

The Economic Impacts of Carolina Beach Inlet Navigability



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Introduction

Based on discussions between Carolina Beach Inlet Association members and UNCW Professor Chris Dumas at a meeting held on December 17, 2013, in Carolina Beach, NC, the UNCW Swain Center conducted a study of The Economic Impacts of Carolina Beach Inlet Navigability in the spring of 2014. The study was based on existing information (previous studies, existing government databases, etc.) supplemented by a small amount of information from local officials and industry representatives gathered through brief surveys. No large, field survey effort was conducted for this study.

Navigability Scenarios Considered

The study assesses the economic impacts of three Carolina Beach inlet (CBI) navigability scenarios: (1) “Recent, Degraded” Navigability Conditions (conditions since 2010, when federal funding for inlet dredging operations was lost; however, funds have been insufficient to maintain the inlet to proper depth and on a regular maintenance schedule since 2005), (2) “Fully Maintained” Navigability Conditions at design depth of 8 feet, +/- 2 feet., and (3) “Essentially Closed” Navigability Conditions of 4 feet average inlet depth or less.

Study Area

The study attempted to develop economic impact estimates for two economic regions:

- New Hanover County,
- and the state of North Carolina as a whole.

Economic Sectors Considered

An economic impact analysis considers both the direct effects of a change in the economy and the “indirect and induced” (or “multiplier”) effects that follow from the direct effects. In this study, the “change in the economy” is a change in the navigability of Carolina Beach inlet. For the purposes of this study, the direct effects of a change in inlet navigability are any changes that occur in commercial fishing, for-hire fishing, or private boat fishing activity through the inlet. The indirect and induced effects are any changes in the activity of seafood processing and packing businesses, marine services (marina, boatyard, boat servicing, fueling, etc.) businesses, lodging, restaurant, grocery, gas station, etc., businesses resulting from changes in the activities of the directly-affected fishing and boating sectors.

Examples of businesses in Carolina Beach potentially affected by indirect multiplier effects of changes in inlet navigability are presented below:

- Tom's Marine (boat sales and service)
- Joyners Marina (fuel and boat slips)
- Federal Point Yacht Club and Marina
- Snows Cut Marina and Yacht club

- Carolina Beach Boat Yard (working boatyard with travel lift)
- Carolina Beach State park and marina (boat slips and fuel)
- Island tackle and hardware (fishing tackle and boat supplies)
- Bame ACE hardware (fishing tackle and boat supplies)
- Gibbies dock and dine (water front restaurant and bar)
- Maxway store (fishing tackle and boating supplies)
- NAPA auto parts store (boating supplies and parts)
- Martins Mobile Marine repair.
- Shane Snow Marine Construction (Piers and bulkhead)
- Skippy Winner Marine Construction (Piers and bulkhead)
- Cape Fear Dive Shop
- B and B bait and tackle
- Carolina Beach mini storage (boat storage)
- Blue Marlin tackle shop
- Trading post (fishing tackle and bait)

Economic Multiplier Effects

Input-output analysis tracks the flow of dollars between and among businesses, consumers, workers, and government agencies in a study region. Input-output analysis is commonly used by economists to estimate the “multiplier effects” or “ripple effects” of a change in the economy. IMPLAN Professional[®] Input-Output Analysis computer software (Minnesota IMPLAN Group, Inc. 2005) will be used in this study to conduct input-output analysis. IMPLAN is a leading input-output modeling software package used by university researchers, government agencies, and consultants nationwide. The IMPLAN software tracks over five hundred industry sectors, and local, state and Federal government sectors, on a county-by-county basis. The developers of the IMPLAN software also market a county-level database that tracks the flow of dollars between and among businesses, consumers, workers, and government agencies at the county level. The database is developed from government surveys of businesses and consumers, employment data, etc. The IMPLAN software and database will be used together with data supplied by local industry representatives and local governments to estimate economic multiplier effects associated with changes in Carolina Beach Inlet navigability for the economic sectors considered in this study.

The analysis will provide five measures of economic multiplier effects: changes in (1) economic output (sales), (2) employment, (3) payrolls, (4) business profits, and (5) government tax receipts.

Commercial Fishing Economic Impacts--Carolina Beach Inlet Recent (Degraded) Navigability Conditions

Economic Impacts Within New Hanover County

Under current, degraded CBI conditions, \$258,000 in annual sales (output) (Direct Effect) from CBI commercial fishery landings within New Hanover County (see Table 2) support an additional \$252,000 in annual economic multiplier effects within the county, for a total economic impact (Total Effect) within the county of \$510,000 in annual economic output (sales) (see Table 3 below). The multiplier effects are the sales made by industries supporting the commercial fisheries within New Hanover County, such as marinas, boat repair, fuel, etc., and the sales made by other New Hanover County businesses to commercial fisherman and their families as they spend the income from commercial fishing (sales of housing, food, clothing, fuel, etc.). In a similar way, the *difference* between the Direct Effect and Total Effect for each of the other economic variables in the table is the multiplier effect for that variable.

Table 3. Annual Commercial Fishing Impacts Within New Hanover County, Recent (Degraded) Inlet Navigability Conditions

Impact Type	Sales (Output)	Employment	Wage, Salary, and Sole Proprietorship Income	Dividend, Rent, and Interest Income	State and Local Taxes	Federal Taxes
Direct Effect	\$258,000	20	\$50,440	\$32,205		
Total Effect	\$510,000	43	\$68,997	\$43,653	\$24,942	\$30,762

Economic Impacts Statewide

The statewide impacts of the commercial fishing supported by CBI differ from those presented for New Hanover County only in the multiplier effects and total impacts—the direct impacts are the same. Typically, when a larger, statewide, geographic region is considered, multiplier effects are larger, and so the total economic impacts of a given economic change are also larger.

The statewide economic impacts of CBI commercial fishing activity for the Recent, Degraded Conditions inlet navigability scenario are presented in Table 4 below. Economic multiplier effects are the difference between the Direct Effects and the Total Effects listed in the table. For example, output (sales) of \$258,000 in New Hanover County generate an additional \$355,381 in economic multiplier effects throughout the state (including New Hanover County), for a statewide total economic impact of \$613,381 in output (sales) (including New Hanover County). The Direct Effects and Total Effects listed in the remaining columns of the table are interpreted in a similar way.

Compared to the multiplier effects occurring within New Hanover County, the statewide multiplier effects are typically larger. For example, whereas every dollar of direct effect output (sales) in the county results in an additional \$0.98 in multiplier effect output (sales) at the county level, every dollar of

direct effect output (sales) in the county results in \$1.38 in multiplier output (sales) statewide (including the \$0.98 of multiplier effect within the county).

Table 4. Statewide Commercial Fishing Impacts, Recent (Degraded) Inlet Navigability Conditions

Impact Type	Sales (Output)	Employment	Wage, Salary, and Sole Proprietorship Income	Dividend, Rent, and Interest Income	State and Local Taxes	Federal Taxes
Direct Effect	\$258,000	20	\$51,916	\$32,205		
Total Effect	\$613,381	47	\$75,500	\$45,499	\$29,944	\$40,281

Changes in Commercial Fishing Economic Impacts Due to Improvement in Carolina Beach Inlet Navigability to “Fully Maintained” Conditions

Economic Impacts Within New Hanover County

Under maintained CBI conditions, \$544,000 in annual sales (output) (Direct Effect) from CBI commercial fishery landings within New Hanover County (see Table 2) support an additional \$531,000 in annual economic multiplier effects within the county, for a total economic impact (Total Effect) within the county of \$1,075,000 in annual economic output (sales). The multiplier effects are the sales made by industries supporting the commercial fisheries within New Hanover County, such as marinas, boat repair, fuel, etc., and the sales made by other New Hanover County businesses to commercial fisherman and their families as they spend the income from commercial fishing (sales of housing, food, clothing, fuel, etc.).

Table 5 below presents the *increases* in annual economic impacts for the various impact categories due to the improvement in CBI navigability. For example, the improvement in CBI navigability is estimated to increase the direct effect of commercial fishing sales (output) by \$286,000 annually.

Table 5. INCREASE in Annual Commercial Fishing Impacts Within New Hanover County, Fully Maintained Inlet Conditions

Impact Type	Sales (Output)	Employment	Wage, Salary, and Sole Proprietorship Income	Dividend, Rent, and Interest Income	State and Local Taxes	Federal Taxes
Direct Effect	\$286,000	22	\$55,914	\$35,700		
Total Effect	\$565,000	48	\$76,438	\$48,360	\$27,632	\$34,080

Economic Impacts Statewide

The statewide impacts of the commercial fishing supported by CBI differ from those presented for New Hanover County only in the multiplier effects and total impacts—the direct impacts are the same. Typically, when a larger, statewide, geographic region is considered, multiplier effects are larger, and so the total economic impacts of a given economic change are also larger.

