

Chapter F6: Benefits Analysis for the Brayton Point Station

This chapter presents the results of EPA’s evaluation of the economic benefits associated with reductions in estimated current I&E at the Brayton Point Station. The economic benefits that are reported here are based on the values presented in Chapters F4 and F5, and EPA’s estimates of current I&E at the facility (discussed in Chapter F3). Section F6-1 summarizes the estimates of economic loss developed using the benefits transfer (BT) approach, presented in Chapter F4, and the habitat replacement cost (HRC) approach, presented in Chapter F5. Section F6-2 discusses the benefits of potential impingement and entrainment reductions using both the BT and the HRC approaches. Section F6-3 discusses the uncertainties in the analysis.

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F6-1 SUMMARY OF CURRENT I&E AND ASSOCIATED ECONOMIC IMPACTS

The flowchart in Figure F6-1 summarizes how the economic estimates were derived from the I&E estimates presented in Chapter F3 and summarized in Tables F4-2, F4-3, F4-9 and F4-10. Figures F6-2 and F6-3 indicate the distribution of I&E losses by species category and associated economic values. These diagrams reflect losses with current technologies. All dollar values and loss percents reflect midpoints of the ranges for the categories of commercial, recreational, nonuse and forage species impacts.

The baseline economic loss due to I&E at Brayton Point Station was calculated in Chapters F4 and F5. In Chapter F4, total economic loss was estimated using a benefits transfer approach to estimate the commercial, recreational, forage, and nonuse values of fish lost to I&E. This is a demand driven approach, i.e., it focuses on the values that people place on fish. In Chapter F5, total economic loss was estimated by calculating the cost to increase fish populations using habitat restoration techniques. This is a supply driven approach, i.e., it focuses on the costs associated with increasing fish populations.

The total annual economic losses associated with each method are summarized in Table F6-1. These values range from \$9,000 to \$873,000 for impingement, and from \$230,000 to \$27.7 million for entrainment. The range of economic loss is developed by taking the midpoint of the benefits transfer results and the 90th percentile species results from the HRC approach.

Table F6-1: Total Baseline Economic Loss from I&E (2000\$, annually)		
	Impingement	Entrainment
Benefits transfer approach (demand driven approach from Chapter F4) ^a	\$9,077	\$230,001
Habitat replacement cost approach (supply driven approach from Chapter F5) ^b	\$873,400	\$27,732,900
Range	\$9,077 to \$873,400	\$230,001 to \$27,732,900

NA = not yet available.

^a Midpoint of Range from Chapter F4.

^b Based on cost to restore 90th percentile species impacted. Note that the lower bound estimates from the HRC approach reflect restoration of only half the impacted fish species (i.e., the 50th percentile). As such, the low end values for HRC were not considered in establishing the range of losses.

