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Understanding Metrics for Communicating the Economic Importance of Florida's Fisheries Part III: Measuring Economic Value[1]

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Abstract

Florida's fish, fisheries, and aquatic resources are important to the state's economy, but often people need to know *how* economically important they are. One challenge is that "economic importance" means different things depending on what economic approaches are used. Understanding these differences is important for discussing the economic importance of fisheries and how they might be affected by management actions or environmental changes. This publication is the third and last in a series that explains the different types of economic metrics and how they are often used in a fisheries context. The first publication in the series, "Understanding Metrics for Communicating the Economic Importance of Florida's Fisheries Part I: An Overview," explains how economic measures can be subdivided into those that quantify market activity and those that measure economic value. The second, "Understanding Metrics for Communicating the Economic Importance of Florida's Fisheries Part II: Quantifying Market Activity," focuses on measuring market activity. This final publication focuses on measures of economic value. It discusses different ways to think about and estimate economic values associated with Florida's fisheries and aquatic resources. This information should help readers, especially management agencies and Extension agents, as well as the interested public, better understand economic value metrics.

Introduction

Fisheries, aquaculture, and aquatic resources provide many benefits to humans. Florida-specific examples include commercial fishing (e.g., the commercial stone crab fishery), recreational fishing (e.g., grouper fishing off Florida's coasts), and aquaculture (e.g., clam farming). The benefits provided by these resources are economically important, but measuring the value of benefits provided can be challenging. Measuring the economic value derived by the users of a fishery (commercial fishers, recreational anglers, charter operators, and seafood consumers) helps management agencies and regional governments make decisions about resource management and investment. Estimating the economic value derived by different groups of people who use fisheries and aquatic resources can provide information on how regulatory and environmental changes will impact these people. The overall goal of this publication is to provide an overview of different ways to think about and estimate the economic values associated with Florida's fisheries and aquatic resources. This information

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should help management agencies, outreach personnel, and the interested public understand the economic value provided by Florida's fisheries and other aquatic resources. This publication briefly discusses the differences between measures of economic value and measures of market activity; difficulties associated with quantifying economic values; the concept of total economic value and its components; differences between market and non-market goods, including different forms of value and valuation techniques associated with each; and ecosystem service values and how they are quantified — all in the context of valuing goods and services associated with Florida's fisheries and aquatic resources. Key terms used to describe and measure economic value are defined in a glossary at the end of the publication. This publication is introductory and designed to cover basic concepts and ideas; additional sources of information are provided for several of the concepts and ideas put forth.

Measures of Economic Value Versus Measures of Market Activity

Measures of the economic importance of fisheries generally can be placed into two main categories, namely **market activity** and **economic value**. Measures focused on the value of **market activity** describe spending. They are used to answer questions like "How many jobs does a certain fishery support?" or "How would a change in recreational fisheries management impact regional sales revenue or jobs?" On the other hand, measures of **economic value** quantify the benefits individuals, and society more generally, receive from a good or service. These are used to answer questions like "How much is a fishing trip worth to a recreational angler?" "How much value would recreational anglers get from an increase in the bag limit for a certain target species?" and "What is the value of water filtration services provided by an oyster reef?"

Difficulties in Understanding and Quantifying Economic Value

The process for measuring and quantifying economic value is difficult to explain for several reasons. First, the efforts to quantify economic value are different from, but often confused with, those that estimate market activity. This confusion is due, at least in part, to the fact that many of the metrics, while evaluating different things, are measured in the same units (dollars). Second, both the type of economic value being measured and the techniques employed to measure that economic value vary based on the type of good or service being valued. This means that the different benefits provided by different facets of Florida fisheries and other coastal resources provide varying types of value and can require different techniques to measure. Furthermore, while we can classify economic values relative to the type of goods or services being valued, the type of value being measured, and the techniques used to estimate these values, these classifications are often not mutually exclusive, which can lead to confusion regarding how to measure these values and what the values mean. We will attempt to clarify some of this confusion by breaking down economic value into its components. We will also provide information on how different types of goods and services are valued differently, and we will present some basic examples of different valuation techniques.