Table 6 below presents the *increases* in annual economic impacts for the various impact categories due to the improvement in CBI navigability. For example, the improvement in CBI navigability is estimated to increase the direct effect of commercial fishing sales (output) by \$286,000 annually.

Compared to the multiplier effects occurring within New Hanover County, the statewide multiplier effects are typically larger. For example, whereas every dollar of direct effect output (sales) in the county results in an additional \$0.98 in multiplier effect output (sales) at the county level, every dollar of direct effect output (sales) in the county results in \$1.38 in multiplier output (sales) statewide (including the \$0.98 of multiplier effect within the county).

Table 6. INCREASE in Statewide Annual Commercial Fishing Impacts, Fully Maintained Inlet Conditions

Impact Type	Sales (Output)	Employment	Wage, Salary, and Sole Proprietorship Income	Dividend, Rent, and Interest Income	State and Local Taxes	Federal Taxes
Direct Effect	\$286,000	22	\$57,550	\$35,700		
Total Effect	\$679,530	52	\$83,642	\$50,406	\$33,173	\$44,625

Changes in Commercial Fishing Economic Impacts Due to Deterioration of Carolina Beach Inlet Navigability to “Essentially Closed” Conditions

If navigability conditions in Carolina Beach inlet were to deteriorate to “Essentially Closed” conditions, defined here as an inlet depth of 4 feet or less, impacts on ocean-going commercial fishing may be significant. If inlets shoal to four feet or less, it is assumed that ocean-going commercial fishing vessels may either: (1) go out of business, (2) travel longer distances to other inlets before reaching the ocean (increasing fuel costs, decreasing ocean fishing time, and decreasing profits), or (3) change ports. Detailed cost and operational information is not available for commercial fishing vessels in all locations along the North Carolina coast. As a result, it was not possible to determine precisely what proportion of the vessels at a given port would select each of the three possible courses of action. For the purposes of this analysis, it is assumed that 1/2 of the commercial fishing vessels using Carolina Beach inlet go out of business, 1/4 move to Wilmington/Wrightsville Beach within New Hanover County, and ¼ move to other ports outside New Hanover County.

Economic Impacts Within New Hanover County

Table. DECREASE in Annual Commercial Fishing Impacts Within New Hanover County, Essentially Closed Inlet Conditions

Impact Type	Sales (Output)	Employment	Wage, Salary, and Sole Proprietorship Income	Dividend, Rent, and Interest Income	State and Local Taxes	Federal Taxes
Direct Effect	\$193,500	15	\$37,830	\$24,154	\$0	\$0
Total Effect	\$382,500	32	\$51,748	\$32,740	\$18,707	\$23,072

Economic Impacts Statewide

Table. DECREASE in Statewide Annual Commercial Fishing Impacts, Essentially Closed Inlet Conditions

Impact Type	Sales (Output)	Employment	Wage, Salary, and Sole Proprietorship Income	Dividend, Rent, and Interest Income	State and Local Taxes	Federal Taxes
Direct Effect	\$129,000	10	\$25,958	\$16,103	\$0	\$0
Total Effect	\$306,691	24	\$37,750	\$22,750	\$14,972	\$20,141

SEAFOOD MARKET/DEALER SALES

Based on industry data for New Hanover County for 2012 (from the IMPLAN database for New Hanover County), on average each dollar of sales by a seafood dealer involves the purchase of \$0.6337 in dockside value from commercial fishermen.

For the purpose of this study, we assume that all commercial fishery landings in New Hanover County are sold to seafood markets/dealers in New Hanover County.

The \$257,550 in annual dockside landings under current (degraded) inlet conditions support sales of \$406,000 per year in sales by seafood markets/dealers in New Hanover County. These sales support an additional \$35,000 annually in economic multiplier effects beyond those supported by the commercial fishing itself, for a total economic impact of \$441,000 in economic output (sales) annually within New Hanover County. The multiplier effects consist of the spending by seafood markets/dealers on non-fish production inputs, such as electricity, ice, packing supplies, etc., and the sales made by other New Hanover County businesses to seafood market/dealer owners, employees and their families as they spend the income from commercial fishing within the county (sales of housing, food, clothing, fuel, etc.).

Under maintained inlet conditions, an estimated \$543,983 in annual dockside landings would support sales of \$858,000 per year by seafood markets/dealers in New Hanover County. These sales would support an additional \$75,000 annually in economic multiplier effects beyond those supported by the commercial fishing itself, for a total economic impact of seafood market/dealer activity of \$933,000 in economic output (sales) annually within New Hanover County. The INCREASE in total economic impact of seafood market/dealer activity in terms of economic output (sales) would be \$492,000 annually ($\$933,000 - \$441,000 = \$492,000$).

Under essentially closed inlet conditions, the value of annual dockside landings would decrease by an estimated \$193,500 per year within New Hanover County, or \$382,500 including multiplier effects. This decrease in landings would REDUCE seafood market/dealer activity in terms of economic output (sales) by an estimated \$330,750 annually within New Hanover County.

Estimating the economic impacts of seafood market/dealer sales statewide, outside New Hanover County, is unfortunately beyond the scope of this study.

RECREATIONAL FISHING

North Carolina Recreational Fishing Trips-- Data Sources, Status, and Recent Trends

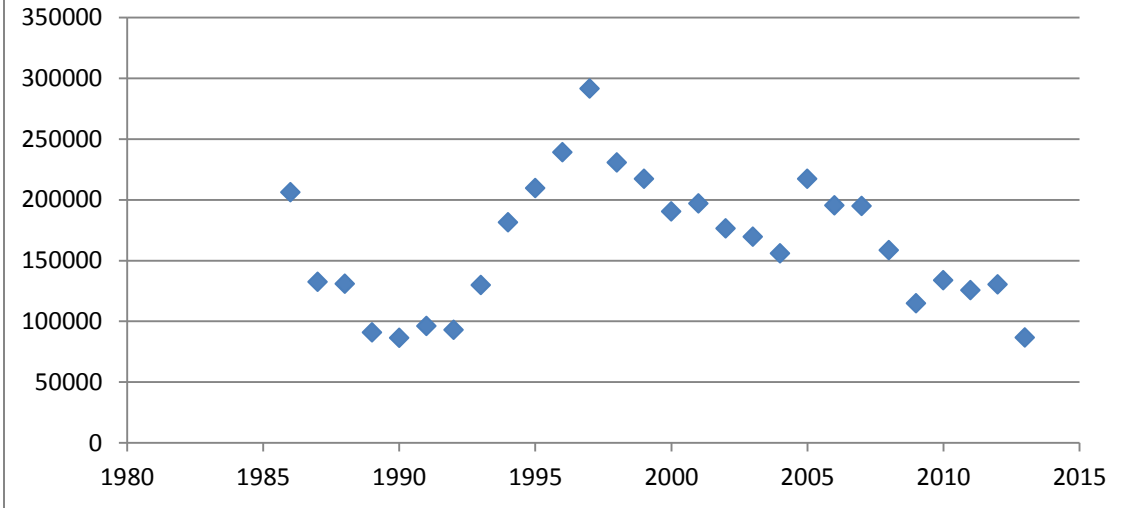
The recreational fishery that uses Carolina Beach inlet to access the ocean is composed of three parts, the charter boat fishery, the head boat fishery and the private boat fishery. The data on the numbers of charter boat trips and private boat trips (similar data on head boat trips are not available) taken in North Carolina from 1985 to 2013 presented in the figures below indicate that there is significant variation in trips from year to year. Differences in trip numbers across years can be due to economic conditions (fuel prices, recessions, etc.), fish abundance in the ocean, changes in fishery regulations, and changing navigability conditions in ocean inlets.

Data on the number of recreational ocean fishing trips are available from the National Marine Fisheries Service, Marine Recreational Information Program (MRIP) for 2011 for the charter boat and private boat fisheries. Data for 2008 for charter boat and head boat trips from a study of the North Carolina for-hire fishery (Dumas et al., 2009). Dumas et al. (2009) and Lovell, Steinbeck and Hilger (2013) provide spending data for the charter boat and head boat fisheries. Herstine et al. (2007) and Lovell, Steinbeck and Hilger (2013) provide spending data for the private boat fishery.

