

FINAL ECOSYSTEM GOODS AND SERVICES CLASSIFICATION SYSTEM (FEGS-CS)



BY

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NOTICE

This document describes a Final Ecosystem Goods and Services Classification System. It was funded wholly by the U.S. Environmental Protection Agency, Office of Research and Development (USEPA-ORD). It has been subject to review by the National Health and Environmental Effects Research Laboratory (NHEERL) and Western Ecology Division (WED) and approved for publication. Approval does not signify that the contents reflect the views of the Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

Please note that this is a large document. Even though all of the pages have been formatted for letter or legal size paper, some of the Appendices may be better suited to viewing on a computer screen. Please consider reviewing this document electronically. If a hard-copy is necessary, please print double-sided.

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QUESTIONS AND COMMENTS

Any questions and/or constructive comments are welcome and may be directed to FEGS.CS@epa.gov. Because we expect that the classification system presented in this document will be updated periodically as more information is collected and more people use the FEGS-CS, we have established a forum where the most up-to-date classification documents may be found. This forum is located at <http://geoplatform1.epa.gov/FEGS.CS/>. In addition to hosting the latest (i.e., future) versions of documents, this website will also allow users to query the FEGS-CS in such a way that they may create standard, customized FEGS Matrices for their individual needs and interests. We will require users of this site to provide identifying information (name, affiliation, email, and intended use). This will allow us to follow-up with users via email and request comments and input. We intend to update the FEGS-CS annually based on input and comments received, as well as internally generated improvements, and we will notify identified users when a new version of this document is available.

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¹ Note that the Environmental Classes, Beneficiary Categorization, Summary Matrix, or FEGS Matrix tables in the Appendices may be accessed differently depending on the file format of the document. If the reader is viewing the Appendices as an Adobe Acrobat (.pdf) file, these specific tables are delineated via bookmarks (with the FEGS Matrices comprised of each of the 15 Environmental Sub-Classes). On the other hand, if the reader is viewing the database as a Microsoft Excel (.xlsx) file, specific tables can be found as separate worksheets (i.e., tabs).

FINAL ECOSYSTEM GOODS AND SERVICES CLASSIFICATION SYSTEM (FEGS-CS)

1. INTRODUCTION

This document introduces, defines, and describes a **classification system**² for ecosystem services. By using the concept of Final Ecosystem Goods and Services (FEGS) to define a specific group of ecosystem services, the authors standardize ecosystem services and provide a solid foundation for their further use and development. The concepts and specifics presented in this document represent the first comprehensive FEGS-CS in existence; therefore, we fully acknowledge that as more people use the FEGS-CS, some of the concepts may be clarified and specifics may be modified (see “Questions and Comments” in the Index for details).

The audience for this document is potentially large and includes individuals, communities, or firms in the public sector, private sector, and non-profit organizations that wish to measure, quantify, map, model, and/or value a standard, but complete, set of ecosystem services anywhere on earth. Technical practitioners (e.g., social scientists, economists, natural scientists, decision-makers, etc.) of ecosystem services will likely appreciate the relatively fine separation of ecosystem services achieved in this classification system and the common language established in this document to efficiently communicate across disciplines and to the public.

2. DEFINING ECOSYSTEM SERVICES

Ecosystem services have become an oft used construct with which to describe, in general and also in very specific terms, benefits provided by nature and valued by people. There are many definitions for the term “**ecosystem services**” (see Nahlik et al. 2012 for an in depth discussion

² While researching the literature, it became apparent that many terms were used in many different ways or even undefined. Because one of our goals in creating the FEGS-CS is to bring structure and consistency to the ecosystem services community, we felt it was crucial to define the terms we use so they are and can be used by others without ambiguity. Throughout this document, we introduce new terms using **bold type** and provide definitions. If these terms are not immediately defined in the text, please refer to the Definitions Appendix. It should be noted that several of the terms, such as “medium” and “subsister”, listed in the Definitions Appendix are not explicitly discussed in this text but are used in the FEGS Matrices Appendix.

of existing definitions), but many of the widely used definitions are not specific enough to result in consistent and explicit identification of ecosystem services (Text Box 1). Furthermore, common categorization schemes for ecosystem services, such as “supporting”, “regulating”, “provisioning”, “cultural” (MEA 2005) are heuristically relevant but do not provide a rigid **framework** in which ecosystem services can be identified on the landscape and explicitly associated with people. While the notion of ecosystem services has been well-received by many sectors of society since the publication of the 2005 Millennium Ecosystem Assessment (MEA 2005), there still exists a glaring need for:

- a united set of concepts that includes a definition of terms from which individual goods and services can be specified,
- metrics and indicators that can be estimated in the environment, and
- specific, identifiable linkages between ecosystem services and human well-being (Ringold et al. 2013; Nahlik et al. 2012a).

There are some large entities such as the United Nations, United Kingdom,

Text Box 1. Ecosystem service literature is full of inconsistencies

After conducting a review of 74 publications that used the term “ecosystem services” in the title or as a keyword, 1260 ecosystem services were identified, of which 512 were unique. It is evident from the examples below that the term “ecosystem service” is used loosely and inconsistently in the literature.

Examples of unique uses of the term ecosystem services include: hydrologic cycle, SOx levels, pollution control, recycling, dung removal, flood protection, pollution dilution, self purification, water quality, natural hazard prevention, erosion reduction, maintenance of air quality, renewal of soil fertility, weathering of rock, potential denitrification, sulfur cycle, bioturbation, morphology, iconic species, plants, oxygen, refugia, latex, bushmeat, seafood, products for material science, oil and gas, low-sediment water for hydropower, water supply, herbs, timber, fodder, summer cottages, retirement, noise abatement, artistic inspiration, cultural diversity, agriculture, spiritual enrichment, photography, bird watching, picking mushrooms, recreation, educational values, access to mates and being loved, aesthetics, immaterial value, ecosystem use, genetic storage, biodiversity, life cycle, pollination, resilience, population control, property value, risk-aversion, options, etc.

The unique ecosystem services were further categorized by processes/functions (39.1%), structural components (8.0%), goods (18.8%), human uses (21.3%), or securities (12.9%). Although lumping ecosystem services into these categories does not facilitate measuring, quantifying, mapping, modeling, valuing, or accounting of ecosystem services, the categories are an effective heuristic tool. It is evident that the majority of ecosystem services identified in the literature are environmental processes or functions. This is particularly an issue because of double counting.

There is a vital need for an ecosystem services classification system that is built upon definitions, is consistent in its application, avoids double accounting, and connects to human well-being - not leaving that complex task to the next recipient of the classification results. One of the most challenging aspects of the ecosystem services literature, to date, is that there is no standardization, and, therefore, communication and consistency in the field have not been achieved.

and European Union (UK Ecosystem Assessment 2012, 2011; UNEP 2009) that are seeking **approaches** to the issue of defining and classifying ecosystem services. A common objective of these efforts seems to be to provide defined and standardized approaches for identifying ecosystem services so that communication and comparison across landscapes can be readily achieved. Much of the progress on this topic can be found in the grey literature – probably because definitive progress has been difficult to achieve and work is presently on-going (Staub et al. 2011, Haines-Young and M. Potschin 2011, 2010; Carpenter et al. 2009; Ott et al. 2009; The Heinz Center 2008; MEA 2005).

Without the standardization that an accepted definition of ecosystem services provides and the consistency that a classification system offers, experts from different disciplines often fail to communicate. Miscommunication results in a disconnect between the goods and services measured by ecologists and those valued by the public. Therefore, these efforts often fail to be useful in analyses of human well-being (Nahlik et al. 2012a, b). Such standardization is required not only so ecosystem services can be similarly discussed – especially across disciplinary boundaries – but also so they may be measured, quantified, and valued in a reliable and repeatable manner, thus facilitating the use of meta-analysis to effectively compare different studies. Ultimately, the consistency of a rigorous ecosystem services classification system is imperative to inform policy development at multiple spatial scales and to incorporate ecosystem services into decision-making.

A group of scientists at the United States Environmental Protection Agency (US EPA) Office of Research and Development (ORD) has adopted the concept of **Final Ecosystem Goods and Services (FEGS)** as a foundation for defining, classifying, and measuring ecosystem services. FEGS, the “components of nature, directly enjoyed, consumed or used to yield human well-being”, are attributed to Boyd and Banzhaf (2007), who defined and initiated the theoretical development of the concept of Ecological Endpoints (Boyd 2007), which later came to be known as FEGS. The FEGS concept and definition has now been, and continues to be, adopted and refined by others (Johnston and Russell 2011; Staub et al. 2011; Haines-Young and Potschin 2010; Ott and Staub 2009; Fisher et al. 2009, 2008).

Nahlik et al. 2012a captures much of the reasoning behind the selection of FEGS as a suitable foundation for defining and classifying ecosystem services. There are four main reasons: 1) FEGS avoids much of the ambiguity inherent in other ecosystem services definitions; 2) FEGS minimizes or avoids double-counting (see 3.4.5. *How FEGS Minimizes Double-Counting* for further details); 3) FEGS are a bridge between natural and social sciences that facilitates direct communication and collaboration; and 4) FEGS are **beneficiary**-specific and may be understood

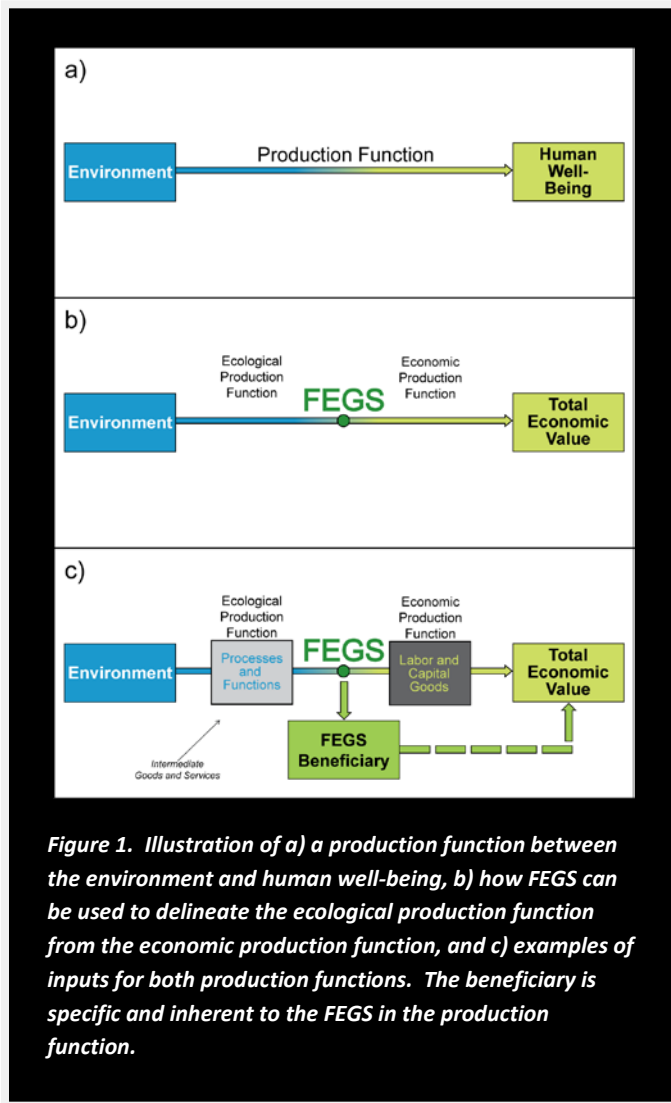
by people without translation or interpretation. US EPA scientists have been working in collaboration with others, including social scientists from diverse organizations, in **transdisciplinary** workshops and other settings since 2008 to translate the economic concept of FEGS into ecological practicality and explore how the FEGS concept might be developed into an **operational** classification system that combines both natural science environmental components and social science connections to humans (Ringold et al. 2013, 2011, 2009; Nahlik et al. 2012a, b). One result from these efforts was the identification of five general **principles** that provide broad guidance for the use of the FEGS approach³. These five Conceptual FEGS Principles include:

Conceptual FEGS Principles	
1	Defining, measuring, quantifying, valuing, and/or accounting for FEGS requires a wholly collaborative effort among natural scientists and social scientists.
2	Environmental processes and functions produce potential FEGS (i.e., stocks), while people, groups, or firms (hereon referred to as "individuals") enjoy, use, or consume FEGS.
3	Defining, identifying, and classifying a complete, but non-duplicative, set of FEGS is the foundation that can be used as a transdisciplinary approach to measure, quantify, map, model, and value ecosystem services.
4	Because individuals enjoy, use, or consume FEGS, an understanding of their beneficiary perspective is crucial to identify FEGS and contribute to the framing of the research and implementation plan .
5	Until the environment is measured [by natural scientists] and beneficiaries can be identified and quantified [by social scientists], the FEGS reported in these matrices are considered candidates.

Most of these principles are explicitly discussed in Nahlik et al. 2012a, which we recommend FEGS-CS users to read. Furthermore, Ringold et al. (2013) give some concrete examples of how FEGS could be used and define the steps taken to determine metrics and indicators for FEGS.

It is useful to think about FEGS in the context of how we have traditionally thought about what the environment provides. Until recently, society has generally thought of the environment as providing goods and services that, through a general **production function**, produce **benefits** or value that ultimately affect human well-being (Figure 1a). This general “ecosystem to human well-being” approach implies that there is an environmental-human continuum. However, unless both environmental and economic (i.e., labor, and capital goods) inputs are well-specified in the general production function, it is difficult (or impossible) to explicitly separate the goods and services provided by (or predominantly by) the environment from the investment humans make to realize the total economic value of those goods and services. For example, agricultural commodities (e.g., corn, cotton, etc.) have both an important ecological component and an important economic component that results in the overall production and

³ In this document, we will introduce two sets of principles (using numbered tables), one of which relates to the FEGS concept and the other relates to identifying FEGS boundaries.

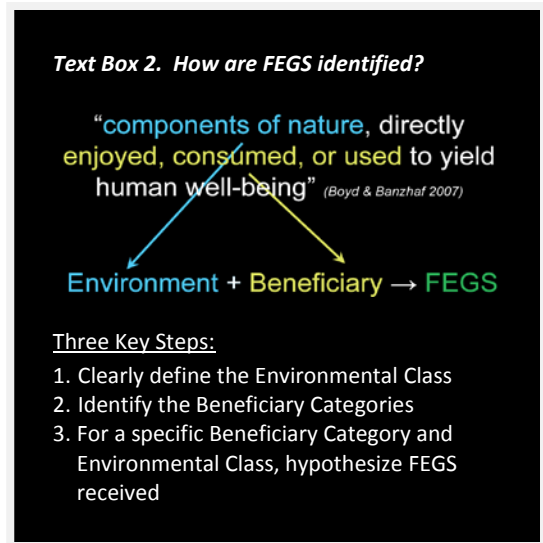


availability of these goods. Consider the environmental and human inputs (i.e., labor and capital goods) into a cotton tee-shirt: the environment provides **intermediate ecosystem goods and services**, such as climate and nutrient cycling, to FECS – open space and soil [quality and quantity] to a farmer – which in turn results in an opportunity to grow cotton. However, humans must provide economic activities and inputs (e.g., fertilizing and tilling the soil, planting seeds, weeding, harvesting) to produce the raw cotton and further economic activities and inputs (e.g., processing, transporting, manufacturing, packaging, selling, etc.) to produce a tee-shirt being sold in a store.

The FECS concept can be used to efficiently and systematically distinguish the production function that is predominantly ecological in nature from the production function that is predominantly economic (Figure 1b); FECS, the ultimate (i.e., last) biophysical

entity in nature used by individuals to acquire a human benefit, are the link between the ecological and economic production functions. The ability to define and identify FECS and the specific biophysical components of goods and services that are principally derived from nature across the landscape (i.e., from different Environmental Classes) is an advancement in our understanding of ecosystem services, and we explicitly identify FECS provided by different Environmental Classes in the Final Ecosystem Goods and Services Classification System (FECS-CS). Because FECS are principally derived from nature, using FECS allows us to separate, quantify, and value the ecological production function from the overall **total economic value**, which includes an economic production function. As Figure 1c illustrates, there are myriad intermediate ecosystem services (often processes and functions) represented in the ecological

production function that are vital to the production of FECS. Many common benefits derived by humans (measured as total economic value) are typically not attained until there is some significant input of labor and capital goods (i.e., human capital). These benefits may not be predominantly ecological in nature, as they are a result of the addition of human capital. However, since we can identify the beneficiaries for specific FECS (and the FECS-CS explicitly defines these beneficiaries) we can determine those specific **ecosystem attribute(s)** associated with the specific FECS that the beneficiary values, and these can directly lead to identifying appropriate **metrics and indicators** for FECS. The FECS, therefore, represent those goods and services that are largely environmentally derived without major inputs of labor or capital from humans.



This document represents the completed initial version of an ecosystem service classification system. FECS-CS provides a solid foundation for defining specific FECS relating to two independent components that are derived from the definition of Final Ecosystem Goods and Services: 1) Environmental Class (addressing the question, “Where does the FECS occur on the earth?”) and 2) Beneficiary Category (addressing the question, “Who is the beneficiary and what are the FECS?”). In other words, FECS are explicitly defined by the landscape in which they occur and the interests of people that interact (i.e., enjoy, consume, or use) with the FECS (Text Box 2). We need to know where the FECS occur on the landscape so FECS can be measured and mapped, and we need to know who the beneficiaries of the FECS are to identify the FECS and connect FECS to human well-being. In other words, by defining the Environmental Class and identifying the Beneficiary Categories, the FECS for a specific place and interest can be hypothesized (from a beneficiary perspective).

We use the word “hypothesized” because we view these FECS and the beneficiaries, as *potential* FECS and *potential* beneficiaries. In collaboration with social scientists, economists, and other natural scientists with expertise in a wide variety of ecosystems, we used our best professional judgement to identify different interests – or beneficiaries (see *Section 3.3. Beneficiary Categories* for details) – and hypothesize what the beneficiaries care about with respect to environmental goods and services. Confirmatory research regarding beneficiary identification, perspectives, and spatial location will be the subject of future transdisciplinary

FEGS Classification Structure	
X	Environmental Class
XX.	Environmental Sub-Class
XX.XX	Beneficiary Category
XX.XXXX	Beneficiary Sub-Category

Figure 2. The general classification structure for FEGS-CS.

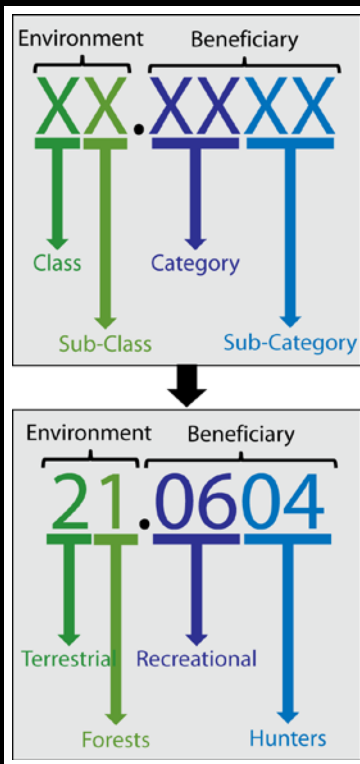


Figure 3. An example of how the FEGS organizational structure is used in practice.

investigations. Until the beneficiaries we propose in the FEGS-CS can be validated (i.e., until *potential* beneficiaries are confirmed as *actual* beneficiaries, and *potential* FEGS are confirmed as *actual* FEGS), the beneficiaries and FEGS discussed in this document must be regarded as hypothetical.

