. As a result, NSPS should represent the most stringent controls attainable through the application of the best available demonstrated control technology for all pollutants (i.e., conventional, nonconventional, and priority

[13] Sec. 306 of the CWA.

pollutants). In establishing NSPS, EPA is directed to take into consideration the cost of achieving the effluent reduction, any non-water quality environmental impacts, and energy requirements.

Typically, EPA evaluates impacts on new source facilities by comparing the costs borne by new source facilities to those estimated for existing sources. Accordingly, if the expected cost to new sources is similar to or less than the expected cost borne by existing sources (and that cost is considered economically achievable for existing sources), EPA considers that the regulations for new sources do not impose requirements that might grant existing operators a cost advantage over new source operators and further determines that the NSPS is affordable and does not present a barrier to entry for new facilities. If the expected cost to new sources is much greater than the cost borne by existing sources, this could discourage the start-up of new businesses who might not be able to compete with existing lower cost producers. In general, the costs to new sources from NSPS requirements are lower than the costs for existing sources because new sources are able to apply control technologies more efficiently than existing sources, which may incur high retrofit costs. Not only will new sources be able to avoid the retrofit costs incurred by existing sources, new sources might also be able to avoid the other various control costs facing some existing producers through careful site selection. If the requirements promulgated in the final regulation do not give existing operators a cost advantage over new source operators, then EPA assumes new source performance standards do not present a barrier to entry for new facilities.

For this analysis, EPA examines whether new aquaculture facilities would face barriers to entry because of the incremental pollution control costs under the final regulation. A barrier to entry analysis addresses the question whether the costs of incremental pollution control would increase the initial investment to the point where the person would change his/her mind on whether to start an operation.

The analysis include all facilities within the scope of the rule including those that fail the baseline discounted cash flow analysis. That is, the barrier to entry analysis includes facilities deemed to be "baseline closures" in the discounted cash flow analysis. Whether incremental costs constitute a barrier to entry is a different question from whether an unprofitable operation should continue to operate. For example, a failing site might incur zero costs under an option and that datum point should be retained in the analysis.

First, EPA examined the proportion of commercial facilities that incur no costs under each option. See EPA's *Development Document* for cost information (USEPA, 2004). Second, EPA examined the proportion of commercial facilities with no land or capital costs under each option. These comparisons examine facility costs and the calculations are the weighted proportions. Third, EPA examined the company average ratio of land and capital costs to total assets. This comparison is calculated on company data because asset data were collected only at the company level. Facility weights cannot be used for the company analyses. In this case, EPA calculates the ratio for each company and then uses the average of the ratios.

3.6 MARKET IMPACTS

EPA was not able to conduct a market model analysis for this rule for the following reasons. First, it is difficult to model this market given the interaction between commercial and noncommercial operations. For example, trout are raised commercially, but also for restoration and recreation. Second, wild catch accounts for a large share of the market for some species. For example, Alaskan salmon is considered a wild catch. Third, USDA Aquaculture Census data indicate that there is a high degree of concentration of specific species, such as trout and some other food fish. Fourth, there is insufficient data and analytical information to conduct this analysis. Specifically, literature on estimated measures of elasticity of supply and demand is limited and exist for only a few species, such as catfish which are not covered by this regulation. Elasticity measures do not exist for most other fish species. Because EPA was not able to conduct a market model analysis for this rule, the Agency is not able to report quantitative estimates of changes in overall supply and demand for aquaculture products and changes in market prices.

In addition, despite the fact that EPA does not have access to a market model as part of its analysis, there are other indications that long-term shifts in supply associated with this rule are unlikely given the dynamics of the U.S. aquaculture market. Specifically, the U.S. faces significant foreign competition from net-exporting nations and internal competition from wild catch and recreational catch harvests, among other factors.

These factors support EPA's approach of assuming that aquaculture producers are unable to pass on increased costs associated with this final regulation. This section discusses EPA rational for assuming that aquacultural producers are unable to pass on increased costs associated with this final regulation, which further highlights the Agency's determination that long-term shifts in supply associated with this rule are unlikely. Section 3.6.1 discusses the role of U.S. aquaculture compared to the world market. Section 3.6.2 reviews the competition within the U.S. from wild harvests and recreational fishing. Section 3.6.3 discusses industry concentration and producer-processor relationships and Section 3.6.4 is a summary.