In addition, the National Marine Fisheries Service collects data on recreational private boat ocean fishing trips as part of the Marine Recreational Information Program (MRIP). The 2011 MRIP data are used in this study since they are the most recent data that included the spending add-on survey. New Hanover County ocean private boat fishing trips that enter the ocean through Carolina Beach Inlet are determined from the MRIP Master Site Register.

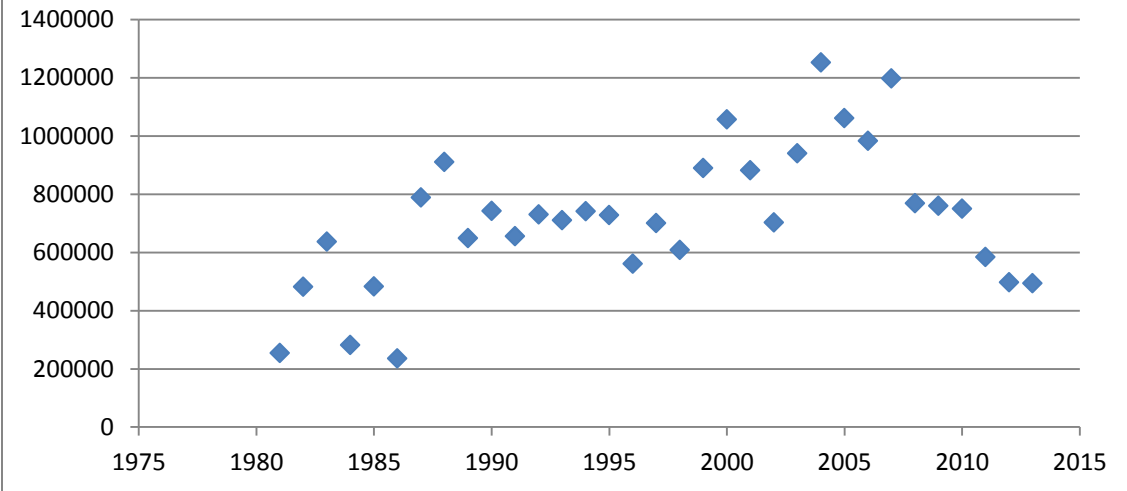
Trends in the numbers of ocean charter boat angler trips and ocean private boat angler trips from the early 1980's to 2013 are presented in Figures 4 and 4 below. The numbers of angler trips are quite variable over the time period covered by the data, showing fluctuations that mirror economy-wide cycles in economic activity. More recently, both charter boat trips and private boat trips have gradually declined since 2006.

**Figure 4. NC Ocean Charter Boat Angler Trips
(Number of Anglers)**



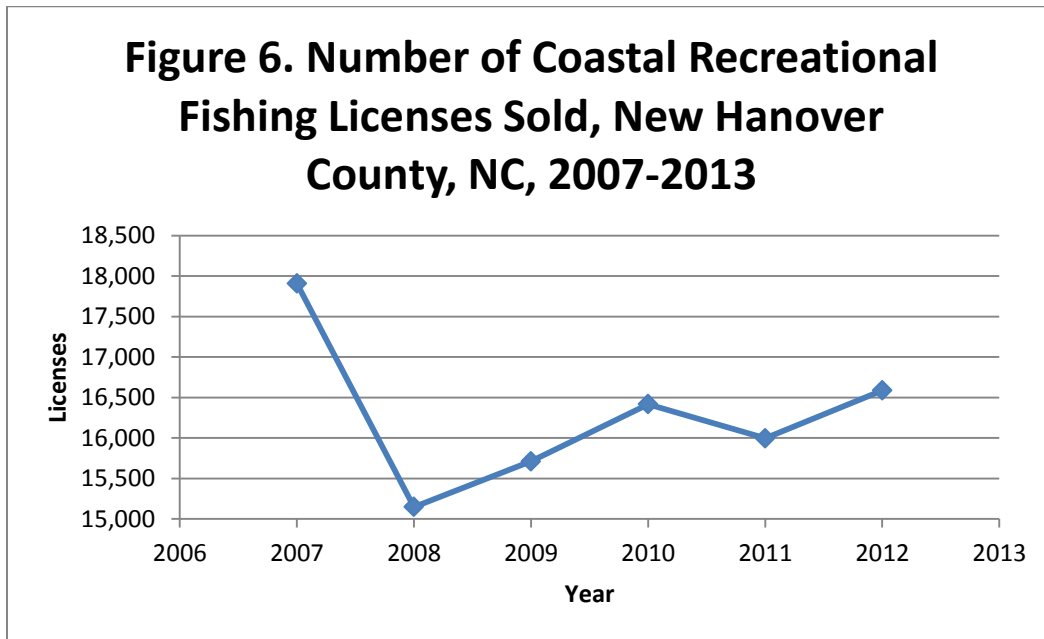
Source: NMFS 2014. Marine Recreational Information Program (MRIP) data, North Carolina Ocean Charter Boat Angler Trips.

**Figure 5. NC Ocean Private Boat Angler Trips
(Number of Anglers)**



Source: NMFS 2014. Marine Recreational Information Program (MRIP) data, North Carolina Ocean Private Boat Angler Trips.

Since 2007, a Coastal Recreational Fishing License (CRFL) has been required to recreationally harvest finfish in the state’s coastal waters. This license is also required to land fish caught greater than three miles in the ocean. The CRFL is issued by Wildlife Resources Commission sales agents such as bait and tackle shops, online, by phone, and at NCDMF license offices. The CRFL data for New Hanover County for 2007—2013 are presented in Figure 6 below. The reduction in the number of licenses due to the 2008 economic recession is clearly visible, as is the subsequent gradual recovery. Similar statistics are not available for a particular inlet, such as Carolina Beach Inlet, within a county.



Source: NCDMF. 2013 License-Statistics Annual Report.

Based on 2008 data from Dumas et al. (2009), 56 percent of charter boat anglers surveyed in the central and southern coastal region of North Carolina are North Carolina residents and 44 percent are out-of-state residents. For head boat anglers surveyed in the same region, 71 percent are North Carolina residents and 29 percent are out-of-state residents.

For charter and head boat anglers using CBI to access the ocean, 58 percent were North Carolina residents, and 42 percent were out-of-state residents (from 28 other states) (Dumas et al. 2009). These data indicate that a substantial proportion of CBI charter and head boat anglers are from out of state.

Of the North Carolina residents using CBI, 21 percent were from New Hanover County, with the remaining North Carolina residents coming from 42 other North Carolina counties (Dumas et al. 2009). The top 10 counties are presented in Table 7 below. These data indicate that residents from many areas of the state use CBI to access Atlantic Ocean fishing.

Table 7. Top 10 Counties of Origin for North Carolina Charter and Head Boat Anglers Using Carolina Beach Inlet (Source: Dumas et al. 2009)

County	Percent of NC-Resident CBI Anglers	County	Percent of NC-Resident CBI Anglers
New Hanover	20.81%	Guilford	4.07%
Wake	13.12%	Randolph	3.62%
Buncombe	8.14%	Orange	3.17%
Mecklenburg	7.24%	Rowan	3.17%
Pender	4.52%	Cumberland	2.71%
		Other NC Counties	29%

Of the 49 New Hanover County resident anglers, 7 (14%) were from Carolina Beach, and 42 (86%) were from other areas within New Hanover County (Dumas et al. 2009). These survey results (albeit based on a limited sample size) indicate that most New Hanover County residents using CBI to access Atlantic Ocean fishing reside outside Carolina Beach itself.

For charter boat anglers making fishing trips in the central and southern region of North Carolina, 92 percent stayed one or more nights at the coast. For head boat anglers making fishing trips in the central and southern region of North Carolina, 63 percent stay one or more nights at the coast. Among those charter and head boat anglers using CBI, the average angler stayed 4.55 nights at the coast, with NC residents staying an average of 3 nights, and non-NC residents staying an average of 6 nights.

For charter boat anglers making fishing trips in the central and southern region of North Carolina, 53 percent said that charter fishing was their primary purpose for visiting the North Carolina coast. For head boat anglers making fishing trips in the central and southern region of North Carolina, 63 percent say that head boat fishing was their primary purpose for visiting the North Carolina coast. Among those charter and head boat anglers using CBI, 63 percent of NC residents said that would not have visited the local area if charter/head boat fishing were not available, while 36 percent of non-NC residents said that they would not have visited the local area if charter/head boat fishing were not available.

For charter and head boat anglers using CBI, 45 percent of NC residents and 42 percent of non-NC residents fish more than 3 miles from shore. This indicates the importance of offshore fishing areas and the importance of inlet navigability for accessing these offshore areas.