The objective of this document is to introduce this initial version of the FEGS-CS. The FEGS-CS is represented as a collection of tables located in the Appendices called the **FEGS Matrices**, which were collectively designed to be a resource and tool for practitioners to use in consistently defining, identifying, quantifying, and valuing FEGS. Within the FEGS Matrices, sets of FEGS⁴ pertaining to specific beneficiaries and provided by particular types of environments are explicitly identified as hypotheses. The following text is intended to accompany the FEGS Matrices and describe the rationale and approach with which the FEGS-CS was created. Our hope is that the following overview will provide users with an adequate knowledge base and serve as a guide for the appropriate use of the FEGS-CS and associated FEGS Matrices.

3. DEVELOPMENT OF THE FEGS-CS

The concept of ecosystem services is compelling because it is the key to understanding the flow of benefits to humans from the landscape. While

⁴ The same beneficiary often utilizes multiple FEGS from the same environment; therefore, a particular beneficiary may be associated with a combination, or set, of FEGS. See Section 3.4. *Final Ecosystem Goods and Services (FEGS)* for a more in-depth discussion.

many studies and reports provide information pertaining to the flow of benefits from the landscape, the information is defined in different ways and not consistently organized or classified. Many groups have attempted to measure and quantify the ecosystem services provided within a defined spatial unit on the Earth's surface so, ultimately, tradeoffs can be weighed and better decisions can be made. Yet, definitive progress in consistently defining, measuring, quantifying, and mapping ecosystem services on the landscape has not been made – perhaps, largely because the need for a systematic and rigorous approach has not been met. To measure, quantify, and map ecosystem services, it is important to accurately and precisely define those services present in such a way that the approach is repeatable in similar locations (i.e., the same types of environments) but can be easily adapted to different locations (i.e., different combinations of environments across the landscape). Secondly, to value ecosystem services (and perform cost-benefit and cost-effectiveness analyses), inform policy and management decisions that are relevant to human well-being, and effectively communicate, it is imperative to identify ecosystem services that are directly connected to what people value. Therefore, determining the connection of ecosystem goods and services to value is equally important as identifying their substantiation with nature. The FECS-CS and associated FECS Matrices described in this document defines and classifies ecosystem services and is a critical foundation for measuring, quantifying, mapping, modeling, and valuing ecosystem services, among other ecosystem service-centric activities that are dependent on a defined and rigorous framework.

Development of the FECS-CS is the first of many steps to provide information and structure for measuring, quantifying, mapping, modeling, and valuing ecosystem services across the landscape. Below, we explain each of the major components of the system (i.e., Environmental Classes and Sub-Classes, Beneficiary Classes and Sub-Classes, and FECS), starting with the organization of the classification system.

3.1. ORGANIZATION OF THE FECS-CS

The FECS-CS is an orthogonal classification system used to describe and account for each set of FECS supplied by a specific environment and pertaining to a specific beneficiary, the general structure of which is provided in Figure 2. The structure is represented by the amalgamation of two independent hierarchies – one associated with the environment and the other with the beneficiary – with each hierarchical level providing an aggregation of detail at the lower level. We currently provide two levels for each hierarchy (i.e., Environmental Classes and Sub-Classes, and Beneficiary Categories and Sub-Categories), with a decimal point separating the two-digit environment portion of the classification from the four-digit beneficiary portion of the

classification (Figure 3). The Environmental [Sub-]Class⁵ is represented on the left side of the decimal and the Beneficiary [Sub-]Category on the right. In this way, each beneficiary and associated set of FEGS is defined by a unique six-digit number. For example, in Figure 3, the “Terrestrial” Environmental Class is represented by “2”, and the “Forests” Sub-Class is represented by “1”. If the FEGS for a Recreational (Beneficiary Category 06) Hunter (Beneficiary Sub-Category 04) in this environment were classified, they would be represented by the number 21.0604. At present, there are a total of 338 unique sets of FEGS defined in the FEGS-CS, but there is the potential to identify many more.

We modeled the FEGS-CS organization after the North American Industrial Classification System (NAICS; see *Section 5. Connection between FEGS and Industrial Classification Systems* for further discussion) for several reasons: 1) one of the long-term goals is to connect FEGS-CS and NAICS, so it is sensible to use an approach similar to the NAICS structure; 2) a significant amount of consideration and research went into the design of the NAICS structure (see http://www.census.gov/eos/www/naics/history/docs/issue_paper_2.pdf for details); 3) the philosophy behind the NAICS structure matches ours. Specifically, the NAICS system has a flexible aggregation structure, which provides detailed data while allowing the user to aggregate the system in any way at any time. By incorporating the same flexibility into the FEGS-CS structure, we expect this (or future variants of this) classification system to be useful for multiple and varied objectives over time.

3.1.1. DETERMINING THE GRAIN OF THE FEGS-CS

No classification is perfect because they are human constructs and are likely to be designed and used in different ways by different practitioners. In the case of FEGS-CS, the human constructs necessitate drawing distinctions and connections between both highly-interdependent natural systems *and* human perceptions, where no obvious guidelines or separations exist. Because one of our primary goals was to develop an ecosystem services classification that is both relatively complete and minimally duplicative, one particular concern was making decisions concerning the grain, or the homogeneous units of division, of the classification system – particularly where we draw the boundaries for determining unique Environmental [Sub-]Classes. The primary rule of thumb we adopted was that *we would not lump or split if the particular Environmental [Sub-]Class seemed to capture a unique and/or well-defined Beneficiary [Sub-]Category*. For example, estuaries and near coastal marine environments were

⁵ The denotation “[Sub-]” in front of “Class” and “Category” is used to refer to the full class/category *and/or* the sub-class/category, depending on how the user of FEGS-CS chooses to think about the classification for their individual needs.

originally considered separate Environmental Sub-Classes, but after consideration, we hypothesized that the beneficiaries were generally the same; thus, these Environmental Sub-Classes were lumped into one. On the other hand, we originally considered near coastal marine and open ocean environment within a single Environmental Sub-Class, but we hypothesized that the beneficiaries were largely different for near coastal systems (e.g., near coastal beneficiaries do not necessarily need a boat or they can rely on small boats to access the environment) than open oceans (e.g., open ocean beneficiaries typically use large boats to access the environment); this Environmental Sub-Class was split into two. Lumping and splitting often required an iteration of the issue by thinking of both the Environmental Sub-Classes and the Beneficiary Sub-Categories simultaneously.

Our overarching goal when developing the [Sub-]Categories was to identify – to the best of our abilities – a complete set of beneficiaries that are discrete when organized by Environmental [Sub-]Classes. As such, we strived to match the Beneficiary [Sub-]Categories to the same “scale” as Environmental [Sub-]Classes. For example, we received a comment that we had left out an important beneficiary – maple syrup collectors. After consideration, we determined that maple syrup collectors would be included under Food Extractors in Forests (21.0201). Because the Environmental Sub-Class (i.e., “Forests”) is not further split into say, “Deciduous Forests” or “Maple-Dominated Forests” it was not appropriate to use a greater level of specificity in identifying the beneficiary.

In the end, we are confident that Environmental [Sub-]Classes and Beneficiary [Sub-]Categories (and, thus, FEGS) have been developed at an intermediate grain that presents a comprehensive, but manageable, organization of environments, beneficiaries, and FEGS. Nevertheless, during our refinement process and internal reviews, we have received recurring comments pertaining to the scale and extent of FEGS-CS – directed toward both the Environmental Classification and the Beneficiary Categorization. For example, some natural scientists and social scientists/economists believed FEGS-CS included too many Environmental Sub-Classes, while others commented that FEGS-CS did not include enough. FEGS-CS has also been criticized for having too many Beneficiary Sub-Categories, regardless of our attempts to capture only unique beneficiaries. On the other hand, we have not received comments to date that major Beneficiary Categories or Sub-Categories have been omitted, although this is surely possible. The fact that we received both comments that the general organization should be aggregated and disaggregated suggested to us that we indeed presented an intermediate grain.

Although we did not develop FEGS-CS beyond the “Sub-” degree (i.e., second level) of hierarchy, an additional degree (i.e., third level) of hierarchy, “Infra-”, could be developed if

users of the FEGS-CS determine that it is necessary. Such an enhancement could be officially codified as part of a future version of FEGS-CS if the need seems justified. In other words, by designing flexibility in the FEGS-CS structure, the Environmental [Sub-]Classes and Beneficiary [Sub-]Categories can easily be expanded into Environmental Infra-Classes and Beneficiary Infra-Categories (i.e., by adding a level to the hierarchy) or aggregated (i.e., into Environmental Classes and Beneficiary Categories) depending on the intended use of this classification system and specific objectives of the user.

Generally, one should use Environmental Classes (i.e., combine Sub-Classes) if the beneficiaries and associated FEGS do not differ greatly among Sub-Classes. On the other hand, if the Environmental Sub-Classes are comprised of largely different beneficiaries, they can be split into specific environments (Infra-Classes). For example, “12. Wetlands” could be split into “1201. Riparian Wetlands”, “1202. Bogs”, “1203. Fens”, “1204. Prairie Potholes”, etc. In some cases, a user may only want to focus on Beneficiary Categories, while others may prefer to add a level of hierarchy, (Infra-Categories; e.g., split “.0604 Anglers” into “.060401 Catch and Release Anglers” and “.060402 Catch and Consume Anglers”).

In the following sections, we continue to explain the major components of the FEGS Matrices: Environmental Classes and Sub-Classes, Beneficiary Classes and Sub-Classes, and FEGS.

3.2. ENVIRONMENTAL CLASSES AND SUB-CLASSES

In classifying the Earth’s surface into spatial units for the FEGS-CS, we had two overriding objectives: 1) to develop a system generally compatible with those geographic/landscape classification systems already in use, and 2) to define spatial units that are generally mappable from satellite data. These objectives are particularly important to facilitate practical use of FEGS-CS using existing GIS and satellite information. We based our units on the Anderson Land Use and Land Cover Classification System (Anderson et al. 1976) and termed them Environmental Classes and Sub-Classes. We carefully chose this terminology (i.e., “environmental”) because several unit types are included that are arguably not ecosystems under many perspectives (see the last paragraph of this section for further discussion).

The Environmental Classification table in Text Box 3 introduces three Environmental Classes (underlined in light blue type) and fifteen Environmental Sub-Classes (in dark blue type), which can be easily derived from the US Geological Survey’s (USGS) National Land Cover Dataset, with two exceptions we discuss below (NLCD; Homer et al. 2004). Further details including examples of specific types of environments for each Environmental Sub-Class can be found in the Environmental Classification table in the Appendix. For example, Environmental Sub-Class “12.

Wetlands” may include isolated depressions, riparian wetlands, bogs, fens, swamps, and prairie potholes, among other wetland types. The reader should note that the examples provided in the Appendix are neither comprehensive nor exclusive, and there may be many similar but identifiable environments encompassed by each Environmental Sub-Class. Although the classification of the Earth’s environments devised for FECS-CS is slightly different from the many landscape classifications that already exist, it is highly-compatible with other classification systems in that existing landscape classes can generally be aggregated or disaggregated to attain FECS-CS Environmental [Sub-]Classes.

Upon consulting natural scientists in several fields of expertise and GIS specialists, we determined that it was necessary to include several Environmental Sub-Classes that are not traditionally considered – namely groundwater, atmosphere, and created greenspace. In each case, the new Environmental Sub-Class (or Class, in the case of Atmosphere) provides FECS that are not captured in any other Environmental [Sub-]Class and provides FECS to unique and important beneficiaries. For example, everyone (i.e., all humans) benefits from the FECS “air” and there is no doubt that the environment (i.e., the atmosphere) is ultimately responsible for providing air for breathing, among numerous other FECS (see *Section 3.4.2. FECS Provided by the Atmosphere* for a full explanation). We also added the Environmental Sub-Class of “Groundwater” to the “Aquatic” Environmental Class, as groundwater provides vital FECS to beneficiaries that rely on wells for water. Although neither groundwater nor atmosphere is explicitly mapped using satellite platforms, maps of these environments derived from alternate methods and sources are available to characterize them at broad spatial scales. Finally, created greenspaces are included as an Environmental Sub-Class because they are often highly regarded and utilized by urban dwellers, leading to increased human well-being. There are potentially many different beneficiaries and FECS for the created greenspace, especially from a recreational perspective.

Text Box 3. Environmental Classes and Sub-Classes used in the FECS-CS.

1. AQUATIC

- 11. Rivers and Streams
- 12. Wetlands
- 13. Lakes and Ponds
- 14. Estuaries and Near Coastal and Marine
- 15. Open Oceans and Seas
- 16. Groundwater

2. TERRESTRIAL

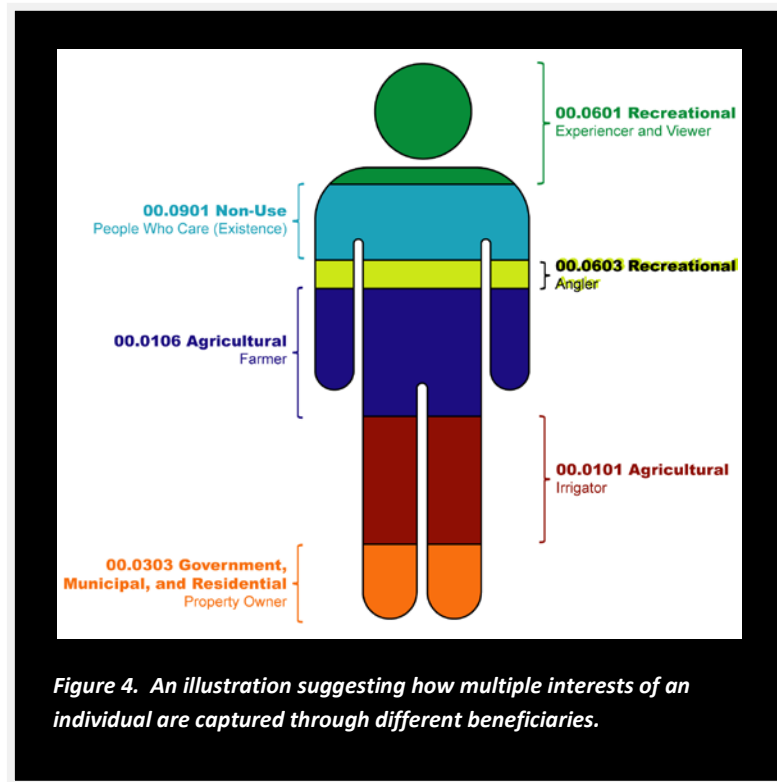
- 21. Forests
- 22. Agroecosystems
- 23. Created Greenspace
- 24. Grasslands
- 25. Scrubland / Shrubland
- 26. Barren / Rock and Sand
- 27. Tundra
- 28. Ice and Snow

3. ATMOSPHERIC

- 31. Atmosphere

3.3. BENEFICIARY CATEGORIES AND SUB-CATEGORIES

Beneficiaries are “the interests of an individual (i.e., person, organization, household, or firm) that drive active or passive consumption and/or appreciation of ecosystem services resulting in an impact (positive or negative) on their welfare” (adapted from Nahlik et al. 2012a). As such, a



person or organization may be comprised of multiple beneficiaries. For example, an individual (represented in Figure 4) may enjoy the scenic views from their property, the existence of National Parks, and fly fishing in their free time. As a farmer, the individual may rely on their land (space and soil) for producing crops and use water from a nearby stream to irrigate during the summer. As a property owner, there may also be benefits from reduced flooding due to a wetland between the stream and dwelling. Therefore, this individual, like most all of us, represents multiple beneficiaries.

Like people, organizations, households, and firms may also be comprised of multiple beneficiaries.

When developing the Beneficiary Categories and Sub-Categories, we strived to identify a list of Beneficiary Sub-Categories based upon those specific goods and services with which they interact that are supplied by a particular Environmental Sub-Class. After identifying a new Beneficiary Sub-Category, we would determine whether this combination of Beneficiary Sub-Categories for a specified Environmental Sub-Class was something that was generally not duplicated in any other FEGS (i.e., intersection between the Beneficiary Sub-Category and Environmental Sub-Class). For example, an agricultural irrigator (Beneficiary Sub-Category) could derive needed water from lakes, wetlands, streams, and groundwater, or any combination thereof. However, each combination would represent a different FEGS because,

in this case, the Beneficiary Sub-Category is the same but the Environmental Sub-Class differs, resulting in four possible different FEGS.

Specific beneficiaries for specific FEGS were first identified as the result of an interdisciplinary workshop held by the US EPA in 2009 to discuss the notion of FEGS as they relate to stream ecosystems (Ringold et al. 2009). One of the major accomplishments was a list of defined beneficiaries of streams developed as a result of open discussion and collaboration among the natural and social scientists that participated in the workshop. While developing the FEGS-CS, we used the same intellectual approach developed in this workshop to refine and expand the Beneficiary [Sub-]Categories to include the additional Environmental Sub-Classes; our refinement process has included many natural and social scientists in a transdisciplinary effort.

There are currently 10 Beneficiary Categories and 38 Beneficiary Sub-Categories in the FEGS-CS, although these numbers may change as we further develop and use the FEGS-CS. We expect that over time, the hypotheses regarding beneficiaries shall be tested and additional beneficiaries may be included. The Beneficiary Sub-Categories are provided in the Beneficiary Categorization Appendix, while definitions of each beneficiary⁶ are listed as a column in the FEGS Matrices.

It is important to understand that FEGS that correspond to multiple beneficiaries do not necessarily indicate greater importance of that FEGS (or well-being). For example, in the Environmental Sub-Class “24. Grasslands”, the FEGS “presence of the environment” is associated with 11 different Beneficiary Sub-Categories, but “flora” is associated with 6 Beneficiary Sub-Categories. This does not mean that for grasslands, presence of the environment is more important than flora. Likewise, an Environmental [Sub-]Class that has a large number of associated Beneficiary [Sub-]Categories does not necessarily indicate a greater importance of that environment. For example, in the Summary Matrix (in the Appendices), Environmental Sub-Class “11. Rivers and Streams” is associated with 34 different Beneficiary Sub-Categories, whereas “13. Created Greenspace” is associated with 13 different Beneficiary Sub-Categories. It is inappropriate to conclude that rivers and streams are more important than created greenspace. Determining the importance of FEGS or different environments is a weighting and valuation issue that will require research beyond what is presented here (see *Section 6. Using the FEGS-CS* for details), although we believe the FEGS-CS provides an important foundation for this future research.

⁶ The definition corresponding to a particular beneficiary in the FEGS Matrices is very general. In other words, the same beneficiary definition is repeated in each FEGS Matrix despite the Environmental Sub-Class.

Text Box 4. Guiding questions for determining FEGS, including examples of questions (Q) and answers (A).

- For a specific Environmental Sub-Class, which Beneficiary Sub-Categories are present?
 - **Q:** *Do Recreational Food Pickers and Gatherers utilize Estuaries and Near Shore Marine environments?* **A:** *Yes.*
- For a specific Beneficiary Sub-Category interested in a specific Environmental Sub-Class, what are the FEGS? Or, what does the beneficiary utilize or care about (to receive a benefit) that is directly provided by the environment?
 - **Q:** *What do Recreational Food Pickers and Gatherers utilize from Estuaries and Near Shore Marine environments that result in a benefit?* **A:** *Flora and fauna, such as seaweed, kelp, mussels, crabs, etc.*
- What is the importance of this [set of] FEGS to the beneficiary?
 - **Q:** *Why do Recreational Food Pickers and Gatherers in Estuaries and Near Shore Marine environments care about flora and fauna?* **A:** *These are edible organisms that can be picked or gathered for personal use.*

3.4. FINAL ECOSYSTEM GOODS AND SERVICES (FEGS)

The fundamental goal in developing the FEGS-CS was to organize ecosystem services in a consistent and meaningful manner, and in doing so, we identified and defined FEGS that pertain explicitly to both the landscape and specific beneficiaries. FEGS are innately associated with the environment in which they occur and to the beneficiary that utilizes them. After developing the Environmental Classification and Beneficiary Categorization (described in previous sections), we used a series of guiding questions to hypothesize how beneficiaries use, interact with, or perceive benefits derived from nature. These guiding questions, outlined in Text Box 4, specifically allowed us to identify the FEGS and define the FEGS by describing their importance to the Beneficiary Sub-Category.

