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Local Economic Contribution of Trout and Salmon Production at McNenny State Fish Hatchery, Spearfish, South Dakota, USA

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Abstract

McNenny State Fish Hatchery, Spearfish, South Dakota, USA primarily produces trout and salmon for stocking into public recreational fishing waters in South Dakota. Hatchery operations at McNenny are funded solely by the sale of hunting and fishing licenses and an excise tax on fishing equipment. This analysis evaluated the contribution of hatchery expenditures and trout and salmon production on the economy of South Dakota for calendar year 2025. The statewide economic contribution attributable to hatchery operations in 2025 was estimated to be $120,000,000. Based on annual hatchery expenditures, the hatchery generated $133 of statewide economic output for every budgetary dollar spent in 2025.

Keywords

Fishing, Production, Economic Output

1. Introduction

Fishing is the second most popular form of outdoor recreation in the United States (Outdoor Industry Association, 2018) and is an important part of the national economy (Bureau of Economic Analysis, 2018). In 2018, 49.4 million Americans fished, continuing an upward trend in the number of participants since 2007 (Outdoor Industry Association, 2019). Almost $50 billion in retail sales was generated by these anglers, providing income for more than 800,000 people (USFWS, 2018). Aquaculture production by publicly-owned hatcheries is essential for recreational fishing, as well as fisheries conservation and restoration in the United States (Jackson et al., 2004; Chilton, 2017; USFWS, 2020; Department of Environmental Conservation, 2026). In 2013, government-run hatcheries produced over 26,000 met-

ric tons of fish for recreational stockings (USDA, 2014). Hatchery-reared fish stocked into public fishing waters can have considerable economic benefits (Johnson & Walsh, 1987; Caudill, 2005, 2007; USFWS, 2006).

The South Dakota Department of Game, Fish and Parks, an agency of South Dakota state government, owns and operates three fish hatcheries, producing nearly 300,000 pounds of fish in 2025 (SDGFP, 2026). The state, just like many other governmental agencies in North America, stocks a large number of rainbow trout (*Oncorhynchus mykiss*) and these fish are mostly stocked at large, catchable sizes (Kerr & Lasenby, 2000; MacCrimmon, 1971; USDA, 2014). Rainbow trout and other salmonids are not native to South Dakota and natural reproduction is very limited, requiring the regular stocking of hatchery-produced trout and salmon to maintain recreational angling opportunities (Barnes, 2007). McNenny State Fish Hatchery in Lawrence County produced approximately one-half of the total biomass of rainbow trout and other salmonid species stocked in South Dakota in 2025.

The first economic contribution analysis of McNenny Hatchery was conducted by Barnes and Palmer (2019). This, one of a very few analyses focusing entirely on an individual hatchery, was conducted for the 2017 production year. Subsequently, Martling et al. (2020) used similar methodology to determine the economic contribution of Cleghorn Springs State Fish Hatchery, another South Dakota state-owned and operated fish hatchery in Rapid City, South Dakota. Economic contributions have been quantified for trout production on the federal level in the United States (USFWS, 2006) and for individual fisheries maintained by hatchery-produced fish (Johnson & Walsh, 1987; Caudill, 2007). Understanding the economic contributions of public hatchery operations is extremely important, given the stewardship obligations of governmental agencies, such as the South Dakota Department of Game, Fish and Parks (SDGFP, 2015). Because there have been considerable changes at McNenny Hatchery in the eight years since Barnes and Palmer (2019) initial economic investigation, this study was undertaken. Thus, the objective of this analysis was to reassess the economic contribution of fish production at McNenny State Fish Hatchery in 2025, using new data and updated methodology.

2. Methods

The economic contribution of McNenny State Fish Hatchery operations was assessed by aggregating the direct, indirect, and induced effects of both hatchery operational expenditures and recreational angler spending attributable to the trout and salmon produced and stocked by McNenny Hatchery. Direct effects are the initial financial injections into the economy. Indirect and induced effects comprise the multiplier effect occurring as the direct spending ripples through the South Dakota economy. Indirect effects are the multiplicative impacts of subsequent rounds of purchases made by linked industries within the supply chain (Windfeld & Lhermie, 2022). Induced effects are the multiplicative impacts of

household spending generated by the salaries supported within those related industries (Malik & Palmeiri, 2008). To calculate the total economic contribution, direct operational and recreational expenditures attributable to McNenny activities were estimated and then augmented to capture the indirect and induced outputs by industry-specific regional economic multipliers from the U.S. Bureau of Economic Analysis's Regional Input-Output Modeling System II (RIMS-II).