Unfortunately, there is less descriptive information available for private boat ocean fishing trips. The Dumas et al. (2009) study did not cover private boat trips. However, the National Marine Fisheries Service collects data on recreational private boat ocean fishing trips as part of the Marine Recreational Information Program (MRIP). The 2011 MRIP data are used in this study since they are the most recent data that also included an add-on survey that measured angler spending. New Hanover County ocean private boat fishing trips that enter the ocean through Carolina Beach Inlet are determined from the MRIP data. In 2011, the MRIP data indicate that 29,491 private boat ocean fishing angler trips were made by North Carolina residents using CBI, and an additional 933 angler trips were made by non-NC residents, for a total of 30,424 private boat angler trips using CBI.

Table 8 below presents estimates of dollar expenditures per angler trip per fishing day based on data from Dumas (2009) and Lovell, et al. (2013). These are estimates of the money spent by one angler, on average, for all days of his or her trip to the Carolina Beach area, allocated to one fishing day. (The expenditure data are presented in this way so that the values can be multiplied by the number of angler fishing days to calculate aggregate expenditures.) Some of the average values may appear low because they include anglers who spent zero money in that expenditure category.

Table 8. NC Recreational Ocean Fishing Expenditure Data, Dollars per Angler Trip, per Fishing Day

EXPENDITURE CATEGORY	IMPLAN SECTOR		Dollars per angler trip/per fishing day		
			Charter	Private	Head Boat
Auto Transport in NC	gas stations	326	\$93.60	\$20.02	\$55.75
Other Transport in NC	rental car	362	\$12.20	\$0.00	\$14.45
Fuel for boat	gas stations	326	\$59.58	\$59.58	\$17.05
Slip/Dock fees	transport by water	334	\$6.87	\$10.62	\$2.75
Bait	commercial fishing	17	\$5.13	\$5.13	\$3.25
Fishing Tackle	sporting goods	328	\$4.91	\$4.91	\$2.70
Boat repairs	boat building & repairing	291	\$27.73	\$27.73	\$6.53
Lodging	hotels	411	\$309.56	\$55.89	\$260.76
Restaurants	restaurants	413	\$84.64	\$31.77	\$76.66
Groceries	grocery stores	324	\$95.49	\$59.01	\$69.76
Ice	ice manufacturing	70	\$2.42	\$2.42	\$0.79
Charter Crew Wages & Tips	household expenditures	labor income	\$25.84	\$0.00	\$14.96
Boat insurance	Insurance carriers	357	\$8.20	\$8.20	\$1.75
Interest on Boat Loan	Commercial Banking	354	\$5.61	\$5.61	\$2.16
Other (Producer Services)	advertising	377	\$10.31	\$0.00	\$0.39
Other (Consumer Retail)	Retail-- General Merchandise	329	\$26.66	\$0.13	\$28.63
Return to Charter Vessel Owner (includes principal payment on boat loan)	household expenditures	labor income	\$69.31	\$0.00	\$59.18

Note: Expenditures include those made by the angler for him/herself and any non-fishing family/friends accompanying the angler on the trip to the coast (but not accompanying the angler on the boat on the day of the survey).

Note: Any charter or head boat fees have been distributed to the various expenditure categories.

Recreational Fishing Economic Impacts--Carolina Beach Inlet Recent (Degraded) Navigability Conditions

The economic impacts of recreational fishing activity supported by Carolina Beach Inlet under current, degraded, inlet navigability conditions are presented in this section. These conditions are assumed to be typical of those existing from 2010, when federal funding for inlet dredging was lost, to 2013. Impacts are presented for two geographic areas, New Hanover County, and the state of North Carolina as a whole (including New Hanover County). For each geographic area, impacts are presented for the charter boat fishery, the head boat fishery, and the private boat fishery.

Charter Boat Fishing Impacts

Dumas et al. (2009) found that in 2008, there were 47 charter vessels accessing the Atlantic Ocean via CBI. These charter vessels made an average of approximately 84 vessel trips per year. An estimated 1,794 full-day charter vessel trips and an additional 1,261 half-day charter vessel trips were made in 2008, carrying an average of 5.28 anglers per vessel trip, for a total of approximately 16,130 angler-day trips. These charter vessels directly support 84 charter captain and crew jobs. The economic impact results below are based on these angler trip data and the expenditure per trip data from Table 8.

Economic Impacts Within New Hanover County

Table 9 below presents the economic impacts within New Hanover County of charter boat fishing activity supported by CBI. Economic multiplier effects are the difference between the Direct Effects and the Total Effects listed in the table. For example, direct expenditures (output) of \$16.7 million made by CBI charter boat anglers in New Hanover County generate an additional \$15.3 million in economic multiplier effects within the county, for a total economic impact of \$32 million in sales (output) within the county. The Direct Effects and Total Effects listed in the remaining columns of the table are interpreted in a similar way.

Table 9. Annual Charter Boat Fishing Impacts Within New Hanover County, Recent (Degraded) Inlet Navigability Conditions

Impact Type	Output	Employment	Wage, Salary, Sole Proprietor and Partnership Income	Corporate Dividends, Rental Income, Interest Income	Total State and Local Tax	Total Federal Tax
Direct Effect	\$16,707,790	84	\$3,070,455	\$2,371,560	-----	-----
Total Effect	\$32,009,327	227	\$8,998,270	\$6,683,189	\$1,485,177	\$1,862,772

Economic Impacts Statewide

The statewide impacts of the charter boat fishing supported by CBI differ from those presented for New Hanover County only in the multiplier effects and total impacts—the direct impacts are the same. Typically, when a larger geographic region is considered, multiplier effects are larger, and so the total economic impacts of a given economic change are also larger.

The statewide economic impacts of charter boat activity for the Recent, Degraded Conditions inlet navigability scenario are presented in Table 10 below. Economic multiplier effects are the difference between the Direct Effects and the Total Effects listed in the table. For example, output (sales) of \$16.7 million in New Hanover County generate an additional \$21.5 million in economic multiplier effects throughout the state (including New Hanover County), for a statewide total economic impact of \$38.2 million in output (sales) (including New Hanover County). The Direct Effects and Total Effects listed in the remaining columns of the table are interpreted in a similar way.

Compared to the multiplier effects occurring within New Hanover County, the statewide multiplier effects are larger. For example, whereas every dollar of direct effect output (sales) in the county results in an additional \$0.92 of multiplier effect output (sales) at the county level, every dollar of direct effect output (sales) in the county results in \$1.28 of multiplier output (sales) statewide (including the \$0.92 of multiplier effect within the county).

Table 10. Annual Charter Boat Fishing Impacts Statewide, Recent (Degraded) Inlet Navigability Conditions

Impact Type	Output	Employment	Wage, Salary, Sole Proprietor and Partnership Income	Corporate Dividends, Rental Income, Interest Income	Total State and Local Tax	Total Federal Tax
Direct Effect	\$16,707,790	84	\$3,161,097	\$2,341,073	-----	-----
Total Effect	\$38,227,797	265	\$11,345,090	\$8,146,079	\$1,786,353	\$2,436,057

Head Boat Fishing Impacts

The head boat analysis includes two head boats, each over 70 in length, identified in the Dumas et al. (2009) study. Each of these head boat vessels make approximately 160 vessel trips per year, on average, carrying an average of 68 anglers per trip. In 2008, these vessels may about 198 full-day fishing trips and 82 half-day fishing trips. These head boat vessels directly supported 16 captain and crew jobs. The economic impact results below are based on these angler trip data and the expenditure per trip data from Table 8.

Economic Impacts Within New Hanover County

Table 11 below presents the economic impacts within New Hanover County of head boat fishing activity supported by CBI. Economic multiplier effects are the difference between the Direct Effects and the Total Effects listed in the table. For example, direct expenditures (output) of \$10.6 million made by CBI head boat anglers in New Hanover County generate an additional \$10.3 million in economic multiplier effects within the county, for a total economic impact of \$20.9 million in sales (output) within the county. The Direct Effects and Total Effects listed in the remaining columns of the table are interpreted in a similar way.

Table 11. Annual Head Boat Fishing Impacts Within New Hanover County, Recent (Degraded) Inlet Navigability Conditions

Impact Type	Output	Employment	Wage, Salary, Sole Proprietor and Partnership Income	Corporate Dividends, Rental Income, Interest Income	Total State and Local Tax	Total Federal Tax
Direct Effect	\$10,575,029	16	\$2,067,462	\$1,588,782	-----	-----
Total Effect	\$20,944,747	113	\$6,086,886	\$4,514,488	\$1,024,323	\$1,263,343

Economic Impacts Statewide

The statewide impacts of the head boat fishing supported by CBI differ from those presented for New Hanover County only in the multiplier effects and total impacts—the direct impacts are the same. Typically, when a larger geographic region is considered, multiplier effects are larger, and so the total economic impacts of a given economic change are also larger.