In the FEGS Matrices, FEGS appear as the intersection of environment and beneficiaries in the fourth column labeled “FEGS” in any of the matrices (i.e., tables) specific to Environmental Sub-Classes. The “FEGS” column specifically lists categories of FEGS (versus describing every FEGS,

each of which is unique because actual FEGS must be associated with an Environmental Sub-Class and Beneficiary Sub-Category) to allow for future querying (see “*Questions and Comments*” in the Index (p.iv) for details) and comparisons across Environmental Sub-Classes or Beneficiary Sub-Categories. Currently, there are 21 categories of FEGS identified in FEGS-CS (Text Box 5). While these categories represent the types of FEGS that the environment supplies to beneficiaries, the FEGS themselves are tied to a Beneficiary Sub-Category and a Environmental Sub-Class. So, while “water” may be a category of FEGS, the actual FEGS may be “water (for growing and maintaining crops) supplied to an Agricultural Irrigator by Rivers and Streams (11.0101)”. Because each FEGS is tied to a Beneficiary Sub-Category and an

Environmental Sub-Class, each of the identified FECS is distinct. Therefore, measuring, quantifying, mapping, modeling, and valuing each FECS will be different.

Categories of FECS (i.e., those listed in Text Box 5) are not FECS. Categories of FECS are heuristic, much like many of the other existing ecosystem service classification systems, such as MEA (2005) because they are general. The FECS is identified only when a category of FECS is connected to a specific beneficiary and an environment. This step is hugely important; in order for ecologists to measure FECS, they have to know what to measure; and what to measure depends on the beneficiary and what they directly utilize, consume, or enjoy from the environment. For example, in the FECS Matrices table for Rivers and Streams, water appears as a FECS for Irrigators (11.0101) and for Industrial Processors (11.0203) Although “water” is the identified category of FECS for both beneficiaries, water utilized (or valued) by an Irrigator is not the same water utilized (or valued) by an Industrial Processor. Even though the

Irrigator and the Industrial Processor may using the same water source (say, water from the same stream), the metrics and indicators, that capture the FECS may be different between the two beneficiaries (as described in the workshop reports Ringold et al. 2011, 2009). Specifically, an Irrigator may care about water available during the growing season that has a low enough concentration of salinity, chemicals, and pathogens that crops that are being irrigated or consumers thereof are not harmed. On the other hand, an Industrial Processor (that primarily uses water for cooling or producing non-edible products) may care specifically only about the quantity and temperature of available water and the presence of organisms in the water that could cause biofouling. In other words, the biophysical unit(s) of measurement for each FECS could be different, even if the type of FECS is the same. In some cases, like that of an Irrigator (11.0101), the biophysical units (i.e., something about the quantity, quality and timing of the water availability) are rather straightforward for natural scientists to measure. Additionally, irrigating communities can offer some concrete guidance on what it is about the water they value or the body of literature pertaining to USDA salinity research could be consulted. But for non-consumptive FECS, such as “presence of the environment”, “viewscales”, and “sounds and

Text Box 5. Twenty-one categories used to organize FECS in the FECS-CS.

- 01 water
- 02 flora
- 03 presence of the environment
- 04 fauna
- 05 fiber
- 06 natural materials
- 07 open space
- 08 viewscales
- 09 sounds and scents
- 10 fish
- 11 soil
- 12 pollinators
- 13 depredators and (pest) predators
- 14 timber
- 15 fungi
- 16 substrate
- 17 land
- 18 air
- 19 weather
- 20 wind
- 21 atmospheric phenomena

scents”, natural scientists generally do not have much professional training or experience with the possible measurements that could be associated with these inspirational, spiritual, and ceremonial connections, for example, to the natural world. Collaboration among social scientists that have capabilities in these areas and natural scientists are imperative to successfully translate the FEGS from the brief descriptions included in FEGS-CS to actual metrics and indicators that connect to human well-being. We expect that this will be an active area of future research.

Often, more than one FEGS associated with a single beneficiary exists in the FEGS Matrices, as several different FEGS may be provided to the same beneficiary within an Environmental Sub-Class. Therefore, we often refer to the combination of multiple FEGS associated with a beneficiary as “sets of FEGS”. For example, grassland may provide both flora and open space (a set of FEGS) to a Livestock Grazer (24.01013). In most cases, the multiple FEGS that comprise a set of FEGS for a beneficiary are not obligated to be provided as a group (i.e., a single FEGS in the set of FEGS may be provided); however, in some cases, such as when “presence of the environment” is combined with other FEGS, if the environment does not exist, other FEGS will simply not be provided. We have not presumed to list all FEGS important to beneficiaries, but we have attempted to identify some of the key sets of FEGS for each particular intersection of Environmental Sub-Class and Beneficiary Sub-Category. Over time, and with application of this classification, we expect the examples of FEGS will become more complete and our proposed FEGS identified in the FEGS-CS will be confirmed or rejected by scientists working to define and understand the beneficiaries.

3.4.1. FEGS AND ENVIRONMENTAL PARTITIONING

Inherent to the FEGS definition, FEGS are associated with the Environmental [Sub-]Class in which they are consumed, used or obtained, even if the FEGS derived from one Environmental [Sub-]Class is dependent on another Environmental [Sub-]Class. For example, shrimp (the FEGS) in both near shore and open ocean environments of the Gulf of Mexico are dependent on the ability of coastal wetlands to provide habitat (an intermediate service in the FEGS-CS construct) to juvenile shrimp (Engle 2011). While the coastal wetlands are essential to the existence of shrimp in the near shore and open oceans, commercial fishermen typically actualize the FEGS (i.e., catch the shrimp) in the ocean (as opposed to in the coastal wetland). Therefore, the FEGS is associated with the near shore and open oceans. From an ecological perspective, this “environmental partitioning” can be risky in the sense that the multitude of interactions among environments is not explicitly accounted for in FEGS-CS. On the other hand, we have yet to find another method to consistently identify, measure, and quantify ecosystem

services across the Earth. We expect that ecological production functions used by modelers to make future projections of FEGS under different possible management parameters will capture and utilize our understanding of such dependence of a FEGS from one Environmental Sub-Class on another Environmental Sub-Class.

One particular FEGS can be particularly difficult to pinpoint to an Environmental [Sub-]Class – a viewscape. If a hiker is standing on a rocky mountaintop overlooking a vista that includes forests, agriculture, rivers, and towns, what Environmental Sub-Class is providing the FEGS (i.e., viewscape)? In this case, even though the hiker is in the “26. Barren / Rock and Sand” Environmental Sub-Class, the viewscales are being provided by each of the environments that make up the vista; therefore, the viewscape is provided by the conglomeration of “21. Forests”, “22. Agroecosystems”, “11. Rivers and Streams”, and (perhaps, if large greenspaces in the town are visible), “23. Created Greenspace”.

3.4.2. FEGS PROVIDED BY THE ATMOSPHERE

The atmosphere is different from all other Environmental [Sub-]Classes in that it overlays, interacts with, and permeates all other Environmental [Sub-]Classes. Because beneficiaries must interact with the atmosphere while also interacting with other Environmental [Sub-]Classes (e.g., forests, grasslands, rivers, etc.) the atmosphere can influence the benefit [received or experienced by the beneficiary] to varying degrees. For example, consider a viewer's vista of a montane forest that is impaired by a variety of atmospheric conditions (e.g., smog, fog, precipitation, suspended particles, etc.). The forest is still providing the FEGS of "viewscape" but the visual benefit to the beneficiary has been diminished. Therefore, we recognize that the FEGS “air” can represent any of three components of the air that are of primary interest to beneficiaries – clean air (visibility), healthful (breathable) air, and air (as a medium). Although these differences are currently not obvious in FEGS-CS, the differences will become clear when metrics and indicators are developed (see *Section 6.1. Measuring FEGS* for more details).

3.4.3. ENVIRONMENTAL STRESSORS AND PRESSURES AND THE PROVISION OF FEGS

Environmental pressures and stressors, both human and natural, critically affect the ability of an Environmental [Sub-]Class to provide FEGS. Therefore, we recognize intensive human activities on the landscape (e.g., farming, mining, urban development, etc.) as major "pressures" and effects from human activities or natural phenomena (e.g., global climate change, sea level rise, pests, diseases, predators, etc.) as “stressors” to Environmental [Sub-]Classes and their ability to provide FEGS or directly to FEGS themselves. Although

pressures and stressors are not explicitly identified in the FECS-CS, they are included as part of the ecological production functions that ultimately lead to FECS. The following example illustrates how pressures and stressors can be accounted for within the FECS-CS construct.

Consider an oyster farmer who has a diminishing crop yield in a particular estuary because of stressors, such as predators or parasites. In the FECS-CS, the oyster farmer is classified under “14.0105 Aquaculturists” (in the Environmental Sub-Class “14. Estuaries and Near Shore Marine”), and the FECS is “presence of the environment” because of the opportunity provided by the environment for cultivating aquatic organisms⁷. Among other metrics and indicators for this FECS, one might measure the “abundance of competitors, predators and parasites, and biofouling organisms” in the environment. A large presence of these harmful organisms, (e.g., burrowing shrimp, starfish, oyster drills) in the estuary may negatively affect the estuary’s ability to provide a “presence of the environment” at a quality that is suitable for oyster farming and, therefore, diminish the value of the estuary to the oyster farmer. If we can develop accurate metrics and indicators, then we should be able to measure and account for the negative effects that pressures and stressors have on the provision of the FECS.

3.4.4. FECS VERSUS BENEFITS

Ecosystem services and benefits are often used synonymously; however, there is a clear distinction between FECS and benefits (Boyd and Banzhaf 2007). Given that FECS are the final (i.e., end) product produced by the environment with which the beneficiary interacts, the benefit of FECS cannot be realized without some varying amount of input of labor and capital goods (i.e., conventional goods and services); however, the input of labor and capital goods necessary to realize a human benefit can vary, as illustrated in Figure 5. In some cases, the necessary input of labor and capital goods is relatively moderate (Figure 5a). For example, an irrigator that receives the benefit of provision of water to crops must transport water (the FECS) from a nearby river to the crops using, perhaps, pumps and infrastructure (e.g., irrigation system, hoses, etc) to realize the benefit. In this case, the irrigator did not have to add significant capital to the FECS; the FECS needed only to be transported. On the other hand, a conventional farmer who benefits from crop production may augment the soil (soil is one of the FECS) in an agroecosystem by tilling, fertilizing, seeding, weeding, applying pesticides, irrigating (which brings in another FECS and beneficiary), and harvesting. A relatively large input of labor and capital goods is necessary to receive the benefit from the FECS (Figure 5b). However, some

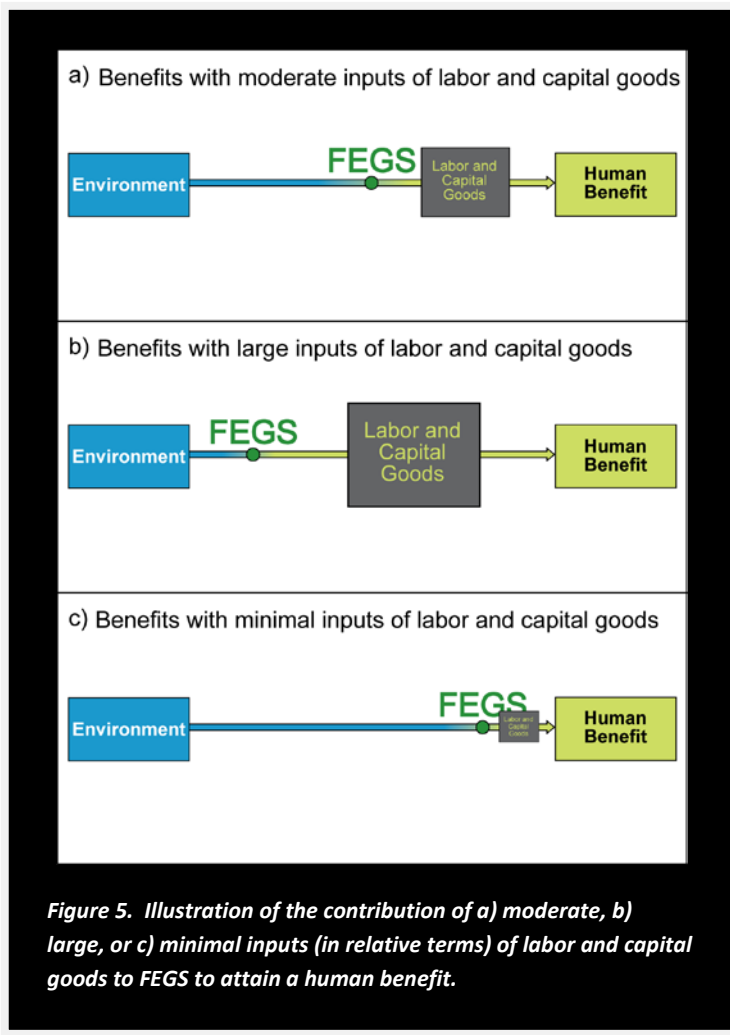
⁷ Note that the oysters are not FECS because, unless they are wild, they are subsidized by the oyster farmer (i.e., they are cultivated and then introduced into the system) – the same logic for not considering corn a FECS to a farmer. See Section 4.1. *Human-Dominated Goods and Services* for an explanation.

benefits can be realized with relatively minimal inputs of human capital (Figure 5c), such as recreational hikers, who need only to transport themselves to the site and expend (human) energy to realize the benefits of pleasing views, exercise, or sense of happiness. Non-use beneficiaries need only some education (i.e., they have to know that a place or environment exists) to benefit from the FECS.

3.4.5. HOW FECS MINIMIZES DOUBLE-COUNTING

Now that the reader has a general understanding of FECS and how they relate to the landscape and beneficiaries, it is useful to explain how using FECS, such as in the FECS-CS, minimizes double-counting when compared to other approaches. When using the MEA classification approach and other classifications

that do not specify “final” ecosystem goods and services, final ecosystem services are intermingled with intermediate services. This often results in double-counting, as an “intermediate ecosystem service” may well be an important and unaccounted for component of another ecosystem service. Consider a forest; as the trees in the forest photosynthesize, they grow and produce wood. Under the MEA approach, primary production is classified as a Supporting ecosystem service, while wood is classified as a Provisioning ecosystem service. Therefore, under the MEA, in this example, the same tree produces two distinct services – primary production and wood provision – even though the wood is wholly dependent on primary production. Moreover, there is no feasible way to distinguish the primary production “process” contribution from that of the provisioning of wood. This is clear example of double-counting. Using the FECS approach, primary production is not explicitly accounted for and wood in the forest is identified as the FECS for which there may be multiple beneficiaries, such



as Timber Extractors (i.e., wood for construction), Timber Subsisters (i.e., wood for fuel), among others. By linking the FEGS to the beneficiary, each FEGS is distinct, mutually exclusive, and connected to human well-being, and thus, can be appropriately quantified and valued.

We do not include primary production as a FEGS because beneficiaries do not typically recognize primary production or the process of photosynthesis as an attribute of the forest ecosystem with which they directly interact. In this case, primary production is an intermediate service that contributes to the existence of many FEGS identified in the FEGS-CS. As a result of primary production of a forest, someone who cuts a tree down for building material (i.e., Timber Extractor (21.0203)) interacts with wood, and a recreational hiker (i.e., Experiencers and Viewers (21.0601)) may interact with the forest as a whole during their hiking experience. Wood and the presence of the ecosystem are considered two distinct FEGS, both of which can be measured on the landscape and quantified using different and specific metrics.

Clearly, there are trade-offs among FEGS, as the Timber Extractor and the Experiencer and Viewer likely could not both fully utilize FEGS in the same forest at the same time. For example, if both FEGS were even moderately available at the same time in the same forest, one would assume that the quantity and/or quality of the FEGS provided are diminished due to the presence of the other. Understanding these tradeoffs by identifying what people care about and measuring what the environment provides, allows for informed, reasoned, reproducible, systematic, and perhaps the possibility of sustainable management decisions.

4. DISTINGUISHING FEGS FROM NON-FEGS

Striving to develop the FEGS-CS in a systematic way, we found ourselves creating fundamental rules, or principles, which helped us to maintain consistency and clear boundaries when identifying FEGS. These principles have been integral and essential for the development of the FEGS-CS, as we encountered many conceptual challenges throughout the development process. As challenges and questions arose, FEGS Boundary Principles were identified, recorded, analyzed, and refined. Ultimately, we developed a set of FEGS Boundary Principles that provide consistency and rationale for distinguishing FEGS from Non-FEGS in a succinct manner. These boundary principles are important because they document the stringency with which FEGS-CS was developed, but also because these boundaries provide clear answers to “Why was *x* included in FEGS-CS but not *y*?”-type questions. We recommend that a first-time user of the FEGS-CS closely examine and become well-versed with these principles so that they may be

employed as references as more time is devoted to understanding and using the FEGS-CS. There are seven FEGS Boundary Principles:

FEGS Boundary Principles	
1	Intermediate goods and services (e.g., photosynthesis, carbon sequestration, biodiversity, etc.) are generally ecosystem structural components, functions, and processes that are not directly used or appreciated by individuals and, thus, are not FEGS. Moreover, most humans do not recognize or understand the importance of these entities. However, intermediate goods and services are vitally important and need to be understood in order to construct process models that can project FEGS into the future under different management scenarios, eventually informing trade-off analyses.
2	FEGS are components of the natural, not the built, environment; therefore, a FEGS must be connected to the lithosphere, hydrosphere, and atmosphere. For example, a tree in a city planter is not a FEGS because it is isolated from the earth (the lithosphere). Likewise, aquariums, [botanical] conservatories, and high-tech athletic fields do not qualify as FEGS.
3	Policy endpoints do not create FEGS. Policies are generally created as a reflection of a) what individuals value and b) processes or features that can be regulated - not necessarily those environmental components with which humans interact (Ringold et al. 2009). Services associated with policy are taken into consideration through specific beneficiaries (i.e., endangered bird species protection is taken into account via bird watchers x presence of endangered bird species) or in connected environments.
4	Human-made infrastructure (e.g., roads, boardwalks), buildings (e.g., marinas, welcome centers), or goods and services with a large input of labor and capital goods (e.g., agricultural row crops, stocked (i.e., put-and-take) fish, lumber from tree plantations, orchard produce, Christmas trees) are not FEGS or considered in the FEGS-CS. Many of these items are accounted for in industrial classification systems (i.e., NAICS or NAPCS). FEGS are provided directly and predominantly by the ecosystem itself and are minimally dependent upon human inputs of labor, energy, capital or other enhancements.
5	Incidental non-marketed environmental by-products of intensively produced goods and services (see principle number 4, above) may be considered FEGS. These may include vistas of agricultural lands, game associated with farmland or tree plantations (e.g., deer, pheasants), etc.
6	Increased value (i.e., property value) or sense of happiness is not a FEGS as it reflects human valuation and not something the ecosystem provides itself (see principle number 4; Ringold et al. 2009).
7	The environment itself can be a FEGS (e.g. for a marina owner – a Resource Dependent Business (14.0206), the presence of the estuary provides the FEGS).