2.1. Direct Effects of Recreational Expenditures

To determine share of angler expenses in South Dakota attributable to McNenny Hatchery, distinct methodologies were used for the three primary regions stocked by the hatchery: Black Hills Eastern South Dakota, and Lake Oahe, a mainstem reservoir of the Missouri River located in central South Dakota. To measure the economic contribution of trout and salmon stocking into Black Hills public fishing waters, trip-related angler expenses of $64,123,560 and equipment expenses of $27,176,818 were combined to produce a total of $91,300,378 in trout and salmon angling-related spending for the region in 2021 (Southwick Associates, 2022). This value was adjusted to 2025 dollars using a CPI (Consumer Price Index) inflation multiple of 1.1623087 (Bureau of Labor Statistics, 2026), resulting in $106,119,223 in total Black Hills angler spending. Because nearly all fish in the Black Hills are stocked, naturally reproducing fish were excluded from the analysis. The inflation-adjusted value was then prorated by McNenny's share of fish stockings in the Black Hills by biomass (50% based on stocking records), yielding Black Hills angler expenses of $53,059,611 directly attributable to McNenny stockings.

Direct angler expense data for eastern South Dakota public fishing waters were not available. Because of the similarity in fish methods, distances traveled, and angler demographics, it was assumed that angler behavior and spending for rainbow trout stockings from McNenny were similar between the Black Hills and eastern South Dakota regions. The economic contribution of eastern South Dakota stockings was estimated using Black Hills angler expenses and biomass as a baseline. Based on stocking records, approximately 70% of the fish biomass reared by McNenny is stocked in the Black Hills, whereas 20% is stocked in eastern South Dakota. Using these ratios, the eastern South Dakota angler expenditures attributable to McNenny stockings of rainbow trout were calculated to be $15,159,889.

Chinook salmon (*Oncorhynchus tshawytscha*) production accounted for the remaining 10% of the fish biomass produced at McNenny Hatchery in 2025. All of these salmon are stocked in Lake Oahe. Lake Oahe total angler expenditures were $22.7 million in 2015 (Mark Fincel, 2016). Adjusted to 2025 dollars using a CPI inflation multiple of 1.370 (Bureau of Labor Statistics, 2026), total angler expenditures were an estimated $31,100,416. Approximately 2.7% of anglers target Chinook salmon in Lake Oahe (SDGFP, 2019a). A total of $839,711 in salmon-specific angler expenditures was obtained by multiplying the total angler expenditures by 2.7%. Based on stocking records, 25% of the salmon stocked into Lake

Oahe in 2025 were produced by McNenny Hatchery. Therefore the total salmon expenditures was multiplied by 25%, resulting in an estimated $209,927 in angler spending attributable to McNenny State Fish Hatchery Chinook salmon production and subsequent stocking into Lake Oahe.

Summing the angler expenses attributable to McNenny Hatchery for angling activities for trout and salmon in the Black Hills, eastern South Dakota, and Lake Oahe operations produced a total of $68,429,428 in direct recreational angler expenditures (Table 1).

Table 1. Angler expenditures for three geographical areas stocked with trout and salmon by McNenny State Fish Hatchery, Spearfish, South Dakota, USA.

Geographic Area	Angler Expenditures
Black Hills	$53,059,612
Eastern South Dakota	15,159,889
Lake Oahe	209,928
Total	**$68,429,429**

2.2. Direct Effects of Operational Expenditures

Total McNenny Hatchery expenditures for 2025 were $902,021 (Table 2). Because this study focused solely on state-level economic contributions, out-of-state expenses like fish food and some equipment purchases were omitted. After removing out-of-state expenditures, the operation of McNenny Hatchery generated a direct economic contribution of $778,655 in the state.

Table 2. Overall and in-state expenditures by category in 2025 for McNenny State Fish Hatchery, Spearfish, South Dakota, USA.