3.6.1 U.S. Aquaculture Compared to Other World Aquaculture Markets

To evaluate the potential for trade and U.S. market impacts due to the final regulation, EPA collected information on world aquaculture from two sources: United Nations Food and Agriculture Organization (FAO) and U.S. National Marine Fisheries Service (NMFS). The numbers vary between the reports but the overall feature—the relatively minor position of the U.S. within world aquaculture—is consistent. FAO reports that total aquaculture production (including aquatic plants) was 45.7 million metric tons by weight and $56.5 billion by value in 2000 (FAO, 2002). China accounted for more than 70 percent of the total by volume and about 50 percent of the total value of world aquaculture production. Other major world producers included India, Japan, Indonesia, Thailand, Thailand, Korea, and several other Southeast Asian countries (Table 3-8).

According to the NOAA's National Marine Fisheries Service, world aquaculture produced 37.9 million metric tons in 2001. Estimated U.S. aquaculture production for 2001 is reported as 0.37 million metric tons or about one percent of total world production (NMFS, 2003). Thus, U.S. production is a small share of world production. Based on other available information, the value of U.S. aquaculture production accounts for roughly 2 percent of the world total. This is based on the reported value of U.S. aquaculture production at almost $1 billion in 2001 (NMFS, 2003), as compared to total world production during that same year, estimated at $56.5 billion including aquatic plants (FAO, 2002). Given the relative size of the U.S. aquaculture market, EPA concludes that the U.S. is unlikely to have much influence on import prices and the United States, in general, is likely a price taker rather than a price setter for aquaculture products.

Table 3-8
Major Aquaculture Producer Countries in 2000

Country	**Quantity (1000 metric tonnes)**	**Value ($Million, US)**
China	32,444	$28,117
India	2,095	$2,166
Japan	1,292	$4,450
Philippines	1,044	$730
Indonesia	994	$2,268
Thailand	707	$2,431
Korea, Republic	698	$698
Bangladesh	657	$1,159
Vietnam	526	$1,096
Rest of World [1]	5,200	$13,400
Total	**45,700**	**$56,500**

Source: FAO, 2002.
[1] Rounded to the nearest hundred. Estimated by EPA.

Farmed fish and other species serve as an important source of food for domestic markets, but exports are also an importance source of foreign trade. The main traded products from aquaculture are shrimp and prawns, salmon, and molluscs (FAO, 2002). In some cases, countries that are not among the top-ranked aquaculture producers in terms of overall production are among the top-ranked countries in terms of trade, particularly for individual fish specie categories. FAO (2002) notes that trade in farmed salmon went from zero to about 1 million metric tons in two decades with the majority of production coming from countries with limited domestic markets such as Norway and Chile. A large share of fish production enters international marketing channels, with about 40 percent exported in 2000 (live weight equivalent) in various food and feed product forms (FAO, 2002).

Across all species of traded fresh and frozen fish and shellfish, data from USDA's ERS indicate that the U.S. is a net-importer of seafood products. Table 3-9 shows the value of U.S. imports and exports of selected seafood products (USDA, 2002, Table 8). In 2001, U.S. exports totaled $0.6 billion, consisting of primarily salmon (frozen Pacific and unspecified canned and prepared salmon). During the same year, U.S. imports totaled $4.8 billion. Shrimp imports (both fresh and frozen) account for more than 75 percent of all imports (Table 3-9).[14] By weight, imports account for more than 40 percent of total

[14] If farmed, shrimp generally are raised in ponds which are not within the scope of the rule.

annual supplies. The U.S. also exports more than two-thirds by weight of its annual production, although mostly in frozen or processed form (Table 3-9). Historical data from USDA show that the gap between imports and exports has continued to widen during the 1990s, as the rate of increase in U.S. imports outpaced growth in U.S. exports.