One of the important issues for anyone trying to classify a broad range of attributes of a similar group of entities is defining the boundaries of the group. Regardless of what is being classified, there are always boundary issues that call for fairly arbitrary decisions unless there are clear reasons for a particular designation. The same boundary issues occur when classifying ecosystem services (Figure 6). In our effort to classify FEGS, one of the key boundary issues was determining which ecosystems services are provided predominantly by the ecosystem, as selecting those ecosystem services that are provided by nature is inherent in the definition of FEGS. However, the fact that all of Earth’s systems are impacted by humans – either directly or indirectly – and are frequently heavily-managed by human beings, makes defining a clear boundary between FEGS and non-ecosystem goods and services difficult.



Figure 6. The conceptual gradient of boundaries that exist in identifying FECS.

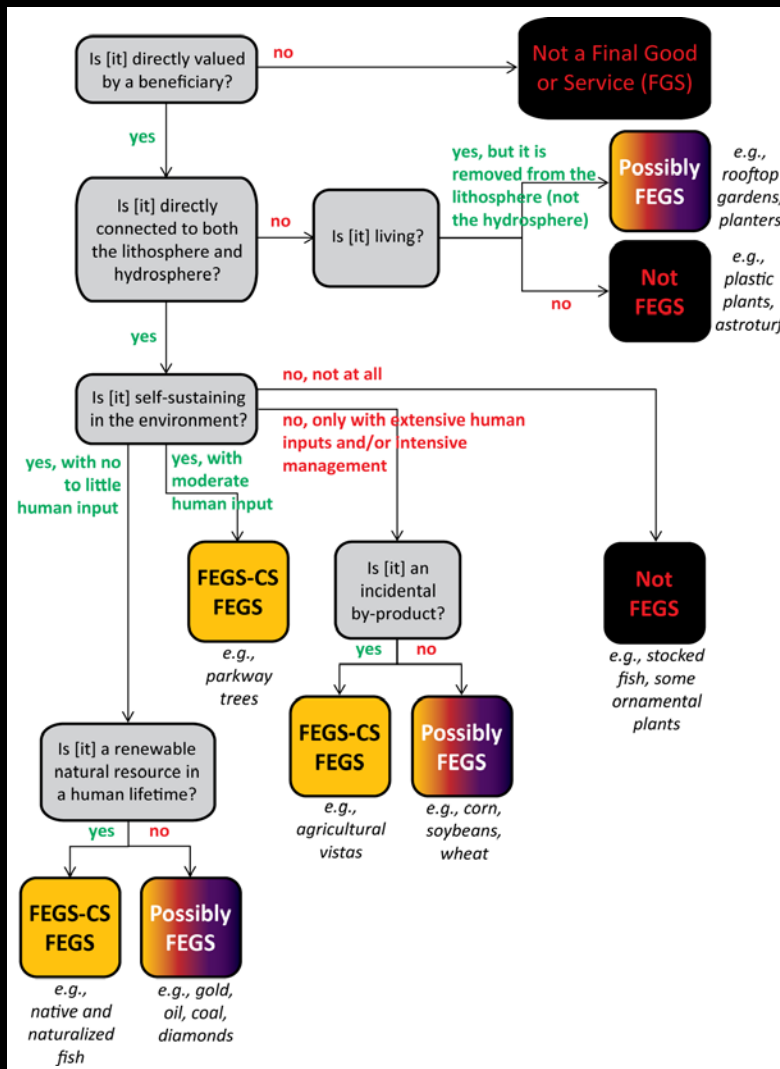


Figure 7. A binary decision flowchart for determining FECS boundaries. The term "[it]" refers to the potential good or service that is under scrutiny.

To understand the FECS Matrices associated with FECS-CS and how the FECS included were determined, it is important to also understand these basic boundary decisions regarding what is or is not considered to be a FECS. While some may disagree with our boundaries, we make these decisions explicit so that the FECS-CS can be properly developed and used to its fullest potential. To help us maintain consistency and clear boundaries among FECS and non-ecosystem goods and services, we subjected potential goods and services to a series of decisions, presented as questions in a binary decision flowchart exemplified in Figure 7. To be complete, we have distinguished decision points that we used for the development of FECS-CS (i.e., yellow boxes labeled “FECS-CS FECS”), and those that others may choose to use for their own purposes (i.e., rainbow boxes labeled “Possibly FECS”). We have used conservative boundaries for defining FECS used in FECS-CS; however, these boundaries may be expanded, if necessary, depending on the specific objectives of the user. If this direction is pursued, it would be incumbent upon the specific author to specify, in some detail, the new boundaries that are being used and the rationale for this specific departure.

The basic definition of FECS requires that the good or service is a component of nature and directly used, consumed, or enjoyed [by people]. As such, the first two criteria in our decision flowchart (Figure 7) are that the potential good or service is 1) valued by a beneficiary and 2) connected to at least the hydrosphere and lithosphere. Requiring potential goods and services to be connected to the hydrosphere (i.e., be outdoors) and the lithosphere (i.e., be directly connected to the soil or ground) provided a coarse boundary between ecosystem and non-ecosystem goods and services. Beyond this, there are two additional criteria that we used to determine the finer boundary between FECS and non-ecosystem goods and services: 1) whether the good or service is self-sustaining with minimal human capital (i.e., energy inputs, obligatory infrastructure, etc.), and 2) whether the good or service is renewable under stable (i.e., not increasing) human demand in a human lifetime (*ca.* 100 years). After careful consideration, we also decided that incidental by-products of intensively managed environments could be considered FECS. In the following sections, we describe our rationale and provide specific cases.

4.1. HUMAN-DOMINATED GOODS AND SERVICES

Given our perspectives regarding the importance of the influence of nature (i.e., with minimal human inputs) on the production of goods and services, we believe agricultural crops – including both food and fiber – that are produced with considerable inputs of human capital and energy are not predominantly ecosystem entities. Cases in which food or fiber exist without the tremendous input of derived energy sources and tending by humans, the food and

fiber are classified to the subsistence and gathering arena. Using similar logic, stocked (i.e., put-and-take) fish *are not* considered FEGS, as they spend the majority of their life in a hatchery and are typically released into the ecosystem as adults. The stocked fish are largely a reflection of human inputs (i.e., labor and capital goods). However, anadromous salmon smolts (juveniles) introduced into an ecosystem that spend the dominant part of their relatively long-life (i.e., 3-8 years) in the ocean and rivers *are* considered FEGS. Because the environment – and not humans – provides conditions and food (i.e., intermediate ecosystem goods and services) during the majority of a salmon’s lifetime, they are considered FEGS.

The principles concerning intensive human inputs apply only to FEGS – not to Environmental Sub-Classes. Even though they are intensively managed, we recognize Agroecosystems and Created Greenspaces as Environmental Sub-Classes; after all, they are connected to the hydrosphere, the atmosphere, and [often] the lithosphere⁸. Consider a golf course; this created greenspace is a human created entity, but it is supported by ecological and biophysical processes. While the experience golfers receive is fully accounted for by the NAICS approach (see *Section 5. Connection between FEGS and Industrial Classification Systems*), there are beneficiaries of golf courses that appreciate the open space, an unintended benefit from these landscapes. Grass clippings from mowing the golf course, however, would not be considered FEGS as the grass is cultivated.

4.2. NON-RENEWABLE GOODS AND SERVICES

When presented with the question regarding whether minerals and fossil fuels could be FEGS, we asked ourselves, “Is this produced by an ecosystem?” Yes, fossil fuels, such as coal and petroleum, were produced by an ecosystem millions of years ago, but they also took millions of years to develop into the goods we find useful today. Minerals (including rock, gems, etc.) are produced by geologic processes that typically occurred eons ago. Some products, like sand, gravel, and mud are not produced or supplied *de novo* by the environment – they are just newly transported. For example, gravel or fine sediments moved downstream during flood periods are mobilized from previous [ancient] deposits. Because we believe that a defining characteristic of a FEGS produced by an ecosystem is that it is renewable, for the FEGS-CS (and others may certainly have different purposes) minerals, coal and petroleum, and similar non-renewable entities are not considered FEGS and not included in the FEGS-CS.

⁸ See *Section 4.3. Incidental By-Products from Intensively Managed Environments* for details on how FEGS are determined in these particular Environmental Sub-Classes.

In some cases, – namely from ancient (i.e., deep) aquifers – water is non-renewable in a human lifetime. Although this ancient water is used and highly valued in many locales, because this water is not renewable, it is not included in the FEGS-CS. The water provided by Environmental Sub-Class “16. Groundwater” and considered a FEGS is *only* from shallow, renewable sources. There are maps that detail the extent and locations of both groundwater types (i.e., shallow and ancient) and allow one to distinguish among FEGS and non-environmental goods and services. Likewise, some material, such as peat, that takes hundreds to thousands of years to accumulate to a beneficial quantity, is also not considered a FEGS because of the time requirements it takes to develop.

4.3. INCIDENTAL BY-PRODUCTS FROM INTENSIVELY MANAGED ENVIRONMENTS

As we have already discussed, several of the Environmental Sub-Classes we chose to include in the FEGS-CS are traditionally intensively-managed by humans, such as Agroecosystems and Created Greenspaces. In these cases, cultivated material (i.e., crops, grass, trees, etc.) are not FEGS because of the predominant human input invested in the good or service (revisit *Section 4.1. Human-Dominated Goods and Services* for our rationale). However, by-products that occur incidentally (i.e., goods and services that are not specifically cultivated or managed) from these environments are considered FEGS in the FEGS-CS. For example, agroecosystems, such as those pictured in Figure 8, are highly managed to produce crops, but the agroecosystem may incidentally provide views (Figure 8a, b), fauna (Figure 8c), among other FEGS to beneficiaries other than farmers. Although the rationale is not as clear for this particular principle as others, we felt that the many unique beneficiaries and the significant portion of the Earth’s landscape devoted to these intensively managed environments warranted the recognition of some FEGS from these Environmental Sub-Classes. Moreover, for

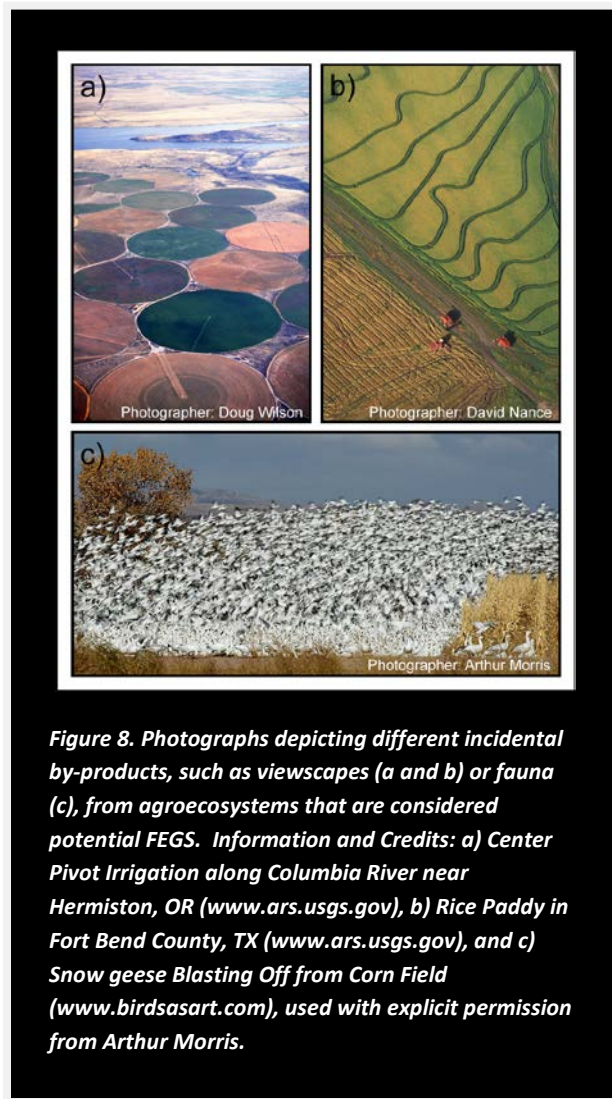


Figure 8. Photographs depicting different incidental by-products, such as views (a and b) or fauna (c), from agroecosystems that are considered potential FEGS. Information and Credits: a) Center Pivot Irrigation along Columbia River near Hermiston, OR (www.ars.usgs.gov), b) Rice Paddy in Fort Bend County, TX (www.ars.usgs.gov), and c) Snow geese Blasting Off from Corn Field (www.birdsasart.com), used with explicit permission from Arthur Morris.

urban dwellers, created greenspace (i.e., parks, lawns, etc.) may provide the majority of FEGS from which they benefit on a daily basis. Incidental by-products from intensively managed environments certainly fall on the far right side of the FEGS-CS portion of the FEGS gradient (Figure 6), and this boundary could change (i.e., by-products could be excluded) in future revisions of FEGS-CS.

4.4. UNTANGLING INTERMEDIATE ECOSYSTEM GOODS AND SERVICES FROM FEGS

We do not claim that distinguishing FEGS from non-ecosystem goods and services, or furthermore, from intermediate ecosystem goods and services, is a simple or clear task. Throughout the process of developing FEGS-CS, we refined our identified FEGS, boundaries, and principles over and over again, and we expect to continue to do so to some extent. One rule of thumb that is easy to forget, but critical to the FEGS approach, is that FEGS are “in addition to” *not* “instead of” (per comm. Paul Ringold, US EPA). In other words, FEGS are one way – although we believe it is the only way that currently exists – to systematically and consistently define, communicate, and connect ecosystem services to human well-being. Using the FEGS approach does not invalidate the importance of ecological processes and functions, or intermediate ecosystem goods and services in general. FEGS would not exist without these vital processes and functions. Likewise, the FEGS approach does not suggest that studying ecosystem processes, functions, and interactions is unnecessary. In fact, understanding these intermediate ecosystem services is vital to the practical use and application of the FEGS-CS. Specifically, measuring, quantifying, or modeling FEGS reveals the importance of intermediate ecosystem goods and services, as these processes, functions, and interactions often indicate or are crucial for modeling FEGS. Nevertheless, the FEGS-CS is often criticized for not explicitly including processes and functions⁹ – especially biodiversity and carbon sequestration. Below, we discuss this issue further.

4.4.1. BIODIVERSITY

It is often asserted that biodiversity (defined as the “...full range of variety and variability within and among living organisms and the ecological complexes in which they occur...” US Congressional Biodiversity Act, HR1268 (1990)), in and of itself, is an ecosystem service. We do not dispute that biodiversity is tremendously important or an ecosystem service; however, we do not believe it is a FEGS. Some recreational beneficiaries – for example, those interested in bird watching – directly enjoy fauna (the FEGS), which is certainly influenced by and directly

⁹ For an explanation of why intermediate ecosystem goods and services are not included in FEGS-CS, revisit *Section 3.4.5. How FEGS Minimizes Double-Counting.*

related to biodiversity (e.g., the number of bird species in a given area). But the bird watcher does not generally or directly use, consume, or enjoy the broader biological context in which the avian biodiversity is embedded; they interact with the birds by viewing them. Furthermore, we hypothesize that the general public (i.e., other beneficiaries) does not directly use, consume, or enjoy biodiversity – if anything, they use, consume, and enjoy the present species of flora, fauna, and fungi, and the number of species present (i.e., biodiversity) may indicate the *extent* to which the FEGS is provided. This is *not* to say biodiversity is not a vital structural component of ecosystems and something in which environmental agencies, organizations, and societies should be interested. The point is that biodiversity is not a FEGS because humans do not directly interact with biodiversity. As natural scientists, we recognize that biodiversity is a prominent, vital, and pervasive intermediate ecosystem service contributing to all goods and services derived from nature; therefore, we expect biodiversity to be regularly included in ecological production functions (i.e., models), and perhaps used as an important indicator of some FEGS.

4.4.2. CARBON SEQUESTRATION

Carbon sequestration is another process that is often asserted as an ecosystem service. Like biodiversity, we do not disagree that it is an ecosystem service in the general sense of the term. Carbon sequestration is certainly a vital process that contributes to the production and availability of many FEGS, but carbon sequestration is not a FEGS. We confidently hypothesize that the average person does not use, consume, or enjoy carbon sequestration; in fact, many people do not know what carbon sequestration is. However, many beneficiaries directly interact with weather (including temperatures) and the risks associated with the presence of particular environments (e.g., risk of flooding from sea level rise). Carbon sequestration and its impact on global climate change (among other processes and functions) are important, but intermediate to the supply of FEGS in an environment that a beneficiary directly uses, consumes, or enjoys.

Intermediate ecosystem goods and services are vast, and including them in an ecosystem services classification not only results in double-counting (see *Section 3.4.5. How FEGS Minimizes Double-Counting* for details), disconnect between disciplines, and failure to dependably make connections to human well-being, it also results in an unmanageable, inconsistent classification system that is a burden to those trying to develop and use it. To be clear, we are not criticizing sectors of academia, government, or society that chose to measure, trade, and value intermediate services, such as biodiversity and carbon sequestration (among

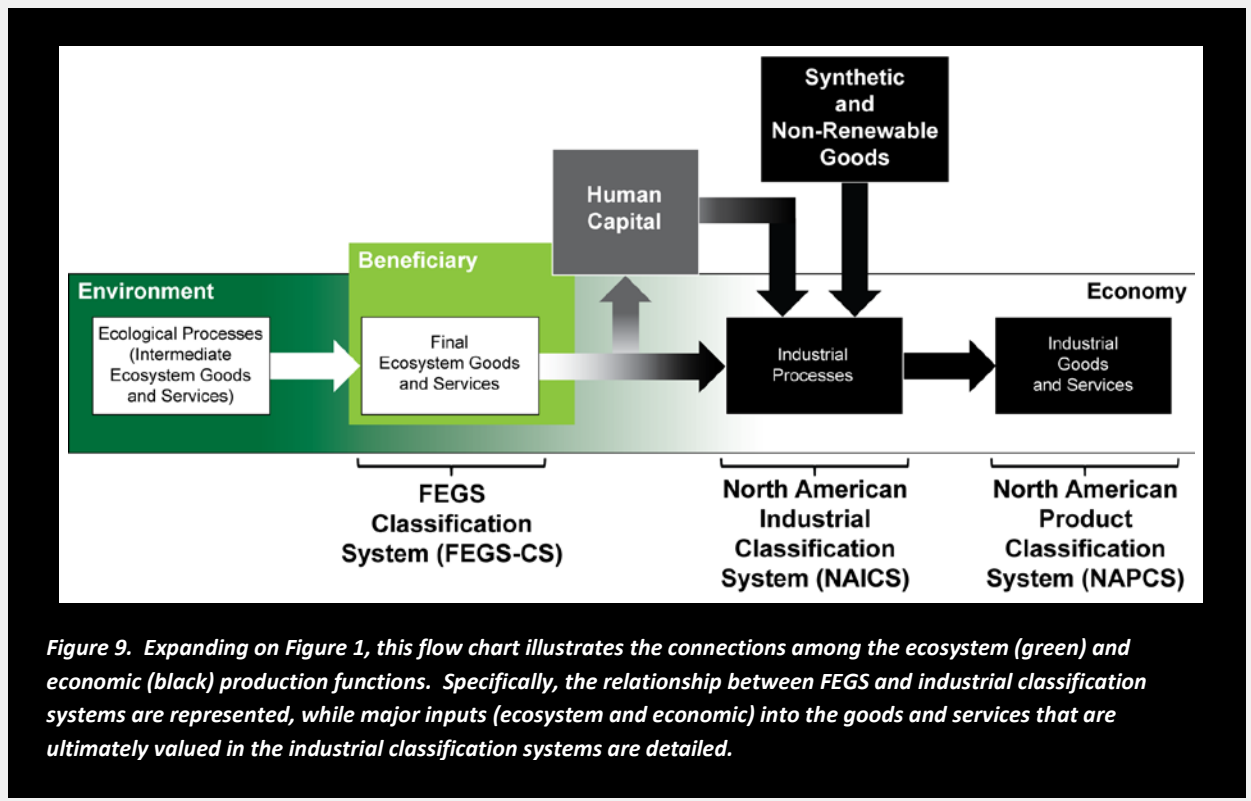
countless other intermediate services); they are simply outside the boundaries of FECS-CS, as are most other ecological structures, functions and processes.