	Expenditures	
Category	Overall	In-State
Salaries	$364,496	$364,496
Benefits	88,245	88,245
Travel	64,337	60,971
Contract Services	132,670	132,670
Supplies & Materials	220,697	100,697
Misc. Outlay	31,576	31,576
Total	**$902,021**	**$778,655**

2.3. Indirect and Induced Effects

Indirect and induced effects were calculated from direct spending from both recreational and operational sources using state-level multipliers. For recreational spending, an angling activity multiplier of 0.738 was used, representing the indirect and induced effects (Bushnell & Barnes, 2026). Applying this multiplier to the

direct recreational expenditures resulted in an indirect and induced effect of $50,500,918. Adding the indirect and induced effects with the direct effect of angler spending gave a total angler-related economic contribution attributable to McNenny operations of $118,930,347.

For hatchery operational expenditures, an economic multiplier of 0.665 was applied to account for the indirect and induced effects generated through the supply chain and subsequent household spending (Bushnell & Barnes, 2026). After applying this multiplier to the in-state direct hatchery expenditures, the indirect and induced effect was $517,805. Adding this to the direct effect of operational expenses gave a total operation-related economic contribution of $1,296,460.

2.4. Total Economic Contribution

The total economic contribution was calculated by combining the multiplied effects of both operational and recreational expenditures attributable to McNenny State Fish Hatchery (**Table 3**). The total economic contribution was divided by 2025 hatchery expenditures to determine the amount of economic contribution per budgetary dollar.

Table 3. Total state-level economic contribution of McNenny State Fish Hatchery, Spearfish, South Dakota, USA, including the economic contribution of each expenditure type as calculated from direct, indirect, and induced economic effects.

Expenditure Type	Direct Effect	RIMS-II Multiplier	Indirect and Induced Effect	Economic Contribution
Operational	$778,655	0.665	$517,806	$1,296,460.58
Recreational	68,429,429	0.738	50,500,918	118,930,347.15
Total	**$411,244,590**		**$51,018,724**	**$120,226,807.72**

3. Results

The total economic contribution of McNenny State Fish Hatchery operations to the South Dakota economy in 2025 was an estimated $120 million. The estimated economic contribution per budgetary dollar spent was $133.

4. Discussion

The economic output of $133 per budgetary dollar expenditure for McNenny State Fish Hatchery calculated in this analysis, exceeds the $51.68 previously reported for 2017 by Barnes and Palmer (2019). However, Barnes and Palmer (2019) had a transposition error regarding angler expenses per day, as reported by Martling et al. (2020). In addition, both Barnes and Plamer (2019) and Martling et al. (2020) also likely had a decimal place calculation error. Applying corrections to their original methodology, the 2017 McNenny Hatchery economic contribution per budgetary dollar spent increased to $380. Similarly, correcting the decimal place error in Martling et al. (2020) increases the economic contribution for the budgetary dollar spent in 2019 at Cleghorn Springs State Fish Hatchery from $172 to

$182.

Rather than indicating a true decline in the economic contribution of McNenny State Fish Hatchery or a lower economic contribution for Cleghorn Springs State Fish Hatchery, these differences are likely due to multiple methodological modifications from the initial analyses. First, the current analysis used more conservative methods to attribute angler expenses to McNenny Hatchery operations, generating a lower but possibly more accurate figure. Secondly, this analysis excluded a base value for stocked fish from the economic contribution calculation. Economic value is a conceptual framework and should theoretically be captured within the actual angler expenditures attributable to the hatchery. Third, this analysis incorporated in-state budgetary expenditures as a secondary source of economic contribution alongside angler expenditures. The methodology used in this study accounted for the indirect and induced effects of expenditures, where the original analysis only captured direct effects. Lastly, it is possible that changes over time in overall fish production poundage, coupled with changes in hatchery expenditures which can vary greatly from year-to-year, could explain the differences between the results of this study and those of Barnes and Palmer (2019) and Martling et al. (2020).

The economic contribution of $133 per budgetary dollar spent at McNenny is similar to the $109 to $141 range reported for federal hatcheries stocking smaller, but still catchable-sized, trout in the southeastern portion of the United States (USFWS, 2001). These results are likely comparable because of the high angling pressure for trout during the summer tourist season in the Black Hills (American Sportfishing Association, 2007). The USFWS (2001) also used a methodology similar to that used in this study.

There are several limitations to the methodology utilized in this analysis. Because direct angler expense data for eastern South Dakota trout fishing waters were unavailable, the economic contributions for this region were imputed using Black Hills angler behaviors and expenses. Actual angler spending patterns by eastern South Dakota trout anglers differ from those in the Black Hills. Additionally, the analysis relied heavily on historical spending and survey data to establish current valuations, including data ranging from 2015 to 2021. While the expense figures were adjusted to 2025 values using Consumer Price Index inflation multiples, actual consumer spending behaviors and angler participation rates may have shifted in ways that strict inflation adjustments fail to capture. Further, using the proportion of stocked fish biomass to prorate angler expenditures assumes a direct, 1:1 correlation between the weight of fish stocked and angler dollars spent, which may not fully account for variations in species desirability or specific angler targeting behaviors.