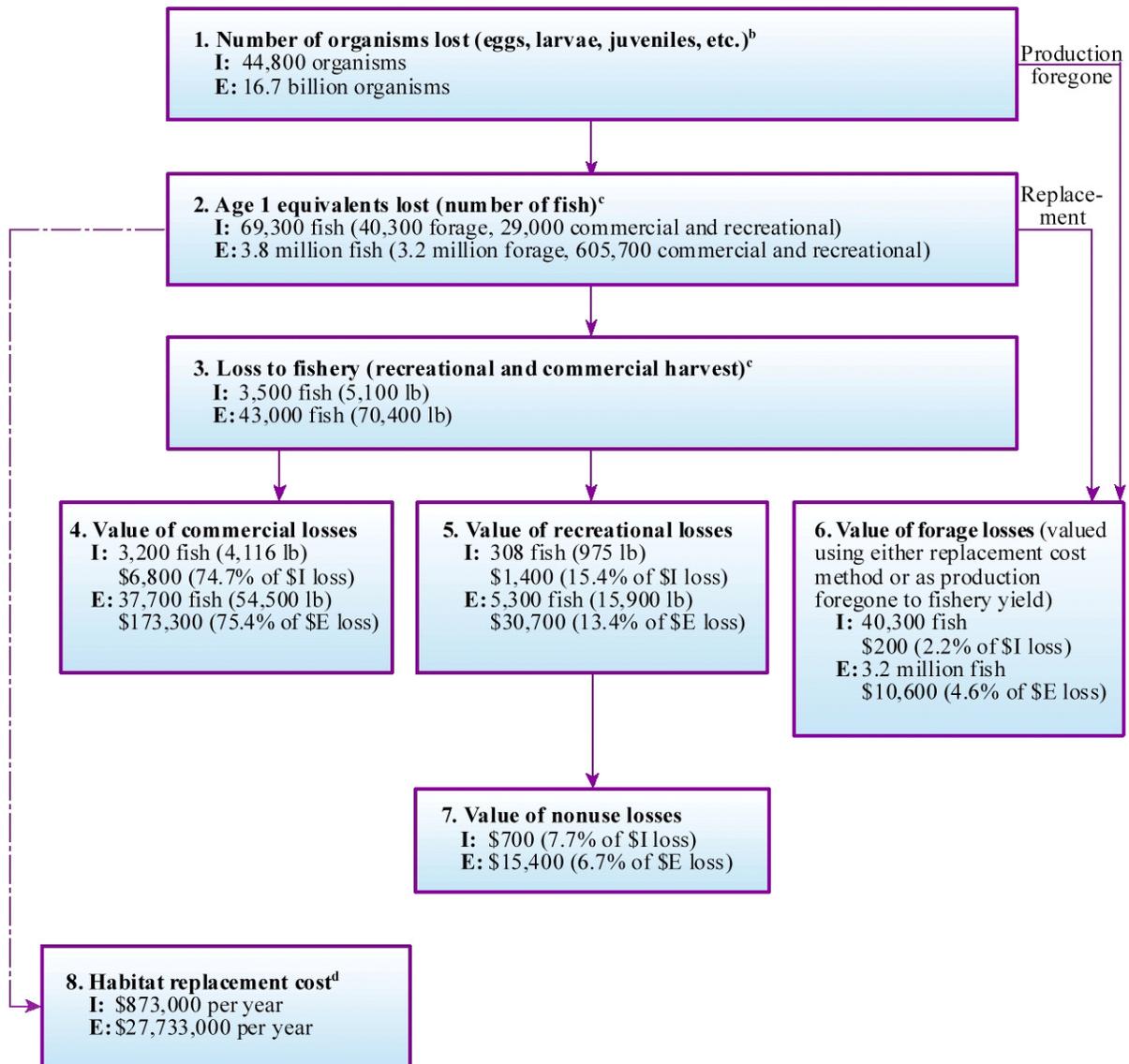
F6-2 POTENTIAL ECONOMIC BENEFITS DUE TO REGULATION

Table F6-2 summarizes the total annual benefits from I&E reductions, as well as remaining economic losses, under scenarios ranging from 10 percent to 90 percent reductions in I&E. Table F6-3 considers the benefits of two options with varying percent reductions of I&E. Table F6-3 indicates that the benefits of one option are expected to range from \$2,000 to \$175,000 for a 20 percent reduction in impingement and from \$92,000 to \$11.1 million for a 40 percent reduction in entrainment. The benefits of another option range from \$5,000 to \$524,000 for a 60 percent reduction in impingement and from \$138,000 to \$16.6 million for a 60 percent reduction in entrainment.