The statewide economic impacts of head boat activity for the Recent, Degraded Conditions inlet navigability scenario are presented in Table 12 below. Economic multiplier effects are the difference between the Direct Effects and the Total Effects listed in the table. For example, output (sales) of \$10.6 million in New Hanover County generate an additional \$14.6 million in economic multiplier effects throughout the state (including New Hanover County), for a statewide total economic impact of \$25.2 million in output (sales) (including New Hanover County). The Direct Effects and Total Effects listed in the remaining columns of the table are interpreted in a similar way.

Compared to the multiplier effects occurring within New Hanover County, the statewide multiplier effects are larger. For example, whereas every dollar of direct effect output (sales) in the county results in an additional \$0.98 of multiplier effect output (sales) at the county level, every dollar of direct effect output (sales) in the county results in \$1.38 of multiplier output (sales) statewide (including the \$0.98 of multiplier effect within the county).

Table 12. Annual Head Boat Fishing Impacts Statewide, Recent (Degraded) Inlet Navigability Conditions

Impact Type	Output	Employment	Wage, Salary, Sole Proprietor and Partnership Income	Corporate Dividends, Rental Income, Interest Income	Total State and Local Tax	Total Federal Tax
Direct Effect	\$10,575,029	16	\$2,127,938	\$1,569,618	-----	-----
Total Effect	\$25,190,422	139	\$7,689,334	\$5,513,291	\$1,229,741	\$1,654,253

Private Boat Fishing Impacts

The National Marine Fisheries Service collects data on recreational private boat ocean fishing trips as part of the Marine Recreational Information Program (MRIP). The 2011 MRIP data are used in this study since they are the most recent data that included the spending add-on survey. New Hanover County ocean private boat fishing trips that enter the ocean through Carolina Beach Inlet are determined from the MRIP data. In 2011, the MRIP data indicate that 29,491 private boat ocean fishing angler trips were made by North Carolina residents using CBI, and an additional 933 angler trips were made by non-NC residents, for a total of 30,424 private boat angler trips using CBI. The economic impact results below are based on these angler trip data and the expenditure per trip data from Table 8.

Economic Impacts Within New Hanover County

Table 13 below presents the economic impacts within New Hanover County of private boat fishing activity supported by CBI. Economic multiplier effects are the difference between the Direct Effects and the Total Effects listed in the table. For example, direct expenditures (output) of \$8.4 million made by CBI private boat anglers in New Hanover County generate an additional \$5.7 million in economic multiplier effects within the county, for a total economic impact of \$14.1 million in sales (output) within the county. The Direct Effects and Total Effects listed in the remaining columns of the table are interpreted in a similar way. One difference between the economic impacts for private boat fishing and the economic impacts for charter and head boat fishing is that the Direct Effect on employment for private boat fishing is not the number of captain and crew employed (as it is for charter and head boat fishing), but rather the number of jobs supported by the direct spending of the private boat owners within New Hanover County on gas, restaurants, lodging, etc.

Table 13. Annual Private Boat Fishing Impacts Within New Hanover County, Recent (Degraded) Inlet Navigability Conditions

Impact Type	Output	Employment	Wage, Salary, Sole Proprietor and Partnership Income	Corporate Dividends, Rental Income, Interest Income	Total State and Local Tax	Total Federal Tax
Direct Effect	\$8,433,852	58	\$1,546,654	\$916,156	-----	-----
Total Effect	\$14,068,913	110	\$3,715,641	\$2,501,552	\$579,916	\$744,474

Economic Impacts Statewide

The statewide impacts of the private boat fishing supported by CBI differ from those presented for New Hanover County for two reasons: (1) unlike charter and head boat owners, some private boat owners reside outside New Hanover County, so direct spending that occurs outside New Hanover County (but inside the state) on boat loan payments and boat insurance is included at the state level but is omitted at the county level, and (2) the state-level multiplier effects of spending in the county are larger than the county-level multiplier effects. Typically, when a larger geographic region is considered, multiplier effects are larger.

The statewide economic impacts of private boat activity for the Recent, Degraded Conditions inlet navigability scenario are presented in Table 14 below. Economic multiplier effects are the difference between the Direct Effects and the Total Effects listed in the table. For example, output (sales) of \$8.9 million generate an additional \$8.8 million in economic multiplier effects throughout the state (including New Hanover County), for a statewide total economic impact of \$17.7 million in output (sales) (including New Hanover County). The Direct Effects and Total Effects listed in the remaining columns of the table are interpreted in a similar way.

Compared to the multiplier effects occurring within New Hanover County, the statewide multiplier effects are larger. For example, whereas every dollar of direct effect output (sales) in the county results in an additional \$0.68 of multiplier effect output (sales) at the county level, every dollar of direct effect output (sales) in the county results in \$0.99 of multiplier output (sales) statewide (including the \$0.68 of multiplier effect within the county).

Table 14. Annual Private Boat Fishing Impacts Statewide, Recent (Degraded) Inlet Navigability Conditions

Impact Type	Output	Employment	Wage, Salary, Sole Proprietor and Partnership Income	Corporate Dividends, Rental Income, Interest Income	Total State and Local Tax	Total Federal Tax
Direct Effect	\$8,854,198	59.7	\$1,670,686	\$1,101,195	-----	-----
Total Effect	\$17,677,114	133	\$5,016,201	\$3,463,699	\$756,391	\$1,061,532

Changes in Recreational Fishing Economic Impacts Due to Improvement in Carolina Beach Inlet Navigability to “Fully Maintained” Conditions

There is considerable uncertainty involved in estimating the economic impacts of improved (fully maintained) navigability conditions at Carolina Beach Inlet for recreational fishing. Data on recreational fishing is available for fewer years than for commercial fishing, so it is more difficult to estimate what the number of recreational trips would be under fully maintained inlet conditions. Furthermore, an extensive survey of recreational fishermen using Carolina Beach Inlet in order to collect new data was not within the scope of this study. All that can be done is to offer crude estimates based on reasonable assumptions and similar studies done elsewhere in North Carolina.

Charter Boat Fishing Impacts

A recent study (Moffatt and Nichol 2014) of the economic impacts of improvements in inlet navigability for Oregon Inlet, North Carolina, found that charter boat operators estimated that the number of charter trips would increase by 10 to 25 percent, or about 20 percent on average, if inlet navigability were to increase from current, degraded, inlet conditions to fully maintained inlet conditions. These charter boats were relatively large vessels that fished offshore. These are charter fishing trips that would not have been made, or that would have been made elsewhere, if Oregon Inlet were not fully open. However, not all charter boat vessels would be equally affected by the change in inlet conditions. For the purposes of the Carolina Beach Inlet study, we assume that charter boats under 30 feet in length would be relatively unaffected by a change from current inlet conditions to fully open inlet conditions, because these vessels have relatively shallow drafts. (This assumption makes the results of the current CBI study more conservative, as some vessels under 30 feet would likely be affected by inlet conditions.) For charter vessels over 30 feet in length, we assume that they would be able to make 20 percent more trips under fully maintained conditions.

Economic Impacts within New Hanover County

We assume that an improvement in Carolina Beach Inlet conditions would increase the number of charter fishing trips by 20 percent for those vessels greater than 30 feet in length. Based on the data from the Dumas (2009) study, there are 18 charter vessels greater than 30 feet in length operating in Carolina Beach Inlet. A 20 percent increase in the number of fishing trips made by these vessels would have the economic impacts within New Hanover County presented in Table 15 below. This increase represents private boat fishing trips that would not have been made, or that would have been made outside New Hanover County, if Carolina Beach Inlet were not fully maintained.