Values Associated with Florida's Fish and Fisheries

Economic value measures the benefits provided by a good or service to individuals and is calculated as the amount individuals are willing to pay for the good or service (Letson 2002; Tietenberg 2006). The economic value of natural-resource-based goods and services, such as those associated with Florida's fish and fisheries, can be broken down further into three subgroups: use value, option value, and non-use value (Tietenberg 2006).

Total Economic Value = Use Value + Option Value + Non-Use Value

Use value is derived from employing the good or service. Use value can be subdivided into direct use value and indirect use value. Direct use values are associated with goods or services where the output is directly consumed, such as an individual purchasing commercially harvested fish. Indirect use values are often associated with benefits provided by a good or service that is not directly consumed by the individual. An example would be an oyster reef restoration project improving water quality and leading to improved recreational fishing (Letson 2002). **Option value** is the value individuals place on the opportunity to use in the future environmental goods or services that they are not currently using. Generally, option value is associated with wanting to preserve the environment for future use (Tietenberg 2006). An example related to Florida fish and fisheries would be the value recreational anglers place on not depleting fish stocks today so that they can derive use values from the stocks in the future. **Non-use value**, the last component of total economic value, is the value individuals place on environmental goods or services they will never

use. Non-use values are commonly associated with people's willingness to pay to protect animals (e.g., manatees) or ecosystems (e.g., the Florida Everglades) that they will never interact with or visit, respectively. Non-use value can be further subdivided into existence and bequest value. **Existence value** is the value a person places on the continued existence of a species or ecosystem, and **bequest value** is the value they associated with protecting the resource for future generations to enjoy (Letson 2002; O'Garra 2009).

When we think about value, we can consider total economic value and its component parts, and we can also examine value based on the nature of the good or service being evaluated, as we will show in the following sections. It is important to note that the different ways of examining economic value in the following sections are not separate from the concept of total economic value, meaning that as we examine different types of goods and services, they can still be thought of as delivering benefits that provide some combination of use, option, and non-use value.

Market and Non-Market Goods and Services

Goods and services associated with Florida's fish and fisheries can be subdivided into two groups: (1) market and (2) non-market goods and services. **Market goods and services** are those traded in markets. They include fish landed by Florida's commercial fishing industry and fees charged by charter operations for guided fishing trips. **Non-market goods and services**, as the name implies, are not traded in markets. Examples of non-market goods and services associated with Florida's fish and fisheries include non-guided recreational fishing trips and the water filtration services provided by oyster reefs. The distinction between market and non-market goods and services is important because, as we will show in the following sections, the distinction leads to differences in what we can measure and the techniques employed in those measurements.

Market Goods and Market Value

Market goods are subjected to the market forces of supply and demand. If demand for a good or service exceeds supply, the price will rise, and if the supply exceeds the demand, the price will fall. The price where supply and demand are equal is the market price — the price the good or service is sold for. Using the market price, we can determine the **market value** of a good or service. We multiply the market price ($/unit) by the amount of the good or service (number of units) being valued. Market value is likely the most intuitive measure of economic value because it is the one people are most familiar with.

Market Value Example and Data Sources

Market value related to commercial fisheries can often be calculated using data published by state and federal agencies including the Florida Fish and Wildlife Conservation Commission (FWC) (https://app.myfwc.com/FWRI/PFDM/ReportCreator.aspx) and NOAA (National Oceanic and Atmospheric Administration) Fisheries (https://www.fisheries.noaa.gov/foss/f?p=215:200:13555668406451:Mail). These agency databases provide area- and time-period-specific data on average market prices and quantities of fish sold.

As an example, using the FWC database, we can estimate the dockside value of Pinellas County commercial red grouper landings in 2022 to be $9,109,655. This market value was the average market price of approximately $5.13/pound multiplied by the total amount caught during 2022 (1,774,959 pounds). It is important to note that the market value is specific to the market being examined, in this case, the dockside market where commercial fishermen sell their fish to dealers and wholesalers. The retail market value, measuring the value when the fish is sold to consumers through restaurants, grocery stores, and seafood markets, would be quite different. The differences would be associated with the costs incurred to further process the fish and transport it.