The national-level economic contribution of McNenny Hatchery operations is likely much greater than reported in this analysis. Several large, regular expenditures, such as fish food purchases, were excluded from the analysis because the manufacturer was located outside of South Dakota. Additionally, region-specific

input-output models exclude subsequent rounds of spending in out-of-state transactions. This analysis did not capture the long-term economic contributions of hatchery research and innovation (Griliches, 1979; Williams & Rank, 1998; Bessette, 2003). Although difficult to quantify, the considerable and consistent research output at McNenny likely produces substantial long-term economic benefits both within the South Dakota economy and well beyond the borders of the state (Evenson, 2001; Salter & Martin, 2001; Blanco et al., 2016). Lastly, this analysis also ignored the expenses and values of the relatively small biomass (approximately 1000 kg) of other fish species, which included 900 catchable-sized channel catfish *(Ictalurus punctatus*), 1,900 catchable-sized bluegill (*Lepomis macrochirus*), and 1,100,000 walleye (*Sander vitreus*) fry produced in a recirculating aquaculture system in 2025 at McNenny Hatchery.

The economic contribution of McNenny Hatchery reported in this study further confirms that hatchery rearing and stocking of trout and salmon for recreational fishing creates substantial economic output across the United States (Johnson & Walsh, 1987; Caudill, 2007; Charbonneau & Caudill, 2010). The total economic contribution of $120 million by McNenny Hatchery occurred without the expenditure of any South Dakota government general tax revenue (SDGFP, 2019b). This indicates that the current user-pay model, whereby anglers pay for hatchery operations by purchasing licenses and fishing equipment, is providing substantial benefits to the non-angling public. Direct spending on outdoor recreation and the associated indirect benefits are a substantial component of the economy of South Dakota (Tourism Economics, 2017).

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

American Sportfishing Association (2007). *State and National Economic Effects of Fishing, Hunting and Wildlife-Related Recreation on U.S. Forest Service-Managed Lands*.

Barnes, M. E. (2007). Fish Hatcheries and Stocking Practices: Past and Present. In C. Berry, K. Higgins, D. Willis, & S. Chipps (Eds.), *History of Fisheries and Fishing in South Dakota* (pp. 267-294). South Dakota Department of Game, Fish and Parks, Pierre.

Barnes, M. E., & Palmer, T. (2019). Economic Impact of McNenny State Fish Hatchery, Spearfish, South Dakota, Usa. *Modern Economy*, *10*, 1581-1588. https://doi.org/10.4236/me.2019.106104

Bessette, R. W. (2003). Measuring the Economic Impact of University-Based Research. *The Journal of Technology Transfer*, *28*, 355-361. https://doi.org/10.1023/a:1024917601088

Blanco, L. R., Gu, J., & Prieger, J. E. (2016). The Impact of Research and Development on Economic Growth and Productivity in the U.S. States. *Southern Economic Journal*, *82*, 914-934. https://doi.org/10.1002/soej.12107

Bureau of Economic Analysis (2018). *Outdoor Recreation Satellite Account: Updated Statistics for 2012-2016*.

Bureau of Labor Statistics (2026). *CPI Inflation Calculator [Interactive Tool]*. U.S. Depart-

ment of Labor.

Bushnell, R. C., & Barnes, M. E. (2026). Economic Contribution of Hatchery-Reared Walleye Stocked in South Dakota, USA. *Modern Economy*, *17*, 14-25. https://doi.org/10.4236/me.2026.171002

Caudill, J. (2005). *The Economic Effects of Rainbow Trout Stockings by Fish and Wildlife Service Hatcheries in FY 2004*. U.S. Fish and Wildlife Service, Division of Economics.

Caudill, J. (2007). *The Economic Impacts of Trout Stocking on Tailwaters in the Southeast Aquatic Resources Partership (SARP)*. U.S. Fish and Wildlife Service, Division of Economics.

Charbonneau, J. J., & Caudill, J. (2010). *Conserving America's Fisheries. An Assessment of Economic Contributions from Fisheries and Aquatic Resource Conservation*. U.S. Fish and Wildlife Service, Division of Economics.