Table 15. Estimated Increase in Annual Charter Boat Fishing Impacts Within New Hanover County Due to Improvement in CBI Navigability to “Fully Maintained” Conditions

Impact Type	Output	Employment	Wage, Salary, Sole Proprietor and Partnership Income	Corporate Dividends, Rental Income, Interest Income	Total State and Local Tax	Total Federal Tax
Direct Effect	\$1,279,746	6	\$235,184	\$181,651		
Total Effect	\$2,451,778	17	\$689,229	\$511,904	\$113,758	\$142,680

Economic Impacts Statewide

We assume that an improvement in Carolina Beach Inlet conditions would increase the number of charter fishing trips by 20 percent for those vessels greater than 30 feet in length. However, not all of these trips would be new to the state, some would simply be trips that are transferred from other locations in the state to New Hanover County. Based on 2008 data from Dumas et al. (2009), for charter and head boat anglers using CBI to access the ocean, 58 percent were North Carolina residents, and 42 percent were out-of-state residents. Hence, only 42 percent of the increase in trips in New Hanover County would be new economic activity from the perspective of the state; the remaining 58 percent of the increase in New Hanover County trips would be simply a transfer of activity from other counties in the state to New Hanover County. The net economic impact for the state is presented in Table 16 below.

Table 16. Estimated Increase in Annual Charter Boat Fishing Impacts Statewide Due to Improvement in CBI Navigability to “Fully Maintained” Conditions

Impact Type	Output	Employment	Wage, Salary, Sole Proprietor and Partnership Income	Corporate Dividends, Rental Income, Interest Income	Total State and Local Tax	Total Federal Tax
Direct Effect	\$537,493	3	\$101,693	\$75,313		
Total Effect	\$1,229,796	9	\$364,974	\$262,061	\$57,467	\$78,368

Head Boat Fishing Impacts

All head boats based in Carolina Beach are relatively large with deep drafts, so they would be affected by changes in inlet conditions. In the absence of other information, we assume that head boats would be able to make 20 percent more trips under fully maintained conditions, similar to the increase in trips made possible for larger charter boats by improved navigability conditions in the inlet. This increase represents head boat fishing trips that would not have been made, or that would have been made outside New Hanover County, if Carolina Beach Inlet were not fully maintained.

Economic Impacts within New Hanover County

Table 17. Estimated Increase in Annual Head Boat Fishing Impacts Within New Hanover County Due to Improvement in CBI Navigability to “Fully Maintained” Conditions

Impact Type	Output	Employment	Wage, Salary, Sole Proprietor and Partnership Income	Corporate Dividends, Rental Income, Interest Income	Total State and Local Tax	Total Federal Tax
Direct Effect	\$2,115,006	3	\$413,492	\$317,756		
Total Effect	\$4,188,949	23	\$1,217,377	\$902,898	\$204,865	\$252,669

Economic Impacts Statewide

We assume that an improvement in Carolina Beach Inlet conditions would increase the number of head boat angler fishing trips by 20 percent. However, not all of these angler trips would be new to the state, some would simply be trips that are transferred from other locations in the state to New Hanover County. Based on 2008 data from Dumas et al. (2009), for head boat anglers using CBI to access the ocean, 58 percent were North Carolina residents, and 42 percent were out-of-state residents. Hence, only 42 percent of the increase in trips in New Hanover County would be new economic activity from the perspective of the state; the remaining 58 percent of the increase in New Hanover County trips would be simply a transfer of activity from other counties in the state to New Hanover County. The net economic impact for the state is presented in Table 18 below.

Table 18. Estimated Increase in Annual Head Boat Fishing Impacts Statewide Due to Improvement in CBI Navigability to “Fully Maintained” Conditions

Impact Type	Output	Employment	Wage, Salary, Sole Proprietor and Partnership Income	Corporate Dividends, Rental Income, Interest Income	Total State and Local Tax	Total Federal Tax
Direct Effect	\$888,302	1	\$178,747	\$131,848		
Total Effect	\$2,115,995	12	\$645,904	\$463,116	\$103,298	\$138,957

Private Boat Fishing Impacts

In the absence of other information, it is assumed that the percentage increase in private boat fishing trips using Carolina Beach under fully maintained inlet conditions would be similar to the percentage increase in charter fishing trips, or 20 percent, for vessels greater than 30 feet in length. For the purposes of the Carolina Beach Inlet study, we assume that private boats under 30 feet in length would be relatively unaffected by a change from current inlet conditions to fully open inlet conditions, because these vessels have relatively shallow drafts. (This assumption makes the results of the current CBI study more conservative, as some vessels under 30 feet would likely be affected by inlet conditions.) For private vessels over 30 feet in length, we assume that they would be able to make 20 percent more trips under fully maintained conditions. This 20 percent increase represents private boat fishing trips that would not have been made, or that would have been made outside New Hanover County, if Carolina Beach Inlet were not fully open.

Based on the 2011 MRIP data, about 30,424 private boat angler trips are made each year using Carolina Beach Inlet. Based on data from NC Division of Marine Fisheries (Crosson 2010)¹, about 15 percent of all NC private boats fishing in salt waters are greater than 30 feet in length. Assuming that each private boat takes the average number of trips per year for private boats, then an estimated 4564 (30,424 private boat angler trips * 15 % greater than 30 feet in length = 4564 angler trips) angler trips would be made annually by private boats greater than 30 feet in length operating in Carolina Beach Inlet under recent, degraded, inlet conditions. We assume that an improvement in Carolina Beach Inlet conditions would increase the number of private boat fishing trips by 20 percent for those vessels greater than 30 feet in length. A 20 percent increase in the number of fishing trips made by these vessels would result in an additional 913 angler trips per year (4564 angler trips * 20 % increase = 913 additional angler trips) taken in private boats greater than 30 feet in length.

¹ Crosson (2010) reports a mean vessel length of 19 feet in his survey sample, a median length of 19 feet, a minimum length of 10 feet, and a maximum length of 41 feet. Assuming a normal distribution of vessel lengths (because the mean equals the median in the sample) with a standard deviation of 10.6, about 20 percent of vessels would be less than 10 feet in length, 98 percent would be less than 41 feet in length, and 85 percent would be less than 30 feet in length, implying that about 15 percent (100 percent – 85 percent = 15 percent) are greater than 30 feet in length.

Economic Impacts within New Hanover County

We assume that an improvement in Carolina Beach Inlet conditions would increase the number of private boat angler trips by 20 percent for those vessels greater than 30 feet in length. A 20 percent increase in the number of private boat angler trips made by these vessels would support the additional economic impacts within New Hanover County presented in Table 19 below.

Table 19. Estimated Increase in Annual Private Boat Fishing Impacts Within New Hanover County Due to Improvement in CBI Navigability to “Fully Maintained” Conditions

Impact Type	Output	Employment	Wage, Salary, Sole Proprietor and Partnership Income	Corporate Dividends, Rental Income, Interest Income	Total State and Local Tax	Total Federal Tax
Direct Effect	\$253,016	2	\$46,400	\$27,485		
Total Effect	\$422,067	3	\$111,469	\$75,047	\$17,397	\$22,334

Economic Impacts Statewide

We assume that an improvement in Carolina Beach Inlet conditions would increase the number of private boat angler fishing trips by 20 percent for those boats over 30 feet in length. However, not all of these angler trips would be new to the state, some would simply be trips that are transferred from other locations in the state to New Hanover County. The 2011 MRIP data on private boat ocean fishing trips indicate that 97 percent (29,491 trips) of the 30,424 total private boat ocean fishing angler trips using CBI in 2011 were made by North Carolina residents, and 3 percent (933 trips) of the 30,424 angler trips were made by non-NC residents. Hence, only 3 percent of the increase in trips in New Hanover County would be new economic activity from the perspective of the state; the remaining 97 percent of the increase in New Hanover County trips would be simply a transfer of activity from other counties in the state to New Hanover County. A 20 percent increase in the number of fishing trips made by these private boats greater than 30 feet in length would result in an additional 27 out-of- state angler trips per year (4564 angler trips * 20 % increase * 3 % out of state = 27 additional out of state angler trips). The net economic impact for the state is presented in Table 20 below.

Table 20. Estimated Increase in Annual Private Boat Fishing Impacts Statewide Due to Improvement in CBI Navigability to “Fully Maintained” Conditions

Impact Type	Output	Employment	Wage, Salary, Sole Proprietor and Partnership Income	Corporate Dividends, Rental Income, Interest Income	Total State and Local Tax	Total Federal Tax
Direct Effect	\$7,969	0	\$1,504	\$991		
Total Effect	\$15,909	0	\$4,515	\$3,117	\$681	\$955

Changes in Recreational Fishing Economic Impacts Due to Deterioration of Carolina Beach Inlet Navigability to “Essentially Closed” Conditions

Charter Boat Fishing

If navigability conditions in Carolina Beach inlet were to deteriorate to “Essentially Closed” conditions, defined here as an inlet depth of 4 feet or less, impacts on charter fishing vessels longer than 30 feet in length may be significant. If inlets shoal to four feet or less, it is assumed that such vessels may either: (1) go out of business, (2) travel longer distances to other inlets before reaching the ocean (increasing fuel costs, decreasing ocean fishing time, and decreasing profits), or (3) change ports. The necessary data are not available to determine precisely what proportion of the vessels at a given port would select each of the three possible courses of action. For the purposes of this analysis, it is assumed that 1/4 of the charter fishing vessels greater than 30’ in length using Carolina Beach inlet would go out of business, 1/2 would move to Wilmington/Wrightsville Beach within New Hanover County, and ¼ would move to other ports outside New Hanover County.