5. CONNECTION BETWEEN FECS AND INDUSTRIAL CLASSIFICATION SYSTEMS

Economic goods and services have been tracked in the United States for nearly a century by several means, one of which is by measuring economic activity of businesses, agencies, and organizations. There are two dominant, albeit related, classification systems used in the world's industrial sector – the International Standard Industrial Classification (ISIC) system and the North American Industry Classification System (NAICS). Both of the ISIC and NAICS were developed to categorize businesses, agencies, and organizations so production-oriented economic activity can be monitored by governments and businesses (visit <http://www.census.gov/eos/www/naics/> for more information). For example, in the United States, many forms (e.g., federal tax forms) for businesses require a NAICS code, by which information is collected and used to develop economic indicators and estimate the Gross Domestic Product (GDP). In the last decade, NAICS has slowly been replacing the ISIC in many countries as the preferred industrial classification system. However, measuring the economic activity (i.e., industrial processes and functions) of businesses (i.e., via NAICS) is only an indicator of the value of economic goods and services. An effort to develop the North American Product Classification System (NAPCS) is currently underway (visit <http://www.census.gov/eos/www/napcs/>). NAPCS will facilitate the identification, classification, and defining of products and services that are sold by those industry classes categorized in NAICS, allowing direct valuation of final economic goods and services.

Ecosystems are the foundation for the industrial sector and the economy. Without ecosystem goods and services, industry, the economy, and ultimately all species (including humans) would cease to exist. While the goods and services provided in the economic sector are well-accounted for (i.e., in NAICS or NAPCS), the contribution of ecosystem goods and services to the economy has been a challenge, in part because a classification system that facilitates the separation of ecosystem goods and services from economic goods and services has not existed. FECS-CS allows the explicit separation of ecosystem and economic goods and services (for an explanation of how, revisit *Section 2. Defining Ecosystem Services*). Figure 9 illustrates the ecosystem (green/white boxes) and economic (white/black boxes) production function continuum, and how major ecosystem and economic components interact. This figure also identifies the component with which each classification system (FECS-CS, NAICS, and NAPCS) is

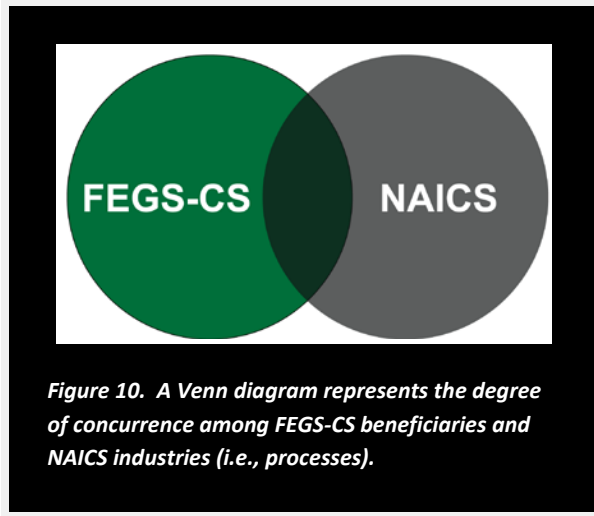
associated. From Figure 9, it is immediately clear that ecological processes and functions (intermediate ecosystem goods and services) and industrial processes (NAICS) are comparable, while FECS and NAPCS both identify and define final [ecosystem/economic] goods and services¹⁰. Identifying the FECS provided by the environment to the industrial sector – either directly (i.e., raw goods) or indirectly (i.e., goods that are transformed using human capital) – would allow natural scientists and economists to establish explicit relationships between ecosystem goods and services and the economic accounting system by linking the ecological and economic production functions.



As a start to establishing relationships between FECS-CS and industrial classification systems, we have identified and propose some connections between FECS-CS and NAICS – specifically, in the third column of each of the FECS Matrices called “Potentially Relevant NAICS Code(s). We were limited by the amount of complexity we could manage, as many of the beneficiaries in NAICS and the FECS-CS are not perfectly analogous – especially since FECS-CS is associated with goods and services, whereas NAICS is associated with processes (i.e., economic intermediates).

¹⁰ Note that Final Ecosystem Goods and Services (FECS) are different from final goods and services (FGS) – an economic term for the goods and services that are available for purchase by an ultimate user (i.e., with no intention to further process the good or service). FGS are the last product in the economic production function, and therefore include human capital and inputs.

Nevertheless, using the 2012 NAICS US three-digit Codes¹¹, we hypothesized which FECS from each Environmental Sub-Class could directly contribute to or be used by the NAICS industrial class.



For example, livestock grazers in scrublands (FECS-CS Code 25.0103) that utilize flora and open space from the environment (FECS) are related to NAICS “Animal Production and Aquaculture” industries (NAICS US Code 112). We found that many of the FECS utilized by beneficiaries (e.g., Irrigators, Food Extractors, Power and Other Electric Generators, etc.) could be clearly connected to NAICS industries (i.e., processes). Some FECS, such as those provided to Learning and Non-Use beneficiaries, could only be vaguely connected to NAICS industries. Other FECS, specifically all those utilized by Recreational

and Subsistence beneficiaries, were entirely absent from the NAICS construct – unsurprisingly, as these beneficiaries tend to utilize the environment with no or minimal economic inputs. Ultimately, this exercise revealed that while there are some direct connections that can be made between FECS-CS and NAICS, both classification systems include many beneficiaries that are unique to the environment or the economy (Figure 10). When the development of NAPCS is complete, the relationship between final ecosystem goods and services and final economic goods and services will be a more appropriate and vital connection to make.

6. USING THE FECS-CS

At a minimum, we expect that the FECS-CS will enhance communication regarding ecosystem services. In particular, the FECS-CS may serve as a standard approach to identify potential defined FECS for those seeking to describe, communicate, or study (i.e., measure, quantify, mapping, model, and/or value) ecosystem services anywhere in the world. The potential users of this FECS-CS include individuals and firms in the public sector, private sector, and non-profit organizations. If a given user knows the Environmental Classes and Sub-Classes that exist in a

¹¹ The 2012 NAICS 2-6 Digit Codes can be downloaded as a Microsoft Excel file (.xls) from <http://www.census.gov/cgi-bin/sssd/naics/naicsrch?chart=2012>.

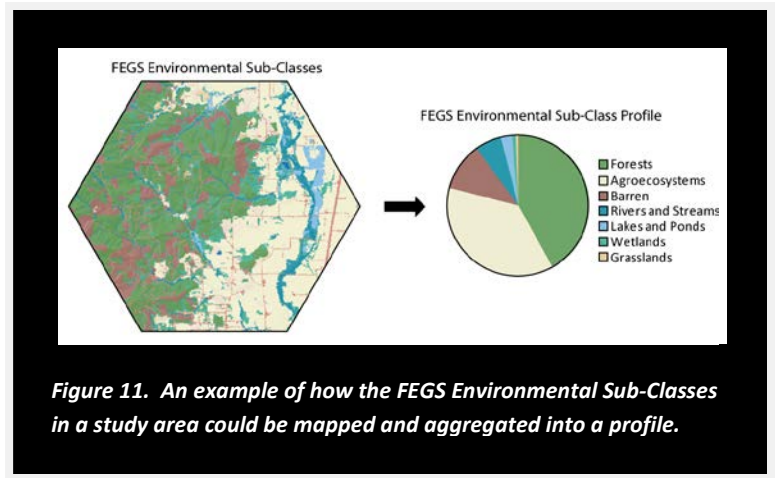
particular area of interest, it is relatively easy to produce a list of potential beneficiaries and potential FEGS using FEGS-CS. This, in itself, is an example of how communication can be greatly improved by the application of FEGS-CS. Needless to say, the FEGS-CS is just a first step within a larger transdisciplinary, scientific effort to develop the knowledge and tools necessary to measure, quantify, mapping, model, and/or value ecosystem services over the landscape. The following sections describe some of the next challenges that we believe need to be addressed in further developing the FEGS concept and approach.

6.1. MEASURING FEGS

Eventually, metrics and indicators appropriate for specific FEGS will be included, where possible, in the FEGS Matrices as an additional column. These metrics and indicators will inform natural scientists what to measure so that the FEGS provided within a specific area (i.e., environments) may be identified and quantified. Ringold et al. (2013) provide some explicit examples of potential metrics and indicators for FEGS provided by rivers and streams. Aside from identifying metrics and indicators, determining how they can be appropriately aggregated to represent FEGS will be an area of necessary research.

At present, we imagine a process where “Provisional” metrics and indicators will be placed in the FEGS-CS in the near future and that, over time and through a vetting process, it would be possible for the Provisional FEGS

Metrics to achieve some level of approval for their usage from the user community. Details of this effort are now being worked out (June 2013).



6.2. MAPPING FEGS

Mapping where FEGS [potentially] occur on the landscape is a vital step to determining their current distribution. Because most FEGS-CS Environmental [Sub-]Classes are based on existing landscape classes (revisit Section 3.2. Environmental Classes and Sub-Classes for details) and beneficiaries, the full suite of potential FEGS and potential Beneficiary [Sub-]Categories that

could exist in an area can already be identified. For example, in Figure 11, at least eight¹² Environmental Sub-Classes are present in the study area (i.e., hexagon), and, therefore, a total of 589 potential FEGS¹³ would exist. If some general information about an area is known (for example, the forests in the study area are off-limits to hunting), some Beneficiary Sub-Categories can be eliminated. Maps of potential FEGS are important because they are spatial representations of where [on the earth's surface] specific FEGS may be provided, which may help users explicitly recognize and address [potential] FEGS in their decision-making and while communicating.

6.3. MODELING FEGS

Modeling FEGS will be important for at least three (related) efforts: (1) determining how [changes in] intermediate ecosystem goods and services affects the provision of FEGS, (2) making spatial linkages among different environments (i.e., Environmental Sub-Classes) to predict tradeoffs among these environments as a result of consuming FEGS (i.e., using water from rivers may impact fauna in a connected wetland), and (3) projecting potential societal changes (i.e., tradeoffs) under different management, pressure, or stressor scenarios. In all of these examples, FEGS, in essence, can be used as the environmental currency that are quantified, valued, and projected under varying scenarios to consistently project future conditions. Such future conditions of FEGS and the related economic and social outcomes due to various tradeoffs could and should be directly analyzed and evaluated from a sustainability perspective.

6.4. VALUING FEGS

Actual valuation of FEGS is outside the scope of this document. However, economists that we have worked with in developing the FEGS-CS approach have been uniformly enthusiastic about three characteristics of this system: 1) the clear and systematic identification of FEGS, 2) the minimization of double counting and 3) the linkage to explicit first-order depictions of specific beneficiaries. For these reasons, we anticipate that the use of FEGS-CS to identify, measure, and model FEGS will facilitate future valuation efforts.

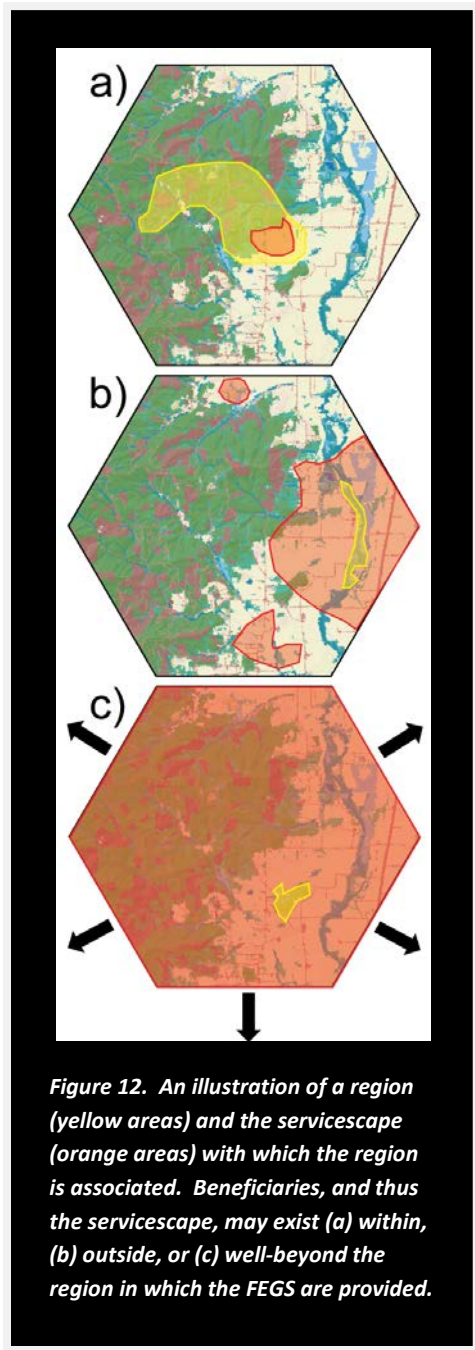
¹² This number comes from the seven Environmental Sub-Classes identified in Figure 11, plus “31. Atmosphere”, which is ubiquitous. The other potentially relevant Environmental Sub-Class is “16. Groundwater”, but other maps would need to be overlaid/developed to identify the presence of this Environmental Sub-Class.

¹³ Many of the 589 potential FEGS are associated with the same Beneficiary Sub-Category and the same Environmental Sub-Class. If the potential FEGS are grouped by Beneficiary Sub-Category and Environmental Sub-Class, 338 sets of FEGS identified.

6.5. NEXT STEPS IN IMPLEMENTING THE FECS APPROACH

In the near term, we plan to participate in one or more real world, on-the-ground, demonstrations or pilot studies that would include FECS-CS along with multiple scales of ecosystem service mapping, applications of process models, decision-support models, valuation approaches, and quantification of resulting human well-being. Progress will be made by collaborating with interested parties (i.e., researchers, government entities, academics, businesses, stakeholders) across disciplines. There is no doubt that collaboration and the coordinated use of FECS-CS will expose many nuances and challenges of applying the FECS approach we propose here; however, we also believe that FECS introduces an appropriate transdisciplinary setting to pursue appropriate solutions. We fully expect that during this demonstration phase, improvements will be made to the FECS-CS.

An important next step in the FECS research, now that an initial classification system for FECS is available, is to define beneficiaries for a **servicescape**. We define a servicescape as the area or areas (as they can be non-contiguous) that contain the beneficiaries that directly enjoy, consume, or use the FECS provided by a defined region. We use the term “region” in a very general sense to refer to any defined geographic boundary, such as a town, a city, a county, a watershed, a state, an ecoregion, or any other well-defined spatial area on the surface of the earth¹⁴. In other words, a servicescape is



where the FECS are realized, and therefore contain the beneficiaries to which the FECS are provided.

¹⁴ We use the term “surface of the earth” instead of “landscape”, as a region [that provides FECS] could be entirely aquatic.

FEGS can certainly be provided to beneficiaries within the region boundaries (Figure 12a), but beneficiaries outside the region may also directly enjoy, consume, or use FEGS within the region (Figure 12b). In many cases, the servicescape is much larger than the region in which the FEGS are provided (Figure 12c). For example, the Great Barrier Reef in Australia provides FEGS to non-use beneficiaries and recreational beneficiaries (who travel to the Great Barrier Reef) in every continent on earth in addition to the local community that it serves. Therefore, the servicescape that the Great Barrier Reef encompasses is vast. On the other hand, a small, isolated stream in Northern Idaho in the United States may only provide FEGS to a few select beneficiaries within the region who know of its existence and utilize FEGS derived therein. In the near-term and into the future, social scientists and natural scientists will need to continue to collaborate in order to define approaches that can adequately identify, quantify, or estimate the beneficiaries associated with different FEGS servicescapes so projected changes in FEGS can be related to human well-being and valued to inform decision making at multiple levels.