Consumer and Producer Surplus

While the market value provides some information on how buyers (consumers) and sellers (producers) value the good or service being transacted, it does not provide a full picture of the benefits accruing to the consumer and the producer. If a consumer pays less for a good than the *maximum amount they would have been willing to pay for it*, the difference between what they were willing to pay and what they paid is called **consumer surplus** and represents value to the consumer. For example, if a consumer is willing to pay $25.00 for a pound of grouper, but they can buy it for a market price of only $20.00, their consumer surplus is $5.00. Similarly, if a producer receives more for a good than the *minimum amount they would have been willing to sell the good for*, the difference between the price received and what they were willing to sell for is called the **producer surplus**. So, if the seller was willing to sell the grouper for $15 per pound, but they sell it for a market price of $20 per pound, their producer surplus would be $5.

We can think of the consumer and producer surpluses in terms of a single transaction, as in the grouper example just described, or we can consider these values relative to an entire market (i.e., all grouper sold in Florida in 2023)

by summing all the surpluses across all transactions. The surplus measures provide information on the benefits received by consumers and producers from taking part in market transactions. Estimating market value is relatively straightforward assuming market price and trading volume data are available, but estimating consumer and producer surplus requires data not directly captured by markets. Estimating consumer and producer surpluses at the individual level requires knowing the consumer's and the producer's personal valuation of the good, and estimating total surpluses requires knowledge of the demand and supply for the good or service in question.

We have discussed consumer and producer surplus in terms of market goods and services for ease of explanation and interpretation. It is important to note, too, that non-market goods and services also provide consumer surpluses. Consumer surpluses associated with non-market goods and services will be discussed in the following sections.

Non-Market Goods and Their Valuation

Non-market goods are not directly traded and, as such, have no market price. Non-market goods include environmental resources, ecological services, certain types of outdoor recreation, and other amenities. Florida fisheries and coastal-resource-specific examples include the value of recreational fishing trips, water filtration services provided by oyster reefs, and wildlife viewing excursions (e.g., manatee watching). Each of these examples provides benefits to people, but the lack of direct market transactions requires us to find different ways of valuing these benefits. In this section, we will examine some techniques commonly used to value non-market goods and services associated with Florida's fisheries and coastal resources.

Recreational Activities and the Travel Cost Method (TCM)

While non-market goods are not directly traded in markets, some recreational activities require users to take part in market transactions and make choices that provide information on how they value the activity. The value people place on a recreational fishing trip, for example, can be inferred by the costs they incurred to take the trip (Pienaar 2017). The TCM is a survey-based approach commonly used to value recreational activities, such as the value of a specific recreational fishery or fishing location. By collecting information on travel costs across a large group of users, the TCM can both estimate total cost incurred by all users of the resource and also estimate the aggregate consumer surplus — the value of the recreation above the costs incurred to participate (Hwang et al. 2021).

TCM Example

The TCM is often used to value aspects of recreational fishing, such as the value of a specific fishing site or an entire fishery. A group of UF/IFAS researchers, along with FWC staff, used TCM to estimate the value of Florida's recreational black crappie fishery (Hwang et al. 2021). The researchers surveyed a representative sample of black crappie anglers regarding their fishing activity, fishing expenditures, and income. After analyzing the data, the researchers estimated the average travel cost associated with a black crappie fishing trip ranged from $8.52 to $17.15 based on where the anglers were from and where they fished. The researchers estimated the annual consumer surplus (fisher value above and beyond the costs incurred) associated with Florida's black crappie fishery at $496 million to $944 million per year for all black crappie fishing trips. Ecosystemvaluation.org provide more detailed overviews of the TCM and its use.