Economic Impacts Within New Hanover County

Table. DECREASE in Annual Charter Boat Fishing Impacts Within New Hanover County, Essentially Closed Inlet Conditions

Impact Type	Sales (Output)	Employment	Wage, Salary, and Sole Proprietorship Income	Dividend, Rent, and Interest Income	State and Local Taxes	Federal Taxes
Direct Effect	\$3,199,364	16	\$587,960	\$454,129	\$0	\$0
Total Effect	\$6,129,446	43	\$1,723,073	\$1,279,760	\$284,396	\$356,701

Economic Impacts Statewide

Table. DECREASE in Statewide Annual Charter Boat Fishing Impacts, Essentially Closed Inlet Conditions

Impact Type	Sales (Output)	Employment	Wage, Salary, and Sole Proprietorship Income	Dividend, Rent, and Interest Income	State and Local Taxes	Federal Taxes
Direct Effect	\$1,599,682	8	\$302,658	\$224,145	\$0	\$0
Total Effect	\$3,660,108	25	\$1,086,232	\$779,944	\$171,034	\$233,240

Head Boat Fishing

If navigability conditions in Carolina Beach inlet were to deteriorate to “Essentially Closed” conditions, defined here as an inlet depth of 4 feet or less, impacts on head boat fishing vessels longer would be significant. If inlets shoal to four feet or less, it is assumed that such vessels may either: (1) go out of business, or (2) change ports. The necessary data are not available to determine precisely what proportion of the vessels at a given port would select each of these possible courses of action. For the purposes of this analysis, it is assumed that 1/4 of the head boat vessel activity supported by Carolina Beach inlet would go out of business, 1/2 would move to Wilmington/Wrightsville Beach within New Hanover County, and 1/4 would move to other ports outside New Hanover County.

Economic Impacts Within New Hanover County

Table. DECREASE in Annual Head Boat Fishing Impacts Within New Hanover County, Essentially Closed Inlet Conditions

Impact Type	Sales (Output)	Employment	Wage, Salary, and Sole Proprietorship Income	Dividend, Rent, and Interest Income	State and Local Taxes	Federal Taxes
Direct Effect	\$5,287,515	8	\$1,033,731	\$794,391	-----	-----
Total Effect	\$10,472,374	57	\$3,043,443	\$2,257,244	\$512,162	\$631,672

Economic Impacts Statewide

Table. DECREASE in Statewide Annual Head Boat Fishing Impacts, Essentially Closed Inlet Conditions

Impact Type	Sales (Output)	Employment	Wage, Salary, and Sole Proprietorship Income	Dividend, Rent, and Interest Income	State and Local Taxes	Federal Taxes
Direct Effect	\$2,643,757	4	\$531,985	\$392,405	-----	-----
Total Effect	\$6,297,606	35	\$1,922,334	\$1,378,323	\$307,435	\$413,563

Private Boat Fishing

If navigability conditions in Carolina Beach inlet were to deteriorate to “Essentially Closed” conditions, defined here as an inlet depth of 4 feet or less, impacts on private boats greater than 30 feet in length may be significant. If inlets shoal to four feet or less, it is assumed that such vessels would change ports. For the purposes of this analysis, it is assumed that ½ of the private boats greater than 30 feet in length move to Wilmington/Wrightsville Beach within New Hanover County, and 1/4 move to other NC ports outside New Hanover County, and ¼ move to ports located outside North Carolina.

Economic Impacts Within New Hanover County

Table. DECREASE in Annual Private Boat Fishing Impacts Within New Hanover County, Essentially Closed Inlet Conditions

Impact Type	Sales (Output)	Employment	Wage, Salary, and Sole Proprietorship Income	Dividend, Rent, and Interest Income	State and Local Taxes	Federal Taxes
Direct Effect	\$632,539	4	\$115,999	\$68,712	\$0	\$0
Total Effect	\$1,055,168	8	\$278,673	\$187,616	\$43,494	\$55,836

Economic Impacts Statewide

Table. DECREASE in Statewide Annual Private Boat Fishing Impacts, Essentially Closed Inlet Conditions

Impact Type	Sales (Output)	Employment	Wage, Salary, and Sole Proprietorship Income	Dividend, Rent, and Interest Income	State and Local Taxes	Federal Taxes
Direct Effect	\$332,032	2	\$62,651	\$41,295	\$0	\$0
Total Effect	\$662,892	5	\$188,108	\$129,889	\$28,365	\$39,807

Consumer Surplus Losses

In addition to the economic impacts associated with changes in inlet navigability, there are also effects on the “Consumer Surplus” of recreational fisher persons. Consumer Surplus is a measure of the economic value of the recreational experience beyond the dollar expenditures necessary to have the experience. Consumer Surplus is related to a consumer’s “Willingness to Pay” for a product or service. For example, if a recreational fisherman would be willing to pay \$700 for a charter fishing experience, but he finds that he only needs to pay \$500 in order to have the experience, then he enjoys \$200 of “Consumer Surplus” value.

Dr. Whitehead estimated the amount of Consumer Surplus that would be *lost* by charter boat, head boat and private boat recreational fishermen using Carolina Beach Inlet if the inlet were to become “Essentially Closed.” (The estimate is based on National Marine Fisheries Service MRIP survey data of recreational ocean water fishermen using Carolina Beach inlet and other inlets in North Carolina.) These fishermen would reallocate their fishing trips to other ports and inlets, but these other inlets give less enjoyment than Carolina Beach inlet (after all, these fishermen had chosen Carolina Beach inlet), so when they are forced to change inlets, they lose some (not all) of their Consumer Surplus value. The estimated loss in Consumer Surplus is \$1.78 million per year for all charter, head boat and private boat fishermen (collectively) who had been using Carolina Beach inlet under recent navigability conditions.

Summary of Results

Maintaining Carolina Beach Inlet navigability at design depth (8ft +/- 2 ft) is estimated to cost approximately \$800,000 per year (US Army Corps of Engineers). Carolina Beach inlet navigability supports an estimated \$68 million in sales and 493 jobs within New Hanover County, \$3.1 million in state and local taxes, and \$3.9 million in federal taxes. (Statewide, the economic impacts of Carolina Beach inlet navigability are somewhat larger still.) If inlet navigability were lost, not all of this economic activity would be lost; some would transfer elsewhere within the county or the state. The tables below detail the economic impacts, both within New Hanover County and statewide, supported by current (degraded) inlet navigability and estimates of the potential changes in economic impacts that might result from changes in inlet navigability.

Recent (Degraded) Inlet Navigability Conditions

Based on the available, existing data, the annual economic impacts within New Hanover County of all boating activity (charter boats, head boats and private boats, combined) using Carolina Beach Inlet (CBI) under current, degraded inlet navigability conditions (average inlet conditions from 2010 to 2014) are summarized in Table 21 below. Statewide economic impacts are summarized in Table 22.

Table 21. Annual Total Economic Impacts of CBI Fishing Activity Within New Hanover County,

Economic Sector	Sales (Output)	Employment	Wage, Salary, and Sole Proprietorship Income	Dividend, Rent, and Interest Income	State and Local Taxes	Federal Taxes
Commercial Fishing	\$510,000	43	\$68,997	\$43,653	\$24,942	\$30,762
Seafood Markets/Dealers	\$441,000	not assessed	not assessed	not assessed	not assessed	not assessed
Charter Boat Fishing	\$32,009,327	227	\$8,998,270	\$6,683,189	\$1,485,177	\$1,862,772
Head Boat Fishing	\$20,944,747	113	\$6,086,886	\$4,514,488	\$1,024,323	\$1,263,343
Private Boat Fishing	\$14,068,913	110	\$3,715,641	\$2,501,552	\$579,916	\$744,474
Total	\$67,973,987	493	\$18,869,794	\$13,742,882	\$3,114,358	\$3,901,351

Table 22. Annual Total Economic Impacts of CBI Fishing Activity Statewide,

Economic Sector	Sales (Output)	Employment	Wage, Salary, and Sole Proprietorship Income	Dividend, Rent, and Interest Income	State and Local Taxes	Federal Taxes
Commercial Fishing	\$613,381	47	\$75,500	\$45,499	\$29,944	\$40,281
Seafood Markets/Dealers	not assessed (>\$441,000)	not assessed	not assessed	not assessed	not assessed	not assessed
Charter Boat Fishing	\$38,227,797	265	\$11,345,090	\$8,146,079	\$1,786,353	\$2,436,057
Head Boat Fishing	\$25,190,422	139	\$7,689,334	\$5,513,291	\$1,229,741	\$1,654,253
Private Boat Fishing	\$17,677,114	133	\$5,016,201	\$3,463,699	\$756,391	\$1,061,532
Total	\$81,095,333	537	\$24,050,625	\$17,123,069	\$3,802,429	\$5,192,123

Fully Maintained Inlet Navigability Conditions

The potential increases in annual economic impacts due to improvements in inlet navigability to “Fully Maintained” conditions (design depth of 8 feet, +/- 2 feet) are summarized in Tables 23 and 24 below.