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APPENDICES

DEFINITIONS

Term	Definition
approach	<i>underlying philosophy leading to guiding principles from which to address ecosystem services in a repeatable manner.</i>
beneficiaries	<i>the interests of an individual (i.e., person, group, and/or firm) that drive active or passive consumption and/or appreciation of ecosystem services resulting in an impact (positive or negative) on their welfare.</i>
beneficiary approach	<i>the classification of ecosystem services by Beneficiary [Sub-]Categories.</i>
benefits	<i>an impact, positive or negative, on human welfare.</i>
classification system	<i>an organized structure for identifying and organizing ecosystem services into a coherent scheme.</i>
community engagement	<i>involvement of individuals, groups, and firms that have an interest (active or passive) in the ecosystem/environment.</i>
ecosystem attributes	<i>a biological, physical, or chemical characteristic or feature inherent to an ecosystem/environment.</i>
ecosystem services	<i>a general term used to refer to "the benefits people obtain from ecosystems" (MEA 2005). A common variation of this general term is "ecosystem goods and services" (EGS). Ecosystem services, used in this general way, is all-inclusive and may include ecological processes and functions (sometimes referred to as intermediate services), goods, services, among anything from or within the environment.</i>
Final Ecosystem Goods and Services (FEGS)	<i>"components of nature, directly enjoyed, consumed, or used to yield human well-being" (Boyd and Banzhaf, 2007). The final ecosystem service is a biophysical quality or feature and needs minimal translation for relevance to human well-being. Furthermore, a final ecosystem service is the last step in an ecological production function before the user interacts with the ecosystem, either by enjoying, consuming, or using the good or service, or using it as an input in the human economy.</i>
FEGS Matrices	<i>a collection of 15 tables that represents the FEGS-CS, in which, for a specific Environmental Sub-Class, beneficiaries and sets of FEGS are identified and described.</i>
framework	<i>a structure that includes the relationships among a set of assumptions, concepts, and practices that establish an approach for accomplishing a stated objective or objectives.</i>

implementation plan	<i>explicit methods and approaches by which an ecosystem service framework can be applied.</i>
intermediate ecosystem goods and services	<i>ecological processes, functions, structures, characteristics, and interactions that are essential to the existence of Final Ecosystem Goods and Services but are not directly enjoyed, used, or consumed by beneficiaries.</i>
medium	<i>a physical entity (e.g., water, air, land) from which beneficiaries receive a benefit. For example, a commercial transporter interacts with the water (as a medium, the FEGS) while ferrying people across a river.</i>
metrics and indicators	<i>a direct or indirect measurement of a FEGS that can be consistently and reliably related to a FEGS. There can be multiple metrics and indicators for a single FEGS, possibly necessitating the aggregation and weighting of metrics and indicators into an index.</i>
operational	<i>used in a repeatable, consistent, and meaningful way.</i>
production function	<i>models of the relationship between inputs and factors of production to production outputs. In the case of ecosystem services, there can be both ecological production functions, relating to natural structure and function (Daily and Matson 2008), and economic production functions, relating to human capital and economic products.</i>
principles	<i>a set of fundamental rules.</i>
servicescape	<i>the area or areas (as they can be non-contiguous) that contain beneficiaries that directly enjoy, consume, or use the FEGS provided by a defined region.</i>
subsister	<i>a beneficiary that relies on the environment's abundance [for water, food, timber, fiber, and fur, and/or building materials) as a major supplement to their existence.</i>
total economic value	<i>the value of the output from an economic production function (i.e., product) that includes the ecological inputs (i.e., the ecological production function) and the inputs of labor and capital goods. Value is unlikely to be identical with the combined market prices to the separate inputs.</i>
transdisciplinary	<i>involving frequent communication and shared effort among two or more traditional academic disciplines that have a common, discipline-transcending theory from which language, concepts, and methods are developed to solve problems beyond the confines of a single discipline (van den Besselaar and Heimeriks 2001).</i>
viewscape	<i>a scene in its entirety within a range of sight, which may include components such as ridgelines, peaks, open meadows, or a "patchwork" of agricultural fields.</i>

Final Ecosystem Goods and Services (FEGS) Environmental Classification

X Environmental Classes		
1 Aquatic	2 Terrestrial	3 Atmospheric
XX. Environmental Sub-Classes		
<p>11. Rivers and Streams <i>...include (but are not limited to)</i> <i>major rivers</i> <i>perennial streams and creeks</i> <i>man-made canals</i></p> <p>12. Wetlands <i>...include (but are not limited to)</i> <i>isolated depressions</i> <i>riparian wetlands</i> <i>bogs and fens</i> <i>tidal wetlands</i></p> <p>13. Lakes and Ponds <i>...include (but are not limited to)</i> <i>saline lakes</i> <i>man-made systems (e.g., reservoirs, wet quarries, reservoirs) excluding industrial (i.e., manure ponds, sewage treatment ponds, mining ponds, etc.)</i></p> <p>14. Estuaries and Near Coastal Marine <i>...include (but are not limited to)</i> <i>estuaries and bays</i> <i>reefs</i> <i>coastal lagoons</i> <i>hyposaline and mesosaline deltas</i> <i>intertidal shores, mud flats, tide pools</i></p> <p>15. Open Oceans and Seas <i>...include (but are not limited to)</i> <i>deep ocean</i> <i>continental shelf</i></p> <p>16. Groundwater <i>...include (but are not limited to)</i> <i>rechargeable aquifers</i> <i>geysers</i> <i>water in caves</i></p>	<p>21. Forests <i>...include (but are not limited to)</i> <i>uncut and wilderness area forests</i> <i>timber plantations</i> <i>woodlots</i></p> <p>22. Agroecosystems <i>...include (but are not limited to)</i> <i>orchards and vineyards</i> <i>row crops and pasture/hay</i> <i>tree farms (short term rotation, e.g., Xmas trees, ornamentals, pulp)</i></p> <p>23. Created Greenspace <i>...include (but are not limited to)</i> <i>parks, parkways, trees</i> <i>cemeteries and airfields</i> <i>lawns and golf courses</i></p> <p>24. Grasslands <i>...include (but are not limited to)</i> <i>tall- and short-grass prairies</i> <i>managed (unplanted) fields</i> <i>restored mines, landfills, etc.</i></p> <p>25. Scrublands / Shrublands <i>...include (but are not limited to)</i> <i>high desert sagelands</i> <i>forested sand dunes</i> <i>juniper scrublands</i></p> <p>26. Barren / Rock and Sand <i>...include (but are not limited to)</i> <i>abandoned (dry) quarries</i> <i>dry desert</i> <i>beaches, unvegetated dunes</i></p> <p>27. Tundra <i>...include (but are not limited to)</i> <i>lichen, moss, sedge cover</i></p> <p>28. Ice and Snow <i>...include (but are not limited to)</i> <i>glaciers</i> <i>permanent snow</i> <i>alpine</i></p>	<p>31. Atmosphere <i>See Principle #16 for more information on Atmosphere Environmental Sub-Class.</i></p>

Note: Beneficiaries, FEGS, and indicators are being identified for each Environmental Sub-Class (e.g., two-digit number). Italicized text provides some specific examples of environments characteristic of the sub-classes.

Final Ecosystem Goods and Services (FEGS) Beneficiary Categorization

XX.XX Beneficiary Categories				
00.01 Agricultural	00.02 Commercial / Industrial	00.03 Government, Municipal, and Residential	00.04 Commercial / Military Transportation	00.05 Subsistence
XX.XXXX Beneficiary Sub-Categories				
00.0101 Irrigators	00.0201 Food Extractors	00.0301 Municipal Drinking Water Plant Operators	00.0401 Transporters of Goods	00.0501 Water Subsisters
00.0102 CAFO Operators	00.0202 Timber, Fiber, and Ornamental Extractors	00.0302 Waste Water Treatment Plant Operators	00.0402 Transporters of People	00.0502 Food Subsisters
00.0103 Livestock Grazers	00.0203 Industrial Processors	00.0303 Residential Property Owners		00.0503 Timber, Fiber, and Fur / Hide Subsisters
00.0104 Agricultural Processors	00.0204 Industrial Dischargers	00.0304 Military / Coast Guard		00.0504 Building Material Subsisters
00.0105 Aquaculturists	00.0205 Electric and other Energy Generators			
00.0106 Farmers	00.0206 Resource-Dependent Businesses			
00.0107 Foresters	00.0207 Pharmaceutical and Food Supplement Suppliers			
	00.0208 Fur / Hide Trappers and Hunters			

XX.XX Beneficiary Categories				
00.06 Recreational	00.07 Inspirational	00.08 Learning	00.09 Non-Use	00.10 Humanity
XX.XXXX Beneficiary Sub-Categories				
00.0601 Experiencers and Viewers	00.0701 Spiritual and Ceremonial Participants and Participants of Celebration	00.0801 Educators and Students	00.0901 People Who Care (Existence)	00.1001 All Humans
00.0602 Food Pickers and Gatherers	00.0702 Artists	00.0802 Researchers	00.0902 People Who Care (Option / Bequest)	
00.0603 Hunters				
00.0604 Anglers				
00.0605 Waders, Swimmers, and Divers				
00.0606 Boaters				

MATRIX SUMMARY

Beneficiary Categories and Sub-Categories	Beneficiary Description	FINAL ECOSYSTEM GOODS AND SERVICES (FEGS) IDENTIFIED FOR EACH ENVIRONMENTAL SUB-CLASS															Beneficiary Frequency (out of 15 Environmental Sub-Classes)
		11. Rivers and Streams	12. Wetlands	13. Lakes and Ponds	14. Estuaries and Near Coastal Marine	15. Open Oceans and Seas	16. Groundwater	21. Forests	22. Agroecosystems	23. Created Greenspace	24. Grasslands	25. Scrublands / Shrublands	26. Barren / Rock and Sand	27. Tundra	28. Ice and Snow	31. Atmosphere	
XX.01 Agricultural																	
XX.0101 Irrigators	Irrigators interact with aquatic environments, as they consume water from aquatic environments for maintaining crops, often moving water through ditches and canals. Note that Farmers and Irrigators are different beneficiaries.	• water	• water	• water													4
XX.0102 CAFO Operators	This beneficiary raises large, dense populations of livestock in a confined area (whether indoors or outdoors).	• water		• water								• open space	• open space				6
XX.0103 Livestock Grazers	This beneficiary uses the environment to graze livestock. Cultivated vegetation is NOT considered a FEGS. For agroecosystems, "planted" pastures only provide space and opportunity to grow feed (not the vegetation itself).	• water • flora	• water • flora • open space	• water	• water • flora • open space			• soil • open space		• flora • open space	• flora • open space		• flora • open space			• weather	10
XX.0104 Agricultural Processors	This beneficiary primarily consumes water for washing edible products.	• water		• water	• water												4
XX.0105 Aquaculturists	Aquaculturists farm aquatic fauna, such as fish, shrimp, oysters, etc. Those who cultivate aquatic flora are accounted for under the Farmer Beneficiary Sub-Category.	• presence of the environment • water	• presence of the environment • water	• presence of the environment • water	• presence of the environment • water	• presence of the environment • water	• presence of the environment • water										6
XX.0106 Farmers	Farmers may plant annual crops (e.g., corn, soybeans, rice) or introduce cultivars that produce perennial, long-term crops (e.g., hay, grapes, cranberries, watercress, Christmas trees). Note that Farmers and Irrigators are different beneficiaries.		• soil • open space • pollinators • depredators and (pest) predators					• soil • open space • pollinators • depredators and (pest) predators		• soil • open space • pollinators • depredators and (pest) predators						• water • weather	4
XX.0107 Foresters	Foresters introduce tree cultivars and nurture those cultivars as they grow into trees, which are harvested. The rotation for the tree crops may be as short as 10 years or many decades.							• soil • open space								• water • weather	2
XX.02 Commercial / Industrial																	
XX.0201 Food Extractors	Food extractors utilize the natural abundance of edible organisms (i.e., non-cultivated or bred) for commercial use or sale. Includes commercial and native hunters (if legal). In aquatic environments, this beneficiary has potential contact with water.	• flora • fauna	• flora • fauna	• flora • fauna	• flora • fauna	• flora • fauna				• flora • fauna • fungi					• flora • fauna		9
XX.0202 Timber, Fiber, and Ornamental Extractors	Timber, fiber, and ornamental extractors rely on the environment for products used or sold commercially. Only non-cultivated, renewable material (i.e., NOT oil, ore, gems, etc.) are considered FEGS.	• fiber • natural materials	• timber • fiber • natural materials	• natural materials	• fiber • natural materials			• fiber • natural materials • timber	• natural materials		• fiber • natural materials	• timber • fiber • natural materials	• natural materials	• fiber • natural materials			10
XX.0203 Industrial Processors	This beneficiary primarily consumes water for cooling, producing pulp, etc. The water has no contact with edibles.	• water		• water	• water	• water	• water									• presence of the environment	6
XX.0204 Industrial Dischargers	Industrial dischargers use the environment [only] for discharging water, material (i.e., sand and gravel, garbage), and emissions. Hydraulic fracking practices involve industrial discharge to groundwater.	• presence of the environment • water	• presence of the environment • water	• presence of the environment • water	• presence of the environment • water	• presence of the environment • water	• presence of the environment • water									• presence of the environment • air	7
XX.0205 Electric and other Energy Generators	This beneficiary relies on the environment for energy or placement of power generation structures, including dams, wind, water, or wave turbines, solar panels, geothermal systems, etc.	• presence of the environment • water		• presence of the environment • water	• presence of the environment • water	• presence of the environment • water	• presence of the environment • water		• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment • wind	12
XX.0206 Resource-Dependent Businesses	Without the environment, this beneficiary would not have the opportunity for businesses, including marinas, stables, and ecotourism (e.g., rafting companies, hot air balloon companies, beach resorts, hot springs, ice hotels) - but not farm or forest land.	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment • weather • air	15
XX.0207 Pharmaceutical and Food Supplement Suppliers	This beneficiary collects organisms from the wild that are used as or for the basis of pharmaceuticals or food supplements for commercial sale. This beneficiary relies on the natural abundance of target organisms.	• flora • fauna	• flora • fauna	• flora • fauna	• flora • fauna	• flora • fauna				• flora • fauna • fungi	• flora	• flora • fauna	• flora • fauna				11
XX.0208 Fur / Hide Trappers and Hunters	This beneficiary takes advantage of the natural abundance of fauna (i.e., not farm-raised or domesticated animals) for fur or hides for commercial use or sale.	• fauna	• fauna	• fauna	• fauna			• fauna			• fauna	• fauna	• fauna	• fauna	• fauna		10
XX.03 Government, Municipal, and Residential																	
XX.0301 Municipal Drinking Water Plant Operators	This beneficiary is responsible for providing water to a community and may do so by collecting water from rivers, reservoirs, lakes, wells, bays, or estuaries. Water is treated and distributed. Direct precip is not generally used as a water source.	• water		• water	• water												4
XX.0302 Waste Water Treatment Plant Operators	This beneficiary uses the environment [only] for discharging treated water.	• water	• water	• water	• water												4
XX.0303 Residential Property Owners	While changes in property value are not a FEGS, residential property owners are affected by the environment in which their property resides.	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	13
XX.0304 Military / Coast Guard	The Military / Coast Guard relies on the environment for the placement of infrastructure (e.g., ports, bases, etc.) or conditions for training activities.	• presence of the environment • open space	• presence of the environment • open space	• presence of the environment • open space	• presence of the environment • open space	• presence of the environment • open space	• presence of the environment • open space	• presence of the environment • open space	• presence of the environment • open space	• presence of the environment • open space	• presence of the environment • open space	• presence of the environment • open space	• presence of the environment • open space	• presence of the environment • open space	• presence of the environment • open space	• presence of the environment • open space	13
XX.04 Commercial / Military Transportation																	
XX.0401 Transporters of Goods	This beneficiary uses the environment as a media to transport goods - specifically, via boats (e.g., barges), airplanes, and overland/off-road vehicles (e.g., quads).	• presence of the environment • water		• presence of the environment • water	• presence of the environment • water	• presence of the environment • water						• presence of the environment • land	• presence of the environment • land	• presence of the environment • land	• presence of the environment • land	• presence of the environment • air	9
XX.0402 Transporters of People	This beneficiary uses the environment as a media to transport people - specifically, via boats (e.g., cruise liners, ferries, tour boats), airplanes, and overland/off-road vehicles.	• presence of the environment • water		• presence of the environment • water	• presence of the environment • water	• presence of the environment • water						• presence of the environment • land	• presence of the environment • land	• presence of the environment • land	• presence of the environment • land	• presence of the environment • air	9

MATRIX SUMMARY

Beneficiary Categories and Sub-Categories	Beneficiary Description	11. Rivers and Streams	12. Wetlands	13. Lakes and Ponds	14. Estuaries and Near Coastal Marine	15. Open Oceans and Seas	16. Groundwater	21. Forests	22. Agroecosystems	23. Created Greenspace	24. Grasslands	25. Scrublands / Shrublands	26. Barren / Rock and Sand	27. Tundra	28. Ice and Snow	31. Atmosphere	Frequency (out of 15 Environmental Sub-Classes)		
XX.05 Subsistence																			
XX.0501	Water Subsisters <i>Water Subsisters rely on a natural source for drinking water and may use wells or cisterns for storage (i.e., they do not receive municipal drinking water). Water purity is important, as water is not or only minimally treated.</i>	• water		• water			• water									• water	• water	5	
XX.0502	Food Subsisters <i>Food Subsisters use the natural abundance of [edible] flora, fungi, and fauna whether collecting, hunting, or fishing as a major supplement to their existence.</i>	• flora • fauna	• flora • fauna	• flora • fauna	• flora • fauna			• flora • fauna • fungi				• flora • fauna • fungi				• flora • fauna	• fauna	10	
XX.0503	Timber, Fiber, and Fur / Hide Subsisters <i>This beneficiary relies on the natural abundance of timber, fiber, and [fauna fur] for / hide for survival. Timber, fiber, and fur / hide used for building material is accounted for in this category.</i>	• fiber • fauna	• timber • fiber • fauna	• fiber • fauna	• timber • fiber • fauna			• timber • fiber • fauna								• timber • fiber • fauna	• fauna	9	
XX.0504	Building Material Subsisters <i>This beneficiary relies on the environment to provide renewable, non-cellular material (primarily snow and ice) used for infrastructure and housing for personal use (i.e., not for commercial sale).</i>																• substrate	1	
XX.06 Recreational																			
XX.0601	Experiencers and Viewers <i>This beneficiary views and experiences the environment via an activity, such as scenery gazing, hiking, bird watching, boating, ice skating, rock climbing, flying kites, etc. This beneficiary does not have physical contact with water.</i>	• presence of the environment • viewscape • flora • fauna • sounds and scents	• presence of the environment • viewscape • flora • fauna • sounds and scents	• presence of the environment • viewscape • flora • fauna • sounds and scents	• presence of the environment • viewscape • flora • fauna • sounds and scents	• presence of the environment • viewscape • flora • fauna • sounds and scents	• presence of the environment • viewscape • flora • fauna • sounds and scents	• presence of the environment • viewscape • flora • fauna • fungi • sounds and scents	• presence of the environment • viewscape • flora • fauna • fungi • sounds and scents	• presence of the environment • viewscape • flora • fauna • fungi • sounds and scents	• presence of the environment • viewscape • flora • fauna • fungi • sounds and scents	• presence of the environment • viewscape • flora • fauna • fungi • sounds and scents	• presence of the environment • viewscape • flora • fauna • fungi • sounds and scents	• presence of the environment • viewscape • flora • fauna • fungi • sounds and scents	• presence of the environment • viewscape • flora • fauna • fungi • sounds and scents	• presence of the environment • viewscape • flora • fauna • fungi • sounds and scents	• presence of the environment • viewscape • flora • fauna • fungi • sounds and scents	• presence of the environment • viewscape • flora • fauna • atmospheric phenomena • sounds and scents • air • wind	15
XX.0602	Food Pickers and Gatherers <i>This beneficiary recreationally picks or gathers from the natural abundance of [edible] flora, fungi, and some fauna (as long as it is not fished or hunted). This beneficiary has potential contact with water.</i>	• flora • fauna	• flora • fauna	• flora • fauna	• flora • fauna			• flora • fauna • fungi				• flora • fauna • fungi				• flora		9	
XX.0603	Hunters <i>This beneficiary is primarily interested in hunting mammals and fowl (not flora or fungi) recreationally (i.e., not for survival). In aquatic environments, this beneficiary has potential contact with water.</i>	• fauna	• fauna	• fauna	• fauna	• fauna		• fauna	• fauna			• fauna	• fauna	• fauna	• fauna	• fauna	• fauna	12	
XX.0604	Anglers <i>Anglers fish recreationally (i.e., not for survival) and include catch-and-release or catch-and-consume activities. Stocked fish are not a FEGS, as they are considered a human input. This beneficiary has potential contact with water.</i>	• fish	• fish	• fish	• fish	• fish												5	
XX.0605	Waders, Swimmers, and Divers <i>This beneficiary recreates in or under the water by either wading, swimming, or diving (i.e., snorkeling, SCUBA diving). By definition, this beneficiary has contact with water.</i>	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment											6	
XX.0606	Boaters <i>Boaters may use motorized (i.e., motor boats) or non-motorized boats (i.e., canoes, kayaks, rafts) to recreate. This beneficiary has potential contact with water.</i>	• presence of the environment • water	• presence of the environment • water	• presence of the environment • water	• presence of the environment • water	• presence of the environment • water	• presence of the environment • water										• wind	7	
XX.07 Inspirational																			
XX.0701	Spiritual and Ceremonial Participants and Celebration <i>This beneficiary uses the environment for spiritual, ceremonial, or celebratory purposes, such as harvest festivals, seafood festivals, Native American observances, religious rites (i.e., baptisms, weddings), personal growth, etc.</i>	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	15
XX.0702	Artists <i>Artists, amateur and professional, utilize the environment or their experience in the environment to produce art. This category may include writers, cinematographers, and recording artist among others.</i>	• presence of the environment • viewscape • sounds and scents • natural materials	• presence of the environment • viewscape • sounds and scents • natural materials	• presence of the environment • viewscape • sounds and scents • natural materials	• presence of the environment • viewscape • sounds and scents • natural materials	• presence of the environment • viewscape • sounds and scents • natural materials	• presence of the environment • viewscape • sounds and scents • natural materials	• presence of the environment • viewscape • sounds and scents • natural materials	• presence of the environment • viewscape • sounds and scents • natural materials	• presence of the environment • viewscape • sounds and scents • natural materials	• presence of the environment • viewscape • sounds and scents • natural materials	• presence of the environment • viewscape • sounds and scents • natural materials	• presence of the environment • viewscape • sounds and scents • natural materials	• presence of the environment • viewscape • sounds and scents • natural materials	• presence of the environment • viewscape • sounds and scents • natural materials	• presence of the environment • viewscape • sounds and scents • natural materials	• presence of the environment • viewscape • sounds and scents • natural materials	• presence of the environment • viewscape • sounds and scents • natural materials	15
XX.08 Learning																			
XX.0801	Educators and Students <i>This beneficiary includes both formal and self-taught educators and students. All parts of the environment are of interest.</i>	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	15
XX.0802	Researchers <i>Researchers are interested in the environment for academic and applied purposes and as a group do not discriminate over which parts of the environment are of interest.</i>	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	15
XX.09 Non-Use																			
XX.0901	People Who Care (Existence) <i>This non-use beneficiary believes it is important to preserve the environment because of a moral/ethical connection or for fear of unintended consequences.</i>	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	15
XX.0902	People Who Care (Option / Bequest) <i>Option/Bequest non-use beneficiaries consider that they or future generations may visit or rely on the environment. This includes beneficiaries that value the traditional aspects or features of an activity or FEGS.</i>	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	• presence of the environment	15
XX.10 Humanity																			
XX.1001	All Humans <i>All humans includes everyone, regardless of whether they actively recognize or appreciate the FEGS, because the FEGS are available to everyone and used by everyone to live.</i>																• air	1	
Number of Beneficiary Sub-Categories Present in Each Environmental Sub-Class		34	27	34	31	21	22	19	14	13	21	23	18	22	18	21		338 Number of Unique Beneficiaries	