Chilton, G. (2017). *Fish Propagation Annual Report for 2016*. Fish Division, Oregon Department of Fish and Wildlife.

Department of Environmental Conservation (2026). *DEC Fish Hatcheries*. Department of Environmental Conservation. https://dec.ny.gov/things-to-do/freshwater-fishing/hatcheries

Evenson, R. E. (2001). Economic Impacts of Agricultural Research and Extension. In B. L. Gardner, & G. C. Rausser (Eds.), *Handbook of Agricultural Economics* (Vol. 1, pp. 573-628). Elsevier.

Griliches, Z. (1979). Issues in Assessing the Contribution of Research and Development to Productivity Growth. *The Bell Journal of Economics*, *10*, 92-116. https://doi.org/10.2307/3003321

Jackson, J. R., Boxrucker, J. C., & Willis, D. W. (2004). Trends in Agency Use of Propagated Fishes as a Management Tool in Inland Fisheries. *American Fisheries Symposium*, *44*, 121-138.

Johnson, D. M., & Walsh, R. G. (1987). *Economic Benefits and Costs of the Fish Stocking Program at Blue Mesa Reservoir, Colorado*. Colorado Water Resources Research Institute.

Kerr, S. J., & Lasenby, T. A. (2000). *Rainbow Trout Stocking in Inland Lakes and Streams: An Annotated Bibliography and Literature Review*. Fish and Wildlife Branch, Ontario Ministry of Natural Resources.

MacCrimmon, H. R. (1971). World Distribution of Rainbow Trout (*Salmo gairdneri*). *Journal of the Fisheries Research Board of Canada*, *28*, 663-704. https://doi.org/10.1139/f71-098

Malik, R. P. S., & Palmeiri, A. (2008). Quantifying Indirect Economic Impacts. In R. Bhatia, R. Cestii, M. Scatasta, & R. P. S. Malik (Eds.), *Indirect Economic Impacts of Dams: Case Studies from India, Egypt, and Brazil* (pp. 101-124). Academic Foundation.

Mark Fincel, B. H. (2016). *Missouri River Strategic Plans.* South Dakota Department of Game, Fish & Parks.

Martling, S., Fletcher, B., & Barnes, M. E. (2020). Economic Impact of Cleghorn Springs State Fish Hatchery, Rapid City, South Dakota, USA. *Modern Economy*, *11*, 1351-1358. https://doi.org/10.4236/me.2020.117096

Outdoor Industry Association (2018). *Outdoor Participation Report*.

Outdoor Industry Association (2019). *Special Report on Fishing*.

Salter, A. J., & Martin, B. R. (2001). The Economic Benefits of Publicly Funded Basic Research: A Critical Review. *Research Policy*, *30*, 509-532.

https://doi.org/10.1016/s0048-7333(00)00091-3

SDGFP (2015). *Strategic Plan 2016-2020*.

SDGFP (2019a). *Creel Survey Reports*.

SDGFP (2019b). *Wildlife and Parks Budget Information*. Division of Wildlife Budget Information.

SDGFP (2026). *2025 Annual Report.* Midstates Printing.

Southwick Associates (2022). *Economic Impact of Hunting, Fishing, Trapping, Boating and Wildlife Viewing in South Dakota*. South Dakota Department of Game, Fish and Parks.

Tourism Economics (2017). *Economic Impact of Tourism in South Dakota*.

USDA (2014). *2012 Census of Agriculture* (Census of Aquaculture (2013), Volume 3, Part 2).

USFWS (2001). *Economic Effects of Trout Production by National Fish Hatcheries in the Southeast*.

USFWS (2006). *Economic Effects of Rainbow Trout Production by the National Fish Hatchery System*. USFWS.

USFWS (2018). *2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation* (FHW/11-NAT [RV]).

USFWS (2020). *National Fish Hatchery System*.

Williams, D., & Rank, A. D. (1998). Measuring the Economic Benefits of Research and Development: The Current State of the Art. *Research Evaluation*, *7*, 17-30. https://doi.org/10.1093/rev/7.1.17

Windfeld, E., & Lhermie, G. (2022). The Value of Canadian Agriculture: Direct, Indirect, and Induced Economic Impacts. *Frontiers in Sustainable Food Systems*, *6*, Article ID: 940968. https://doi.org/10.3389/fsufs.2022.940968