Table F6-2: Summary of Current Economic Losses and Benefits of a Range of Potential I&E Reductions at Brayton Point Station (\$2000)				
		Impingement	Entrainment	Total
Baseline Losses	low	\$9,000	\$230,000	\$239,000
	high	\$873,000	\$27,733,000	\$28,606,000
Benefits of 10% reductions	low	\$1,000	\$23,000	\$24,000
	high	\$87,000	\$2,773,000	\$2,861,000
Benefits of 20% reductions	low	\$2,000	\$46,000	\$48,000
	high	\$175,000	\$5,547,000	\$5,721,000
Benefits of 30% reductions	low	\$3,000	\$69,000	\$72,000
	high	\$262,000	\$8,320,000	\$8,582,000
Benefits of 40% reductions	low	\$4,000	\$92,000	\$96,000
	high	\$349,000	\$11,093,000	\$11,443,000
Benefits of 50% reductions	low	\$5,000	\$115,000	\$120,000
	high	\$437,000	\$13,866,000	\$14,303,000
Benefits of 60% reductions	low	\$5,000	\$138,000	\$143,000
	high	\$524,000	\$16,640,000	\$17,164,000
Benefits of 70% reductions	low	\$6,000	\$161,000	\$167,000
	high	\$611,000	\$19,413,000	\$20,024,000
Benefits of 80% reductions	low	\$7,000	\$184,000	\$191,000
	high	\$699,000	\$22,186,000	\$22,885,000
Benefits of 90% reductions	low	\$8,000	\$207,000	\$215,000
	high	\$786,000	\$24,960,000	\$25,746,000

Table F6-3: Summary of Benefits of Potential I&E Reductions at Brayton Point Station (\$2000)				
		Impingement	Entrainment	Total
20% reduced impingement and 40% reduced entrainment	low	\$2,000	\$92,000	\$94,000
	high	\$175,000	\$11,093,000	\$11,268,000
50% reduced impingement and 60% reduced entrainment*	low	\$5,000	\$138,000	\$143,000
	high	\$524,000	\$16,640,000	\$17,164,000

Figure F6-1: Overview and Summary of Average Annual I&E at Brayton Point Station and Associated Economic Values (based on I&E averaged over the period 1974-83 and adjusted for current operations; all results are annualized)^a



^a All dollar values are the midpoint of the range of estimates.

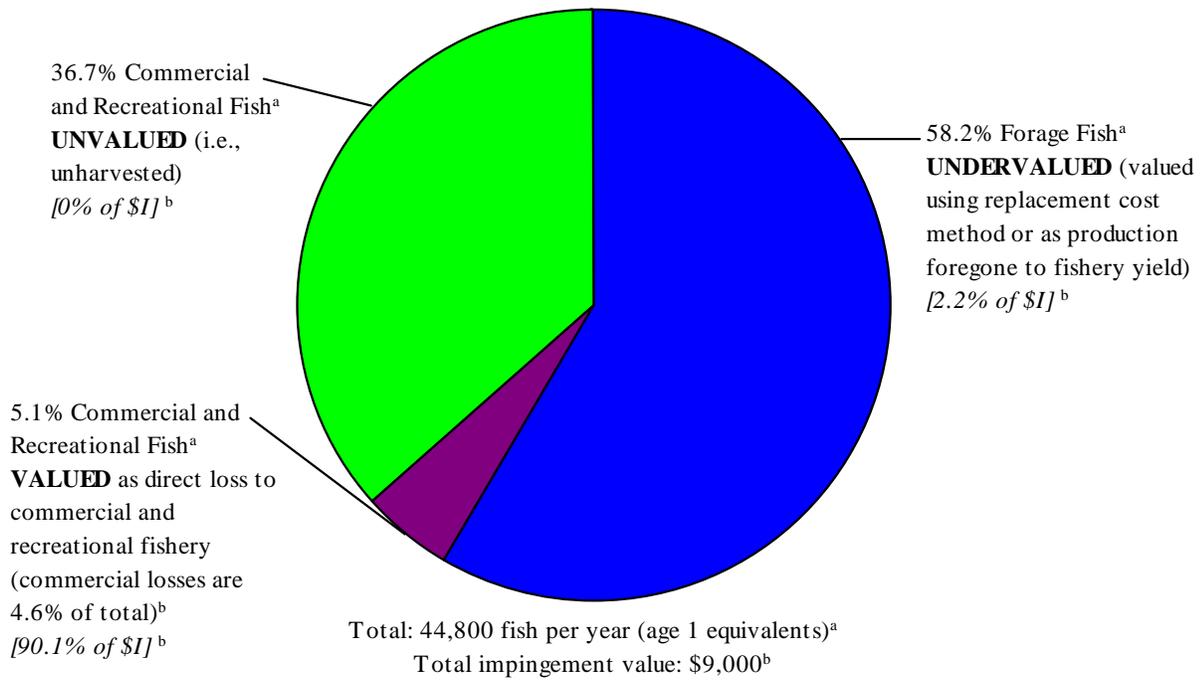
^b From Table F3-10 of Chapter F3.