11. RIVERS AND STREAMS

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
11.01 Agricultural						
11.0101 Irrigators	111	<i>Irrigators interact with aquatic environments, as they consume water from aquatic environments for maintaining crops, often moving water through ditches and canals. Note that Farmers and Irrigators are different beneficiaries.</i>	<ul style="list-style-type: none"> • water 		<ul style="list-style-type: none"> • water for growing and maintaining crops 	
11.0102 CAFO Operators	112	<i>This beneficiary raises large, dense populations of livestock in a confined area (whether indoors or outdoors).</i>	<ul style="list-style-type: none"> • water 		<ul style="list-style-type: none"> • water for livestock consumption 	
11.0103 Livestock Grazers	112	<i>This beneficiary uses the environment to graze livestock. Cultivated vegetation is NOT considered a FEGS. For agroecosystems, "planted" pastures only provide space and opportunity to grow feed (not the vegetation itself).</i>	<ul style="list-style-type: none"> • water • flora 		<ul style="list-style-type: none"> • water suitable for livestock consumption • non-cultivated vegetation for livestock consumption 	
11.0104 Agricultural Processors	115, 311	<i>This beneficiary primarily consumes water for washing edible products.</i>	<ul style="list-style-type: none"> • water 		<ul style="list-style-type: none"> • water for processing edible products 	
11.0105 Aquaculturists	112	<i>Aquaculturists farm aquatic fauna, such as fish, shrimp, oysters, etc. Those who cultivate aquatic flora are accounted for under the Farmer Beneficiary Sub-Category.</i>	<ul style="list-style-type: none"> • presence of the environment • water 		<ul style="list-style-type: none"> • opportunity provided by the environment for cultivating aquatic organisms • conditions (i.e., water quality) provided by the environment for cultivating aquatic organisms 	
11.02 Commercial / Industrial						
11.0201 Food Extractors	114, 311, 312, 454	<i>Food extractors utilize the natural abundance of edible organisms (i.e., non-cultivated or bred) for commercial use or sale. Includes commercial and native hunters (if legal). In aquatic environments, this beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • flora • fauna 	<ul style="list-style-type: none"> • wild rice, watercress, water pepper • fish, crawfish, clams, snails, alligator 	<ul style="list-style-type: none"> • edible organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) for commercial use or sale • edible organisms (i.e., birds, mammals, reptiles, etc.) for commercial use or sale 	
11.0202 Timber, Fiber, and Ornamental Extractors	339, 424, 453, 454	<i>Timber, fiber, and ornamental extractors rely on the environment for products used or sold commercially. Only non-cultivated, renewable material (i.e., NOT oil, ore, gems, etc.) are considered FEGS.</i>	<ul style="list-style-type: none"> • fiber • natural materials 	<ul style="list-style-type: none"> • reeds, grasses • mollusk shells 	<ul style="list-style-type: none"> • non-cultivated fiber for commercial use or sale • non-cultivated ornamental products or by-products (from cultivation) used ornamentally for commercial use or sale 	
11.0203 Industrial Processors	313-339	<i>This beneficiary primarily consumes water for cooling, producing pulp, etc. The water has no contact with edibles.</i>	<ul style="list-style-type: none"> • water 		<ul style="list-style-type: none"> • water suitable for cooling or processing industrial products 	
11.0204 Industrial Dischargers	211, 212, 221, 311-339	<i>Industrial dischargers use the environment [only] for discharging water, material (i.e., sand and gravel, garbage), and emissions. Hydraulic fracking practices involve industrial discharge to groundwater.</i>	<ul style="list-style-type: none"> • presence of the environment • water 		<ul style="list-style-type: none"> • opportunity to discharge into the environment • medium for receiving industrial discharge 	
11.0205 Electric and other Energy Generators	221	<i>This beneficiary relies on the environment for energy or placement of power generation structures, including dams, wind, water, or wave turbines, solar panels, geothermal systems, etc.</i>	<ul style="list-style-type: none"> • presence of the environment • water 		<ul style="list-style-type: none"> • opportunity to install power generation structures, such as dams and water turbines • flowing water that can be used for energy generation 	

11. RIVERS AND STREAMS

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
11.0206 Resource-Dependent Businesses	487, 712, 713, 721, 722	<i>Without the environment, this beneficiary would not have the opportunity for businesses, including marinas, stables, and ecotourism (e.g., rafting companies, hot air balloon companies, beach resorts, hot springs, ice hotels) - but not farm or forest land.</i>	<ul style="list-style-type: none"> presence of the environment 		<ul style="list-style-type: none"> opportunity for placement of infrastructure and reduced/increased risk of flooding, erosion, and pest infestation on the property 	
11.0207 Pharmaceutical and Food Supplement Suppliers	325, 339, 424	<i>This beneficiary collects organisms from the wild that are used as or for the basis of pharmaceuticals or food supplements for commercial sale. This beneficiary relies on the natural abundance of target organisms.</i>	<ul style="list-style-type: none"> flora fauna 	<ul style="list-style-type: none"> fish for fish oil 	<ul style="list-style-type: none"> organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) used in medicines or sold for medicinal purposes organisms (i.e., birds, mammals, reptiles, etc.) or products associated with organisms (i.e., oils, fats, keratin, etc.) used in medicines or sold for medicinal purposes 	
11.0208 Fur / Hide Trappers and Hunters	114	<i>This beneficiary takes advantage of the natural abundance of fauna (i.e., not farm-raised or domesticated animals) for fur or hides for commercial use or sale.</i>	<ul style="list-style-type: none"> fauna 	<ul style="list-style-type: none"> beaver 	<ul style="list-style-type: none"> organisms (i.e., mammals and reptiles) that provide fur or hides for commercial use or sale 	
11.03 Government, Municipal, and Residential						
11.0301 Municipal Drinking Water Plant Operators	221	<i>This beneficiary is responsible for providing water to a community and may do so by collecting water from rivers, reservoirs, lakes, wells, bays, or estuaries. Water is treated and distributed. Direct precip is not generally used as a water source.</i>	<ul style="list-style-type: none"> water 		<ul style="list-style-type: none"> water suitable for processing by a municipal drinking water plant 	
11.0302 Waste Water Treatment Plant Operators	221	<i>This beneficiary uses the environment [only] for discharging treated water.</i>	<ul style="list-style-type: none"> water 		<ul style="list-style-type: none"> medium for discharging [treated municipal wastewater] into the environment 	
11.0303 Residential Property Owners	531, 532, 814	<i>While changes in property value are not a FEGS, residential property owners are affected by the environment in which their property resides.</i>	<ul style="list-style-type: none"> presence of the environment 		<ul style="list-style-type: none"> opportunity for placement of infrastructure and reduced/increased risk of flooding, erosion, and pest infestation on the property 	
11.0304 Military / Coast Guard	928	<i>The Military / Coast Guard relies on the environment for the placement of infrastructure (e.g., ports, bases, etc.) or conditions for training activities.</i>	<ul style="list-style-type: none"> presence of the environment open space 		<ul style="list-style-type: none"> opportunity for placement of infrastructure suitable conditions for training activities 	
11.04 Commercial / Military Transportation						
11.0401 Transporters of Goods	483	<i>This beneficiary uses the environment as a media to transport goods - specifically, via boats (e.g., barges), airplanes, and overland/off-road vehicles (e.g., quads).</i>	<ul style="list-style-type: none"> presence of the environment water 		<ul style="list-style-type: none"> opportunity for the transportation of goods medium for and conditions that support the transportation of goods 	
11.0402 Transporters of People	483, 487	<i>This beneficiary uses the environment as a media to transport people - specifically, via boats (e.g., cruise liners, ferries, tour boats), airplanes, and overland/off-road vehicles.</i>	<ul style="list-style-type: none"> presence of the environment water 		<ul style="list-style-type: none"> opportunity for the transportation of people medium for and conditions that support the transportation of people 	
11.05 Subsistence						

11. RIVERS AND STREAMS

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
11.0501 Water Subsisters	None	<i>Water Subsisters rely on a natural source for drinking water and may use wells or cisterns for storage (i.e., they do not receive municipal drinking water). Water purity is important, as water is not or only minimally treated.</i>	<ul style="list-style-type: none"> • water 		<ul style="list-style-type: none"> • water suitable for drinking (i.e., human consumption) 	
11.0502 Food Subsisters	None	<i>Food Subsisters use the natural abundance of [edible] flora, fungi, and fauna whether collecting, hunting, or fishing as a major supplement to their existence.</i>	<ul style="list-style-type: none"> • flora • fauna 	<ul style="list-style-type: none"> • wild rice, watercress, water pepper • fish, crawfish, clams, snails, alligator 	<ul style="list-style-type: none"> • edible organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) that are gathered for personal use (i.e., not for sale) • edible organisms (i.e., birds, mammals, reptiles, etc.) that are hunted for personal use (i.e., not for sale) 	
11.0503 Timber, Fiber, and Fur / Hide Subsisters	None	<i>This beneficiary relies on the natural abundance of timber, fiber, and [fauna for] fur / hide for survival. Timber, fiber, and fur / hide used for building material is accounted for in this category.</i>	<ul style="list-style-type: none"> • fiber • fauna 	<ul style="list-style-type: none"> • reeds, grasses • moose, beaver 	<ul style="list-style-type: none"> • fiber used for clothing/warmth, infrastructure, housing, roofing, and/or fuel for personal use (i.e., not for sale) • organisms (i.e., mammals and reptiles) that provide fur or hides used for clothing/warmth, infrastructure, housing, roofing, and/or fuel for personal use (i.e., not for sale) 	
11.06 Recreational						
11.0601 Experiencers and Viewers	None	<i>This beneficiary views and experiences the environment via an activity, such as scenery gazing, hiking, bird watching, botanizing, ice skating, rock climbing, flying kites, etc. This beneficiary does not have physical contact with water.</i>	<ul style="list-style-type: none"> • presence of the environment • viewsapes • flora • fauna • sounds and scents 		<ul style="list-style-type: none"> • opportunity to view the environment and organisms within it • landscape that provides a sensory experience • organisms (i.e., flowers, plants, etc.) that can be viewed • organisms (i.e., birds, mammals, reptiles, etc.) that can be viewed • sounds and scents that provide a sensory experience 	
11.0602 Food Pickers and Gatherers	None	<i>This beneficiary recreationally picks or gathers from the natural abundance of [edible] flora, fungi, and some fauna (as long as it is not fished or hunted). This beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • flora • fauna 	<ul style="list-style-type: none"> • crawfish, clams, snails 	<ul style="list-style-type: none"> • edible organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) that are picked and/or gathered for personal use (i.e., not for sale) • edible organisms (i.e., insects, some aquatic organisms, etc.) that are picked and/or gathered (i.e., not hunted or fished) for personal use (i.e., not for sale) 	
11.0603 Hunters	None	<i>This beneficiary is primarily interested in hunting mammals and fowl (not flora or fungi) recreationally (i.e., not for survival). In aquatic environments, this beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • fauna 	<ul style="list-style-type: none"> • moose, ducks, geese 	<ul style="list-style-type: none"> • organisms (i.e., birds, mammals, reptiles, etc.) that can be hunted 	

11. RIVERS AND STREAMS

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
11.0604 Anglers	None	<i>Anglers fish recreationally (i.e., not for survival) and include catch-and-release or catch-and-consume activities. Stocked fish are not a FEGS, as they are considered a human input. This beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • fish 		<ul style="list-style-type: none"> • fish in the water 	
11.0605 Waders, Swimmers, and Divers	None	<i>This beneficiary recreates in or under the water by either wading, swimming, or diving (i.e., snorkeling, SCUBA diving). By definition, this beneficiary has contact with water.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity and conditions for wading, swimming, and/or diving 	
11.0606 Boaters	None	<i>Boaters may use motorized (i.e., motor boats) or non-motorized boats (i.e., canoes, kayaks, rafts) to recreate. This beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • presence of the environment • water 		<ul style="list-style-type: none"> • opportunity for recreational boating • medium and conditions for recreational boating 	
11.07 Inspirational						
11.0701 Spiritual and Ceremonial Participants and Participants of Celebration	813	<i>This beneficiary uses the environment for spiritual, ceremonial, or celebratory purposes, such as harvest festivals, seafood festivals, Native American observances, religious rites (i.e., baptisms, weddings), personal growth, etc.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity and conditions for spiritual and ceremonial practices and celebrations 	
11.0702 Artists	339, 423, 424, 512, 711	<i>Artists, amateur and professional, utilize the environment or their experience in the environment to produce art. This category may include writers, cinematographers, and recording artist among others.</i>	<ul style="list-style-type: none"> • presence of the environment • viewscapes • sounds and scents • natural materials 	<ul style="list-style-type: none"> • birds singing, rapids • shells, dried flowers 	<ul style="list-style-type: none"> • opportunity for a sensory experience [which may lead to the benefit of inspiration for art] • landscape that provides a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., films, soundtracks, etc.) • sounds and scents that provide a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., films, soundtracks, etc.) • natural materials that provide a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., sculpture, mixed media paintings, etc.) 	
11.08 Learning						
11.0801 Educators and Students	611	<i>This beneficiary includes both formal and self-taught educators and students. All parts of the environment are of interest.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunities to understand, communicate, and educate 	
11.0802 Researchers	541, 611	<i>Researchers are interested in the environment for academic and applied purposes and as a group do not discriminate over which parts of the environment are of interest.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • research opportunities 	
11.09 Non-Use						

11. RIVERS AND STREAMS

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
11.0901 People Who Care (Existence)	813, 924	<i>This non-use beneficiary believes it is important to preserve the environment because of a moral/ethical connection or for fear of unintended consequences.</i>	• presence of the environment		• knowing that the environment exists	
11.0902 People Who Care (Option / Bequest)	813, 924	<i>Option/Bequest non-use beneficiaries consider that they or future generations may visit or rely on the environment. This includes beneficiaries that value the traditional aspects or features of an activity or FEGS.</i>	• presence of the environment		• knowing that the environment exists	

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Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
12.01 Agricultural						
12.0101 Irrigators	111	<i>Irrigators interact with aquatic environments, as they consume water from aquatic environments for maintaining crops, often moving water through ditches and canals. Note that Farmers and Irrigators are different beneficiaries.</i>	<ul style="list-style-type: none"> • water 		<ul style="list-style-type: none"> • water for growing and maintaining crops 	
12.0103 Livestock Grazers	112	<i>This beneficiary uses the environment to graze livestock. Cultivated vegetation is NOT considered a FEGS. For agroecosystems, "planted" pastures only provide space and opportunity to grow feed (not the vegetation itself).</i>	<ul style="list-style-type: none"> • water • flora • open space 	<ul style="list-style-type: none"> • salt hay, grasses 	<ul style="list-style-type: none"> • water suitable for livestock consumption • non-cultivated vegetation for livestock consumption • suitable conditions (i.e., land) to graze livestock 	
12.0105 Aquaculturists	112	<i>Aquaculturists farm aquatic fauna, such as fish, shrimp, oysters, etc. Those who cultivate aquatic flora are accounted for under the Farmer Beneficiary Sub-Category.</i>	<ul style="list-style-type: none"> • presence of the environment • water 		<ul style="list-style-type: none"> • opportunity provided by the environment for cultivating aquatic organisms • medium and conditions (i.e., water quality) provided by the environment for cultivating aquatic organisms 	
12.0106 Farmers	111, 113	<i>Farmers may plant annual crops (e.g., corn, soybeans, rice) or introduce cultivars that produce perennial, long-term crops (e.g., hay, grapes, cranberries, watercress, Christmas trees). Note that Farmers and Irrigators are different beneficiaries.</i>	<ul style="list-style-type: none"> • soil • open space • pollinators • depredators and (pest) predators 		<ul style="list-style-type: none"> • suitable soil in which annual or perennial crops (NOT crops themselves) can be grown • suitable conditions (i.e., land) in which to grow annual or perennial crops (NOT crops themselves) • wild pollinators that provide opportunity to grow annual or perennial crops • wild depredators and (pest) predators that provide opportunity to grow crops 	
12.02 Commercial / Industrial						
12.0201 Food Extractors	114, 311, 312, 454	<i>Food extractors utilize the natural abundance of edible organisms (i.e., non-cultivated or bred) for commercial use or sale. Includes commercial and native hunters (if legal). In aquatic environments, this beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • flora • fauna 	<ul style="list-style-type: none"> • wild rice, lotus root • fish, crawfish, duck 	<ul style="list-style-type: none"> • edible organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) for commercial use or sale • edible organisms (i.e., birds, mammals, reptiles, etc.) for commercial use or sale 	
12.0202 Timber, Fiber, and Ornamental Extractors	339, 424, 453, 454	<i>Timber, fiber, and ornamental extractors rely on the environment for products used or sold commercially. Only non-cultivated, renewable material (i.e., NOT oil, ore, gems, etc.) are considered FEGS.</i>	<ul style="list-style-type: none"> • timber • fiber • natural materials 	<ul style="list-style-type: none"> • cypress • sphagnum, cattails, grasses • shells, dried flowers 	<ul style="list-style-type: none"> • non-cultivated timber (i.e., trees) for commercial use or sale • non-cultivated fiber for commercial use or sale • non-cultivated ornamental products or by-products (from cultivation) used ornamentally for commercial use or sale 	
12.0204 Industrial Dischargers	211, 212, 221, 311-339	<i>Industrial dischargers use the environment [only] for discharging water, material (i.e., sand and gravel, garbage), and emissions. Hydraulic fracking practices involve industrial discharge to groundwater.</i>	<ul style="list-style-type: none"> • presence of the environment • water 		<ul style="list-style-type: none"> • opportunity to discharge into the environment • medium for receiving industrial discharge 	