Table 3-9
2001 Imports and Exports of Selected Seafood Products ($1000)

Product	Imports	Exports	Net
Shrimp, frozen	2,957,944	54,553	2,903,391
Atlantic salmon, fresh	685,289	37,945	647,344
Shrimp, fresh & prepared	678,853	51,481	627,372
Tilapia	127,797	0	127,797
Atlantic salmon, frozen	87,483	139	87,344
Mussels	43,610	1,595	42,015
Ornamental Fish	40,863	6,914	33,949
Oysters	36,914	8,238	28,676
Trout, fresh & frozen	11,507	1,577	9,930
Pacific salmon, fresh	30,462	22,166	8,296
Clams	8,296	6,593	1,703
Trout, live	99	271	(172)
Canned & prepared salmon	36,199	167,825	(131,626)
Pacific salmon, frozen	14,940	236,604	(221,664)
Total	**4,760,256**	**595,901**	**4,164,355**

Source: USDA, 2002.

One of the main reason the U.S. is not a major exporter of seafood products, as well as other types of agricultural products, is attributable in part to the presence of a large domestic market for these products. In the case of aquaculture, for example, although the U.S. exports about 2 million pounds of trout per year, this compares to total U.S. utilization of trout of roughly 100 million pounds annually, valued at about $76 million in 2001 (USDA, 2002). USDA data on U.S. aquaculture production of fresh and frozen trout show that U.S. imported 4.3 million pounds and exported 2.0 million pounds in 2003, consistent with the broader trends across the industry. For live trout, however, the U.S. currently reports a small positive net trade balance.

3.6.2 Intra-national Competition from Wild and Noncommercial or Public Sources

In addition to competition from foreign production, U.S. aquaculturists must also compete internally against the wild seafood harvest and production from noncommercial or public sources.

Production from wild seafood harvest greatly exceed that of farm-produced seafood products. The NMFS term for quantities of fish, shellfish, and other aquatic plants and animals brought ashore and sold is “landings.” U.S. aquaculture’s 2001 production was about 0.9 billion pounds (NMFS, 2003). In contrast, U.S. domestic landings for 2001 totaled 9.5 billion pounds. In terms of weight, wild catch is 11 to 12 times larger than domestic production. See Table 3-10 for a comparison by select species. In terms

Table 3-10
Sources and Uses of Aquaculture Species in the United States, 1998

Species	Units	Aquaculture: Total to Recreation, Restoration	Aquaculture: Total to Food/ End use	Wild Catch [1]	Net Imports	Total Use
Catfish	(1,000 lbs)	10,175	563,934	11,590	1,100	586,799
		2%	96%	2%	0%	100%
Trout	(1,000 lbs)	46,341	47,422	789[1]	4,217	98,769
		47%	48%	1%	4%	100%
Salmon	(1,000 lbs)	291,147	107,160	644,434	42,331	1,085,072
		27%	10%	59%	4%	100%
Tilapia	(1,000 lbs)	0	11,571	0	60,911	72,482
		0%	16%	0%	84%	100%
Hybrid Striped Bass	(1,000 lbs)	612	8,407	6,715	1,927	17,661
		3%	48%	38%	11%	100%
Ornamentals	($1,000)	414	68,568	0	34,563	103,545
		0%	66%	0%	33%	100%
Baitfish	($1,000)	1,537	35,945	0[1]	0	37,482
		4%	96%	0%	0%	100%
Crawfish	(1,000 lbs)	35	17,426	22,226	4,387	44,074
		0%	39.5%	50.4%	10.0%	100%
Shrimp	(1,000 lbs)	8	4,209	277,757	670,212	952,186
		0%	0%	29%	70%	100%
Crab	($1,000)	21	10,276	473,378	295,518	779,193
		0%	1%	61%	38%	100%
Clam	($1,000)	50	50,026	135,237	31,164	216,477
		0%	23%	62%	14%	100%
Mussel	($1,000)	3	3,177	1,604	29,855	34,639
		0%	9%	5%	86%	100%
Oyster	($1,000)	27	26,985	88,627	29,785	145,424
		0%	19%	61%	20%	100%

Source: USDA, 2000b; USDA, 2000c; NMFS, 1998; and NMFS 1999.
[1] Figures shown for wild catch are from NMFS, 1999. Much of the trout and all of the baitfish wild catch is not reported to NMFS. Wild catch will be a substantial factor in both these markets.

of value, in 1998, U.S. aquaculture accounted for $0.9 billion while domestic landings accounted for $3.3 billion. Based on these data, aquaculture represents about 10 percent of the weight and about 30 percent by value compared to wild harvest.