^c From Tables F4-2, F4-3, F4-9, and F4-10 of Chapter F4.

^d Excluding estimated HRC costs for artificial reef emplacement, as discussed in Chapter F5.

Note: Species with I&E <1 percent of the total I&E were not valued.

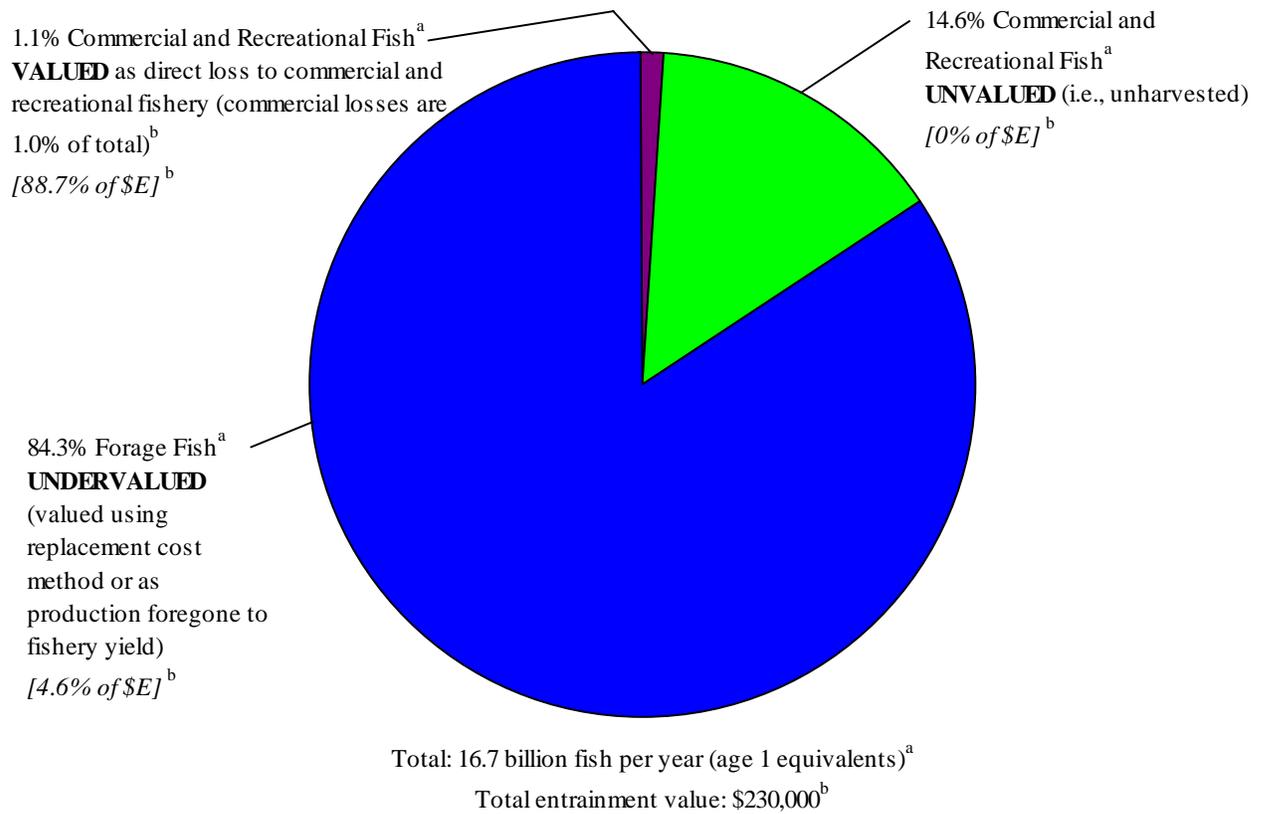
Figure B6-2: Brayton Point: Distribution of Impingement Losses by Species Category and Associated Economic Values