Environmental Amenities and the Contingent Valuation Method (CVM)

While the TCM allows us to use costs associated with recreational fishing trips and other activities to estimate the value to the user, there are many non-market goods and services associated with Florida's fisheries and aquatic resources that do not involve market transactions. Examples of such goods and services could include water filtration provided by oyster reefs that benefit people boating, swimming, diving, or otherwise recreating on the coast or a change in recreational fisheries regulations that would allow recreational fishers to keep more of the fish they catch. For these types of goods and services, we can use survey techniques known as stated preference valuation methods to estimate value (Kahn 2005). **Stated preference valuation methods** are so named because instead of observing actual spending on a good or service, known as **revealed preference valuation methods**, we ask people to "state" their valuation of the good or service. Stated-preference valuation methods are often used to measure option and non-use value associated with non-market goods and services. Examples include the value associated with protecting manatees from extinction (non-use value) and the value an angler might place on protecting a fish species they currently do not fish for but might in the future (option value). One of the most-used stated preference valuation methods is the CVM. The CVM uses survey questions regarding an individual's willingness to pay for changes in the quality or quantity of a good or service (Haab and McConnell 2003). CVM is often used to value fisheries and aquatic resources such as water quality; protection of threatened or

endangered species (e.g., whales); and the preservation of natural areas (Kahn 2005).

CVM Example

A 2018 study by UF/IFAS researchers used a contingent valuation survey to examine springs visitors' willingness to pay for Florida springs restoration projects (Wu et al. 2018). Their survey asked visitors about their willingness to pay for a hypothetical increase in park entrance fees that would be used for springs restoration. Their results indicate that visitors were willing to pay $12 to $14 more per person per trip for springs restoration programs and that they would not decrease their number of trips because of the additional fee.

Ecosystem Service Valuation and Benefits Transfer

Ecosystem services are the benefits provided to humans by the natural environment and healthy ecosystems. Ecosystem services can be classified as market or non-market in nature and can be examined using the total economic value framework discussed earlier. Ecosystem service values can be described and examined using the concepts and techniques previously discussed in this publication. It is because of increased awareness of the importance of, and need to value, ecosystem services over the past several decades and the multitude of ecosystem services provided by Florida's fisheries and aquatic resources that we discuss them separately here.

Ecosystem services can be divided into different types. **Provisioning services** include physical goods from the natural environment such as seafood from Florida's coastal waters. **Regulating services** are the benefits provided by natural ecosystems such as erosion prevention associated with nearshore reefs. **Cultural services** are the recreational, aesthetic, and spiritual benefits provided by nature to humans. A Florida-specific example would be the benefits recreational anglers receive from Florida's bountiful fisheries. **Supporting services**, as the name suggests, support the other ecosystem services; common examples include soil formation, photosynthesis, and nutrient cycling. Removing nitrogen from coastal waters and providing habitat for fish are examples of supporting services provided by Florida's oyster reefs (Millenium Ecosystem Assessment 2005).

Valuation of ecosystem services can be accomplished using the techniques outlined previously in this publication based on the service being examined. Previous examples provided can also be classified as ecosystem services. Pinellas County commercial red grouper landings are an example of a provisioning ecosystem service and values associated with Florida recreational fishing and springs recreation are examples of cultural ecosystem services.

Another valuation technique used to measure ecosystem service values is benefits transfer. **Benefits transfer** involves applying economic valuation studies of ecosystem services from one location to value the ecosystem service in another location. The original study will still rely on a valuation technique such as the TCM or CVM. Instead of re-creating the study for the current study site, however, the benefit values will be transferred to the site/ecosystem of interest. For instance, if FWC wanted to estimate the value of black crappie fishing on Lake Talquin, they could potentially use the per-angler expenditure data and consumer surplus estimates from Hwang et al. (2021) multiplied by the estimated number of Lake Talquin black crappie anglers to estimate the values associated specifically with Lake Talquin black crappie fishing. While benefits transfer can be used to save time and money in valuing ecosystem services, careful consideration is required when applying the method. Ecosystem services are generally specific to a geographic area and the period when the estimation was completed. Benefits transfer should be undertaken only if the ecosystem services being evaluated are similar and the previous study is not outdated (Ropicki et al. 2016).