Production from noncommercial or public facilities that primarily raise fish for ecological restoration, or recreation also account for a large share of total U.S. aquaculture production (depending on the species). Many of these fish are grown in government fish hatcheries; others are sold to government entities by commercial growers for stocking. Production decisions for these recreationally oriented growers are not governed by the same types of market forces that influence commercial decision-makers. Much of this production is financed by fishing license fees and other taxes. The ultimate consumers are anglers and those who value a natural environment. They do not make consumption decisions based on the price of stocking fish. Hence there is no market relationship, in the traditional sense, for these fish.

Table 3-10 summarizes the uses of aquaculture products and their sources for 1998 combining information from USDA's *1998 Census of Aquaculture* and National Marine Fisheries Service (NMFS) documents.[15] For example, almost half the trout and three-quarters of the salmon raised in U.S. aquaculture are used for ecological restoration, fee-fishing, or recreation (Table 3-10). Table 3-11 abstracts information from Table 3-10 to graphically illustrate the variety of market types among the aquaculture products.

3.6.3 Industry Concentration and Producer-Processor Relationships

The market structure for the private aquaculture industry is characterized by high facility concentration offset by competing sources and substitutes. USDA's *1998 Census of Aquaculture* data indicate a high degree of concentration at the facility level (USDA, 2000b). In the extreme cases, eight facilities in Texas produce 70 percent of the value of shrimp produced by aquaculture in the U.S. Three percent of the ornamental fish facilities (12 facilities) produce about 60 percent of the value of the industry. Table 3-12 summarizes the share of production from the top ten percent of facilities. Many of the aquaculture production industries are small and highly concentrated both in terms of the number of firms and geographic area (ornamentals, baitfish, salmon, and shrimp).

However, the existence of other sources of production, such as wild catch and imports, and close substitutes may limit the exercise of oligopoly power on the part of aquaculture producers. For salmon, shrimp, and most mollusks, the wild catch is greater than domestic aquacultural production. For baitfish, wild catch is not recorded in the fisheries statistics but is an important part of the market and always an option for anglers if farm-raised baitfish prices rise too high. Even when the wild product is only a close substitute for the farm-raised product, prices for the wild product will influence prices for the aquacultural product. If the wild catch products or imports are setting the price, it is unlikely that aquaculture producers could pass on increased production costs through to consumers and more of the costs of compliance (if not all) will need to be absorbed by the facility.

[15] Table 3-10 was assembled from three different sources so the data in each column may not be comparable to neighboring columns and adding them together may be incorrect. The purpose of the table, however, is to show rough scales of contributions of aquaculture (for recreation and food use), wild catch and imports to total U.S. supply for various species.

Table 3-11
Characteristics of Aquaculture Species Markets

Species	Aquaculture is largest source	Recreation is a large use	Imports... dominate domestic aquaculture	Imports... are a major component	Wild catch... dominates domestic aquaculture	Wild catch... is a major component
Catfish	X	-	-	-	-	-
Trout	X	X	-	-	-	[1]
Salmon	-	X	-	-	X	X
Tilapia	-	-	X	X	-	-
Hyb Striped Bass	X	-	-	X	-	X
Ornamentals	X	-	-	X	-	-
Baitfish	X	-	-	-	-	[1]
Crawfish	-	-	-	-	X	X
Shrimp	-	-	X	X	X	X
Crab	-	-	X	X	X	X
Clam	-	-	-	X	X	X
Mussel	-	-	X	X	-	-
Oyster	-	-	X	X	X	X

Source: Summarized from previous table.
[1] Much of the trout and all of the baitfish wild catch is not reported. Baitfish wild harvest was reported to be 50 percent of market at JSA Aquaculture Effluents Technical Workshop, 9/20/2000. Wild catch will be a substantial factor in both these markets.
Note: "Recreation is a large use" means ecological restoration, fee-fishing, recreational, and government use is greater than 20 percent of total use. "Dominates domestic aquaculture" means wild catch or net trade provides a greater proportion of total use than aquaculture. "Major component" means more than 10 percent of total use.