^a Impacts shown are to age 1 equivalent fish, except impacts to the commercially and recreationally harvested fish include impacts for all ages vulnerable to the fishery.

^b Midpoint of estimated range. Nonuse values are 7.7 percent of total estimated \$I loss.

Figure F6-3: Brayton: Distribution of Entrainment Losses by Species Category and Associated Economic Values



^a Impacts shown are to age 1 equivalent fish, except impacts to the commercially and recreationally harvested fish include impacts for all ages vulnerable to the fishery.

^b Midpoint of estimated range. Nonuse values are 6.7 percent of total estimated \$E loss.

F6-3 SUMMARY OF OMISSIONS, BIASES, AND UNCERTAINTIES IN THE BENEFITS ANALYSIS

Table F6-4 presents an overview of omissions, biases, and uncertainties in the benefits estimates. Factors with a negative impact on the benefits estimate bias the analysis downward, and therefore would raise the final estimate if they were properly accounted.

Issue	Impact on Benefits Estimate	Comments
Used data from 1974-1983 as baseline for calculating I&E figures	Understates benefits ^a	There is data suggesting a plant-impacted declining fishery before 1985. Therefore numbers based on 1974-1983 may underestimate the full impact that Brayton I&E would have on a healthy fishery.
Long-term fish stock effects not considered	Understates benefits ^a	EPA assumed that the effects on stocks are the same each year, and that the higher fish kills would not have cumulatively greater impact.
Effect of interaction with other environmental stressors	Understates benefits ^a	EPA did not analyze how the yearly reductions in fish may make the stock more vulnerable to other environmental stressors. In addition, as water quality improves over time due to other watershed activities, the number of fish impacted by I&E may increase.
Recreation participation is held constant ^a	Understates benefits ^a	Recreational benefits only reflect anticipated increase in value per activity outing; increased levels of participation are omitted.
Boating, bird-watching, and other in-stream or near-water activities are omitted ^a	Understates benefits ^a	The only impact to recreation considered is fishing.
Did not count benefits for artificial reef installation for the tautog	Uncertain	As explained above in Section F5-6.3, the available information suggests very high restoration costs to offset I&E losses for just the tautog, which makes up only 0.8 percent of the I&E losses at Brayton Point. This result may be correct, but further investigation of potential tautog productivity at reefs is warranted. Therefore, EPA did not include these values in the HRC total benefits estimate.
HRC based on capture data assumed to represent age 1 fish	Understates benefits ^a	High percent of less than age 1 fish observed in capture data, thereby leading to potential underestimate of scale of restoration required.
Effect of change in stocks on number of landings	Uncertain	EPA assumed a linear stock to harvest relationship (e.g., that a 13 percent change in stock would have a 13 percent change in landings); this may be low or high, depending on the condition of the stocks.
Nonuse benefits	Uncertain	EPA assumed that nonuse benefits are 50 percent of recreational angling benefits.
Recreation values for various geographic areas	Uncertain	Some recreational values used are from various regions beyond the Brayton Point region.

^a Benefits would be greater than estimated if this factor were considered.