Summary and Additional Resources

Florida's fisheries and aquatic resources provide food, recreation, and numerous other benefits to people. When we quantify these benefits in dollar terms, we measure their economic value. That value can be associated with using the resource now (use value), using it in the future (option value), or just knowing the resource is there (non-use value). We can classify economic values relative to the type of goods or services being valued (market vs. non-market) and the techniques used to estimate these values (TCM, CVM, etc.). Unfortunately, these classifications are often not mutually exclusive, which can lead to confusion regarding how to measure these values and what the values mean. This publication has provided an overview of different concepts of economic value associated with Florida's fisheries and aquatic resources and has highlighted several techniques used to estimate these values. It is important to note that this publication is designed to serve as an introduction to the concept of economic value applied to fisheries and aquatic resources and not a complete explanation. A full discussion of the topic could fill multiple textbooks — we have simply outlined the basics

and provided examples to get you started on your learning journey. Table 1 provides additional resources available to those interested in learning more.

Glossary

Benefits transfer – Applying ecosystem service valuations estimated from the analysis of one study site to another.

Bequest value – The value someone receives from protecting a natural resource for future generations.

Consumer surplus – The difference between the highest price a consumer would have been willing to pay for a good or service and the price they actually paid.

Cultural services – Ecosystem services that provide recreational, aesthetic, and spiritual benefits.

Ecosystem services – The benefits provided to humans by the natural environment and healthy ecosystems.

Existence value – The value someone receives from knowing that a natural resource exists.

Market goods and services – Goods and services that are directly traded in markets where the market price provides some information about both the buyer's and the seller's valuation of the good or service.

Market value – The value of goods or services traded on markets as measured by the average market price multiplied by the units of the good or service being valued.

Non-market goods and services – Goods and services that are not directly traded through markets but do provide value to people.

Non-use value – The value a person receives from protecting a natural resource they will never use. Generally, non-use value can be further classified as bequest or existence value.

Option value – The value someone receives from protecting the ability to use a natural resource in the future even if the resource is not currently being used.

Producer surplus – The difference between the price for which a producer sold a good or service minus the smallest amount for which they would have been willing to sell the good or service.

Provisioning services – A type of ecosystem service that involves physical goods provided by ecosystems, for instance, food, water, or timber.

Regulating services – Ecosystem service benefits associated with the regulation of ecosystem processes including flood prevention, erosion control, and climate regulation.

Revealed preference valuation methods – Valuation techniques that estimate the value of a good or service by observing consumer purchases related either directly or indirectly to the good or service in question.

Stated preference valuation methods – Survey-based techniques that ask people questions designed to elicit their value for a good or service.

Total economic value – The sum of all values a person receives from a natural resource. This value is comprised of use value, option value, and non-use value.

Use value – The value someone receives from direct use of an environmental resource.

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Table 1. Additional Sources.

Link	Topic Area	Description
https://www.bluevalue.org/	Benefits Transfer Database	Searchable ecosystem service valuation research database for benefits transfer developed by the Harte Research Institute at TAMU Corpus Christi.
Economic Valuation of Natural Resources: A Handbook for Coastal Resource Policymakers	Natural Resource Valuation Guide	NOAA-produced handbook on valuing coastal natural resources with in-depth coverage of concepts and tools as well as case studies.
https://www.ecosystemvaluation.org/uses.htm	Ecosystem Service Valuation	An expansive website provided by the USDA and NOAA that covers concepts of economic value, valuation of ecosystem services, and methods to estimate values of services with examples of each (including some not covered in this publication).
FA 252 – How Ecosystem Services are Measured and Why it Matters for Florida	Ecosystem Service Valuation	EDIS publication discussing ecosystem services and briefly describing numerous approaches to their valuation.
United Nations Guidance Manual on Value Transfer Methods for Ecosystem Services	Benefits Transfer	UN document on benefits transfer.