Table 3-12
Industry Concentration

Species	Top 10 percent of farms: Number of Farms	Top 10 percent of farms: Produce (Percent value)	Total Value ($1,000)
Catfish	137	65%	450,710
Trout	56	72%	72,473
Other Food Fish	44	85%	168,532
Ornamentals	35	75%	68,982
Baitfish	28	67%	37,482
Crustaceans	84	74%	36,318
Mollusks	54	79%	89,128

Source: USDA, 2000b.
Note: Production value categories added together to find top 10 percent.

Like wild catch, a high level of imports reduces the effect of changes in aquacultural production on the market. For tilapia, shrimp, and mussels, imports are a much larger share of the market than domestic aquaculture and undoubtedly have more influence on the market price. The situation for salmon is less straightforward, as the information presented in Tables 3-10 and 3-11 combine Pacific and Atlantic salmon. Also, the U.S. is net-exporter of processed salmon and frozen Pacific salmon, but a net-importer of fresh Atlantic salmon (Table 3-9). Atlantic salmon imports are twice total domestic salmon farm production. There is evidence that Atlantic and Coho salmon are substitutes in some situations (Clayton and Gordon, 1999). Whatever the precise relationships, trade flows have a large effect on the prices of many aquaculture products.

The largest segment of the U.S. aquaculture industry is catfish and is characterized by producers selling their goods to processors. USDA's *Aquaculture Outlook* and *Catfish Processing* reports the price paid by processors for farm-raised catfish and the average price received by processors for the final product (USDA, 2004b). However, catfish are raised mostly in ponds and not in the scope of the rule.

The salmon segment is marked by a limited number of companies. Some of these also own processing facilities as well, however, the pressure from imports will keep them from raising prices.

USDA (2004c) indicates that about 70 percent of food size trout (12 inches or longer) are sold to processors. In contrast, smaller-sized trout (between 6 to 12 inches) tend to be sold for to fee fishing operations (54 percent), the government (13.8 percent), and other producers (12 percent). Producers of food size trout are unlikely to have much market power because the majority of the fish are sold to processors. Producers of smaller trout have to compete with wild, recreational catch because most of their fish go to fee fishing operations. Finally, the trout segment is marked by many relatively small producers and thus trout producers have little ability to control prices.

3.6.4 Summary

In summary, EPA believes that its "no-cost-pass-through" assumption for the purposes of conducting its closure analysis is justified for the reasons discussed in this section. First, U.S. aquaculture production is small relative to the world market and the U.S. faces significant foreign competition from imports other lower-cost, net-importing nations. Second, U.S. aquaculture production also competes internally with production from both wild catch and recreational catch. Third, despite signs of concentration in these industries, the existence of other sources of production (e.g., wild catch, imports, and other close substitutes) may limit the ability of producers to control prices.

In addition, aquaculture operators are likely to have limited ability to pass on costs or negotiate higher product price, due in part to their position as suppliers of inputs to a complex chain of processors, wholesalers, and retailers (i.e., aquaculture operators have little influence over prices). Farmers are at the bottom of a long food marketing chain (including processors, wholesalers, retailers etc.) and cannot influence prices. Also, in part, this is attributable in part to imperfect market conditions characterized by "buyer" concentration (i.e., there are "few buyers" in the food processing and retail sectors relative to "many sellers" in the farm sector) and conditions of oligopsony/monopsony (Rogers and Sexton, 1994). Other factors include the competitive nature of agricultural production and the dynamics of the food marketing system. For more information, see EPA's Economic Analysis supporting the final CAFO regulations (USEPA, 2002a).

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