Table 23. INCREASE in Annual Total Economic Impacts of CBI Fishing Activity Within New Hanover County,

Economic Sector	Sales (Output)	Employment	Wage, Salary, and Sole Proprietorship Income	Dividend, Rent, and Interest Income	State and Local Taxes	Federal Taxes
Commercial Fishing	\$565,000	\$48	\$76,438	\$48,360	\$27,632	\$34,080
Seafood Markets/Dealers	\$492,000	not assessed	not assessed	not assessed	not assessed	not assessed
Charter Boat Fishing	\$2,451,778	17	\$689,229	\$511,904	\$113,758	\$142,680
Head Boat Fishing	\$4,188,949	23	\$1,217,377	\$902,898	\$204,865	\$252,669
Private Boat Fishing	\$422,067	3	\$111,469	\$75,047	\$17,397	\$22,334
Total	\$8,119,794	91	\$2,094,513	\$1,538,209	\$363,652	\$451,763

Table 24. INCREASE in Annual Total Economic Impacts of CBI Fishing Activity Statewide,

Economic Sector	Sales (Output)	Employment	Wage, Salary, and Sole Proprietorship Income	Dividend, Rent, and Interest Income	State and Local Taxes	Federal Taxes
Commercial Fishing	\$679,530	\$52	\$83,642	\$50,406	\$33,173	\$44,625
Seafood Markets/Dealers	not assessed (>\$492,000)	not assessed	not assessed	not assessed	not assessed	not assessed
Charter Boat Fishing	\$1,229,796	\$9	\$364,974	\$262,061	\$57,467	\$78,368
Head Boat Fishing	\$2,115,995	\$12	\$645,904	\$463,116	\$103,298	\$138,957
Private Boat Fishing	\$15,909	0	\$4,515	\$3,117	\$681	\$955
Total	\$3,361,700	21	\$1,015,393	\$728,294	\$194,619	\$262,905

Essentially Closed Inlet Navigability Conditions

The potential decreases in annual economic impacts due to deterioration of Carolina Beach inlet navigability to “Essentially Closed” conditions (average inlet depth of 4 feet) are summarized in Tables 25 and 26 below. **Consumer Surplus Loss:** There is also an estimated consumer surplus loss to charter boat, head boat and private boat fisher persons (collectively) of \$1.78 million per year.

Table 25. DECREASE in Annual Total Economic Impacts of CBI Fishing Activity Within New Hanover County,

Economic Sector	Sales (Output)	Employment	Wage, Salary, and Sole Proprietorship Income	Dividend, Rent, and Interest Income	State and Local Taxes	Federal Taxes
Commercial Fishing	\$382,500	32	\$51,748	\$32,740	\$18,707	\$23,072
Seafood Markets/Dealers	\$330,750	not assessed	not assessed	not assessed	not assessed	not assessed
Charter Boat Fishing	\$6,129,446	43	\$1,723,073	\$1,279,760	\$284,396	\$356,701
Head Boat Fishing	\$10,472,374	57	\$3,043,443	\$2,257,244	\$512,162	\$631,672
Private Boat Fishing	\$1,055,168	8	\$278,673	\$187,616	\$43,494	\$55,836
Total	\$18,370,238	140	\$5,096,937	\$3,757,360	\$858,759	\$1,067,281

Table 26. DECREASE in Annual Total Economic Impacts of CBI Fishing Activity Statewide,

Economic Sector	Sales (Output)	Employment	Wage, Salary, and Sole Proprietorship Income	Dividend, Rent, and Interest Income	State and Local Taxes	Federal Taxes
Commercial Fishing	\$306,691	24	\$37,750	\$22,750	\$14,972	\$20,141
Seafood Markets/Dealers	not assessed (>\$330,750)	not assessed	not assessed	not assessed	not assessed	not assessed
Charter Boat Fishing	\$3,660,108	25	\$1,086,232	\$779,944	\$171,034	\$233,240
Head Boat Fishing	\$6,297,606	35	\$1,922,334	\$1,378,323	\$307,435	\$413,563
Private Boat Fishing	\$662,892	5	\$188,108	\$129,889	\$28,365	\$39,807
Total	\$10,927,297	\$89	\$3,234,424	\$2,310,906	\$521,806	\$706,751

References

- Crosson, S. 2010. A Social and Economic Survey of Recreational Saltwater Anglers in North Carolina. North Carolina Division of Marine Fisheries. Morehead City, NC.
- Dumas, C. F., Whitehead, J., Landry, C., Herstine, J. 2009. Economic Impacts and Recreation Value of the North Carolina For-Hire Fishing Fleet. North Carolina Sea Grant. Raleigh, NC.
- Herstine, Jim, Chris Dumas and John Whitehead. 2007. The Economic Impacts and Economic Benefits of Recreational Boating Along the Atlantic Intracoastal Waterway (AIWW) in North Carolina. North Carolina Sea Grant. Raleigh, NC.
- IMPLAN Group LLC. 2014. IMPLAN version 3.0 software and 2012 dataset. Huntersville, NC. Available: <http://implan.com/>
- Lovell, Sabrina, Scott Steinback, and James Hilger. 2013. The Economic Contribution of Marine Angler Expenditures in the United States, 2011. U.S. Dep. Commerce, NOAA Tech. Memo.
- Miller, R. E., and P. D. Blair. 1985. —Input-Output Analysis: Foundations and Extensions . Prentice Hall. 464 pp.
- Moffatt and Nichol. 2014. Study of the Economic Impacts of Oregon Inlet Navigability to Dare County, the Surrounding Region, and the State of North Carolina, Final Report. Raleigh, NC. May 2014.
- NCDMF. 2013. 2013 License-Statistics Annual Report. North Carolina Division of Marine Fisheries. Morehead City, NC.
- NCDMF. 2014. Commercial Fishing Statistics. Personal communication. North Carolina Division of Marine Fisheries. Morehead City, NC.

Appendix

The Study Researchers

Dr. Chris Dumas and Dr. John Whitehead will collect and review academic and technical information needed for the study and will conduct the economic analysis. Dr. Dumas' firm will hire Dr. Whitehead as a subcontractor. Dr. Chris Dumas is a professor of Economics at the University of North Carolina, Wilmington. A native of Wilmington, North Carolina, Dr. Dumas has been working on issues related to coastal economics along the South Atlantic coast, and in North Carolina in particular, for over 15 years, including the economics of commercial and recreational fisheries, beach tourism, boat building, beach re-nourishment, hurricane impacts and terminal groins. Dr. Dumas conducted much of the economic analysis for the 2006 Oregon Inlet study. Since then, Dr. Dumas has provided economic analysis for the North Carolina Beach and Inlet Management Plan ("BIMP" plan), the Terminal Groin study, and various studies of the economic impacts of for-hire and private boat fishing in North Carolina. A list of related research is included in the appendix to this proposal.

Dr. John Whitehead is a professor of Economics and chair of the Department of Economics at Appalachian State University. Dr. Whitehead has worked in the areas of recreational fisheries economics, beach tourism and nourishment economics and hurricane impact economics for over 20 years. Dr. Whitehead is considered a national expert in the area of measuring the economic benefits of for-hire and private boat recreational fishing, with extensive knowledge of the MRFSS survey data collected by the National Marine Fisheries Service that is used to assess the benefits of recreational saltwater fishing. A list of related research is included in the appendix to this proposal.

In addition, both Dr. Dumas and Dr. Whitehead have served on the Socio-Economic Advisory Panel for the South Atlantic Fisheries Management Council.