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Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
12.0206 Resource-Dependent Businesses	487, 712, 713, 721, 722	<i>Without the environment, this beneficiary would not have the opportunity for businesses, including marinas, stables, and ecotourism (e.g., rafting companies, hot air balloon companies, beach resorts, hot springs, ice hotels) - but not farm or forest land.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity for placement of infrastructure and reduced/increased risk of flooding, erosion, and pest infestation on the property 	
12.0207 Pharmaceutical and Food Supplement Suppliers	325, 339, 424	<i>This beneficiary collects organisms from the wild that are used as or for the basis of pharmaceuticals or food supplements for commercial sale. This beneficiary relies on the natural abundance of target organisms.</i>	<ul style="list-style-type: none"> • flora • fauna 	<ul style="list-style-type: none"> • salix alba (salicylic acid), sweet flag 	<ul style="list-style-type: none"> • organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) used in medicines or sold for medicinal purposes • organisms (i.e., birds, mammals, reptiles, etc.) or products associated with organisms (i.e., oils, fats, keratin, etc.) used in medicines or sold for medicinal purposes 	
12.0208 Fur / Hide Trappers and Hunters	114	<i>This beneficiary takes advantage of the natural abundance of fauna (i.e., not farm-raised or domesticated animals) for fur or hides for commercial use or sale.</i>	<ul style="list-style-type: none"> • fauna 	<ul style="list-style-type: none"> • beaver, alligator, snake 	<ul style="list-style-type: none"> • organisms (i.e., mammals and reptiles) that provide fur or hides for commercial use or sale 	
12.03 Government, Municipal, and Residential						
12.0302 Waste Water Treatment Plant Operators	221	<i>This beneficiary uses the environment [only] for discharging treated water.</i>	<ul style="list-style-type: none"> • water 		<ul style="list-style-type: none"> • medium for discharging [treated municipal wastewater] into the environment 	
12.0303 Residential Property Owners	531, 532, 814	<i>While changes in property value are not a FEGS, residential property owners are affected by the environment in which their property resides.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity for placement of infrastructure and reduced/increased risk of flooding, erosion, and pest infestation on the property 	
12.0304 Military / Coast Guard	928	<i>The Military / Coast Guard relies on the environment for the placement of infrastructure (e.g., ports, bases, etc.) or conditions for training activities.</i>	<ul style="list-style-type: none"> • presence of the environment • open space 		<ul style="list-style-type: none"> • opportunity for placement of infrastructure • suitable conditions for training activities 	
12.05 Subsistence						
12.0502 Food Subsisters	None	<i>Food Subsisters use the natural abundance of [edible] flora, fungi, and fauna whether collecting, hunting, or fishing as a major supplement to their existence.</i>	<ul style="list-style-type: none"> • flora • fauna 	<ul style="list-style-type: none"> • fish, crawfish, ducks, nutria 	<ul style="list-style-type: none"> • edible organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) that are gathered for personal use (i.e., not for sale) • edible organisms (i.e., birds, mammals, reptiles, etc.) that are hunted for personal use (i.e., not for sale) 	

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Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
12.0503 Timber, Fiber, and Fur / Hide Subsisters	None	<i>This beneficiary relies on the natural abundance of timber, fiber, and [fauna for] fur / hide for survival. Timber, fiber, and fur / hide used for building material is accounted for in this category.</i>	<ul style="list-style-type: none"> • timber • fiber • fauna 	<ul style="list-style-type: none"> • cypress • reeds, grasses, palm leaves • moose, beaver, alligator 	<ul style="list-style-type: none"> • timber (i.e., trees) used for clothing/warmth, infrastructure, housing, roofing, and/or fuel for personal use (i.e., not for sale) • fiber used for clothing/warmth, infrastructure, housing, roofing, and/or fuel for personal use (i.e., not for sale) • organisms (i.e., mammals and reptiles) that provide fur or hides used for clothing/warmth, infrastructure, housing, roofing, and/or fuel for personal use (i.e., not for sale) 	
12.06 Recreational						
12.0601 Experiencers and Viewers	None	<i>This beneficiary views and experiences the environment via an activity, such as scenery gazing, hiking, bird watching, botanizing, ice skating, rock climbing, flying kites, etc. This beneficiary does not have physical contact with water.</i>	<ul style="list-style-type: none"> • presence of the environment • viewscapes • flora • fauna • sounds and scents 		<ul style="list-style-type: none"> • opportunity to view the environment and organisms within it • landscape that provides a sensory experience • organisms (i.e., flowers, plants, etc.) that can be viewed • organisms (i.e., birds, mammals, reptiles, etc.) that can be viewed • sounds and scents that provide a sensory experience 	
12.0602 Food Pickers and Gatherers	None	<i>This beneficiary recreationally picks or gathers from the natural abundance of [edible] flora, fungi, and some fauna (as long as it is not fished or hunted). This beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • flora • fauna 	<ul style="list-style-type: none"> • crawfish, mussels 	<ul style="list-style-type: none"> • edible organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) that are picked and/or gathered for personal use (i.e., not for sale) • edible organisms (i.e., insects, some aquatic organisms, etc.) that are picked and/or gathered (i.e., not hunted or fished) for personal use (i.e., not for sale) 	
12.0603 Hunters	None	<i>This beneficiary is primarily interested in hunting mammals and fowl (not flora or fungi) recreationally (i.e., not for survival). In aquatic environments, this beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • fauna 	<ul style="list-style-type: none"> • beaver, ducks, geese, alligator 	<ul style="list-style-type: none"> • organisms (i.e., birds, mammals, reptiles, etc.) that can be hunted 	
12.0604 Anglers	None	<i>Anglers fish recreationally (i.e., not for survival) and include catch-and-release or catch-and-consume activities. Stocked fish are not a FEGS, as they are considered a human input. This beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • fish 		<ul style="list-style-type: none"> • fish in the water 	
12.0605 Waders, Swimmers, and Divers	None	<i>This beneficiary recreates in or under the water by either wading, swimming, or diving (i.e., snorkeling, SCUBA diving). By definition, this beneficiary has contact with water.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity and conditions for wading, swimming, and/or diving 	

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Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
12.0606 Boaters	None	<i>Boaters may use motorized (i.e., motor boats) or non-motorized boats (i.e., canoes, kayaks, rafts) to recreate. This beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • presence of the environment • water 		<ul style="list-style-type: none"> • opportunity for recreational boating • medium and conditions for recreational boating 	
12.07 Inspirational						
12.0701 Spiritual and Ceremonial Participants and Participants of Celebration	813	<i>This beneficiary uses the environment for spiritual, ceremonial, or celebratory purposes, such as harvest festivals, seafood festivals, Native American observances, religious rites (i.e., baptisms, weddings), personal growth, etc.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity and conditions for spiritual and ceremonial practices and celebrations 	
12.0702 Artists	339, 423, 424, 512, 711	<i>Artists, amateur and professional, utilize the environment or their experience in the environment to produce art. This category may include writers, cinematographers, and recording artist among others.</i>	<ul style="list-style-type: none"> • presence of the environment • viewsapes • sounds and scents • natural materials 	<ul style="list-style-type: none"> • birds singing, frogs croaking • shells, dried flowers 	<ul style="list-style-type: none"> • opportunity for a sensory experience [which may lead to the benefit of inspiration for art] • landscape that provides a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., films, soundtracks, etc.) • sounds and scents that provide a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., films, soundtracks, etc.) • natural materials that provide a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., sculpture, mixed media paintings, etc.) 	
12.08 Learning						
12.0801 Educators and Students	611	<i>This beneficiary includes both formal and self-taught educators and students. All parts of the environment are of interest.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunities to understand, communicate, and educate 	
12.0802 Researchers	541, 611	<i>Researchers are interested in the environment for academic and applied purposes and as a group do not discriminate over which parts of the environment are of interest.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • research opportunities 	
12.09 Non-Use						
12.0901 People Who Care (Existence)	813, 924	<i>This non-use beneficiary believes it is important to preserve the environment because of a moral/ethical connection or for fear of unintended consequences.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • knowing that the environment exists 	
12.0902 People Who Care (Option / Bequest)	813, 924	<i>Option/Bequest non-use beneficiaries consider that they or future generations may visit or rely on the environment. This includes beneficiaries that value the traditional aspects or features of an activity or FEGS.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • knowing that the environment exists 	

13. LAKES AND PONDS

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
13.01 Agricultural						
13.0101 Irrigators	111	<i>Irrigators interact with aquatic environments, as they consume water from aquatic environments for maintaining crops, often moving water through ditches and canals. Note that Farmers and Irrigators are different beneficiaries.</i>	<ul style="list-style-type: none"> • water 		<ul style="list-style-type: none"> • water for growing and maintaining crops 	
13.0102 CAFO Operators	112	<i>This beneficiary raises large, dense populations of livestock in a confined area (whether indoors or outdoors).</i>	<ul style="list-style-type: none"> • water 		<ul style="list-style-type: none"> • water for livestock consumption 	
13.0103 Livestock Grazers	112	<i>This beneficiary uses the environment to graze livestock. Cultivated vegetation is NOT considered a FEGS. For agroecosystems, "planted" pastures only provide space and opportunity to grow feed (not the vegetation itself).</i>	<ul style="list-style-type: none"> • water 		<ul style="list-style-type: none"> • water suitable for livestock consumption 	
13.0104 Agricultural Processors	115, 311	<i>This beneficiary primarily consumes water for washing edible products.</i>	<ul style="list-style-type: none"> • water 		<ul style="list-style-type: none"> • water for processing edible products 	
13.0105 Aquaculturists	112	<i>Aquaculturists farm aquatic fauna, such as fish, shrimp, oysters, etc. Those who cultivate aquatic flora are accounted for under the Farmer Beneficiary Sub-Category.</i>	<ul style="list-style-type: none"> • presence of the environment • water 		<ul style="list-style-type: none"> • opportunity provided by the environment for cultivating aquatic organisms • medium and conditions (i.e., water quality) provided by the environment for cultivating aquatic organisms 	
13.02 Commercial / Industrial						
13.0201 Food Extractors	114, 311, 312, 454	<i>Food extractors utilize the natural abundance of edible organisms (i.e., non-cultivated or bred) for commercial use or sale. Includes commercial and native hunters (if legal). In aquatic environments, this beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • flora • fauna 	<ul style="list-style-type: none"> • fish, brine shrimp (from saline lakes) 	<ul style="list-style-type: none"> • edible organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) for commercial use or sale • edible organisms (i.e., birds, mammals, reptiles, etc.) for commercial use or sale 	
13.0202 Timber, Fiber, and Ornamental Extractors	339, 424, 453, 454	<i>Timber, fiber, and ornamental extractors rely on the environment for products used or sold commercially. Only non-cultivated, renewable material (i.e., NOT oil, ore, gems, etc.) are considered FEGS.</i>	<ul style="list-style-type: none"> • natural materials 	<ul style="list-style-type: none"> • shells, driftwood 	<ul style="list-style-type: none"> • non-cultivated ornamental products or by-products (from cultivation) used ornamentally for commercial use or sale 	
13.0203 Industrial Processors	313-339	<i>This beneficiary primarily consumes water for cooling, producing pulp, etc. The water has no contact with edibles.</i>	<ul style="list-style-type: none"> • water 		<ul style="list-style-type: none"> • water suitable for cooling or processing industrial products 	
13.0204 Industrial Dischargers	211, 212, 221, 311-339	<i>Industrial dischargers use the environment [only] for discharging water, material (i.e., sand and gravel, garbage), and emissions. Hydraulic fracking practices involve industrial discharge to groundwater.</i>	<ul style="list-style-type: none"> • presence of the environment • water 		<ul style="list-style-type: none"> • opportunity to discharge into the environment • medium for receiving industrial discharge 	
13.0205 Electric and other Energy Generators	221	<i>This beneficiary relies on the environment for energy or placement of power generation structures, including dams, wind, water, or wave turbines, solar panels, geothermal systems, etc.</i>	<ul style="list-style-type: none"> • presence of the environment • water 		<ul style="list-style-type: none"> • opportunity to install power generation structures, such as dams and water turbines • flowing water that can be used for energy generation 	

13. LAKES AND PONDS

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
13.0206 Resource-Dependent Businesses	487, 712, 713, 721, 722	<i>Without the environment, this beneficiary would not have the opportunity for businesses, including marinas, stables, and ecotourism (e.g., rafting companies, hot air balloon companies, beach resorts, hot springs, ice hotels) - but not farm or forest land.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity for placement of infrastructure and reduced/increased risk of flooding, erosion, and pest infestation on the property 	
13.0207 Pharmaceutical and Food Supplement Suppliers	325, 339, 424	<i>This beneficiary collects organisms from the wild that are used as or for the basis of pharmaceuticals or food supplements for commercial sale. This beneficiary relies on the natural abundance of target organisms.</i>	<ul style="list-style-type: none"> • flora • fauna 	<ul style="list-style-type: none"> • fish for fish oil 	<ul style="list-style-type: none"> • organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) used in medicines or sold for medicinal purposes • organisms (i.e., birds, mammals, reptiles, etc.) or products associated with organisms (i.e., oils, fats, keratin, etc.) used in medicines or sold for medicinal purposes 	
13.0208 Fur / Hide Trappers and Hunters	114	<i>This beneficiary takes advantage of the natural abundance of fauna (i.e., not farm-raised or domesticated animals) for fur or hides for commercial use or sale.</i>	<ul style="list-style-type: none"> • fauna 	<ul style="list-style-type: none"> • beaver 	<ul style="list-style-type: none"> • organisms (i.e., mammals and reptiles) that provide fur or hides for commercial use or sale 	
13.03 Government, Municipal, and Residential						
13.0301 Municipal Drinking Water Plant Operators	221	<i>This beneficiary is responsible for providing water to a community and may do so by collecting water from rivers, reservoirs, lakes, wells, bays, or estuaries. Water is treated and distributed. Direct precip is not generally used as a water source.</i>	<ul style="list-style-type: none"> • water 		<ul style="list-style-type: none"> • water suitable for processing by a municipal drinking water plant 	
13.0302 Waste Water Treatment Plant Operators	221	<i>This beneficiary uses the environment [only] for discharging treated water.</i>	<ul style="list-style-type: none"> • water 		<ul style="list-style-type: none"> • medium for discharging [treated municipal wastewater] into the environment 	
13.0303 Residential Property Owners	531, 532, 814	<i>While changes in property value are not a FEGS, residential property owners are affected by the environment in which their property resides.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity for placement of infrastructure and reduced/increased risk of flooding, erosion, and pest infestation on the property 	
13.0304 Military / Coast Guard	928	<i>The Military / Coast Guard relies on the environment for the placement of infrastructure (e.g., ports, bases, etc.) or conditions for training activities.</i>	<ul style="list-style-type: none"> • presence of the environment • open space 		<ul style="list-style-type: none"> • opportunity for placement of infrastructure • suitable conditions for training activities 	
13.04 Commercial / Military Transportation						
13.0401 Transporters of Goods	483	<i>This beneficiary uses the environment as a media to transport goods - specifically, via boats (e.g., barges), airplanes, and overland/off-road vehicles (e.g., quads).</i>	<ul style="list-style-type: none"> • presence of the environment • water 		<ul style="list-style-type: none"> • opportunity for the transportation of goods • medium for and conditions that support the transportation of goods 	
13.0402 Transporters of People	483, 487	<i>This beneficiary uses the environment as a media to transport people - specifically, via boats (e.g., cruise liners, ferries, tour boats), airplanes, and overland/off-road vehicles.</i>	<ul style="list-style-type: none"> • presence of the environment • water 		<ul style="list-style-type: none"> • opportunity for the transportation of people • medium for and conditions that support the transportation of people 	
13.05 Subsistence						

13. LAKES AND PONDS

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
13.0501 Water Subsisters	None	<i>Water Subsisters rely on a natural source for drinking water and may use wells or cisterns for storage (i.e., they do not receive municipal drinking water). Water purity is important, as water is not or only minimally treated.</i>	<ul style="list-style-type: none"> • water 		<ul style="list-style-type: none"> • water suitable for drinking (i.e., human consumption) 	
13.0502 Food Subsisters	None	<i>Food Subsisters use the natural abundance of [edible] flora, fungi, and fauna whether collecting, hunting, or fishing as a major supplement to their existence.</i>	<ul style="list-style-type: none"> • flora • fauna 	<ul style="list-style-type: none"> • fish, brine shrimp (from saline lakes) 	<ul style="list-style-type: none"> • edible organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) that are gathered for personal use (i.e., not for sale) • edible organisms (i.e., birds, mammals, reptiles, etc.) that are hunted for personal use (i.e., not for sale) 	
13.0503 Timber, Fiber, and Fur / Hide Subsisters	None	<i>This beneficiary relies on the natural abundance of timber, fiber, and [fauna for] fur / hide for survival. Timber, fiber, and fur / hide used for building material is accounted for in this category.</i>	<ul style="list-style-type: none"> • fiber • fauna 	<ul style="list-style-type: none"> • reeds • beaver 	<ul style="list-style-type: none"> • fiber used for clothing/warmth, infrastructure, housing, roofing, and/or fuel for personal use (i.e., not for sale) • organisms (i.e., mammals and reptiles) that provide fur or hides used for clothing/warmth, infrastructure, housing, roofing, and/or fuel for personal use (i.e., not for sale) 	
13.06 Recreational						
13.0601 Experiencers and Viewers	None	<i>This beneficiary views and experiences the environment via an activity, such as scenery gazing, hiking, bird watching, botanizing, ice skating, rock climbing, flying kites, etc. This beneficiary does not have physical contact with water.</i>	<ul style="list-style-type: none"> • presence of the environment • viewscapes • flora • fauna • sounds and scents 		<ul style="list-style-type: none"> • opportunity to view the environment and organisms within it • landscape that provides a sensory experience • organisms (i.e., flowers, plants, etc.) that can be viewed • organisms (i.e., birds, mammals, reptiles, etc.) that can be viewed • sounds and scents that provide a sensory experience 	
13.0602 Food Pickers and Gatherers	None	<i>This beneficiary recreationally picks or gathers from the natural abundance of [edible] flora, fungi, and some fauna (as long as it is not fished or hunted). This beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • flora • fauna 	<ul style="list-style-type: none"> • mussels, clams 	<ul style="list-style-type: none"> • edible organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) that are picked and/or gathered for personal use (i.e., not for sale) • edible organisms (i.e., insects, some aquatic organisms, etc.) that are picked and/or gathered (i.e., not hunted or fished) for personal use (i.e., not for sale) 	
13.0603 Hunters	None	<i>This beneficiary is primarily interested in hunting mammals and fowl (not flora or fungi) recreationally (i.e., not for survival). In aquatic environments, this beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • fauna 	<ul style="list-style-type: none"> • beaver, ducks, geese 	<ul style="list-style-type: none"> • organisms (i.e., birds, mammals, reptiles, etc.) that can be hunted 	

13. LAKES AND PONDS

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
13.0604 Anglers	None	<i>Anglers fish recreationally (i.e., not for survival) and include catch-and-release or catch-and-consume activities. Stocked fish are not a FEGS, as they are considered a human input. This beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • fish 		<ul style="list-style-type: none"> • fish in the water 	
13.0605 Waders, Swimmers, and Divers	None	<i>This beneficiary recreates in or under the water by either wading, swimming, or diving (i.e., snorkeling, SCUBA diving). By definition, this beneficiary has contact with water.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity and conditions for wading, swimming, and/or diving 	
13.0606 Boaters	None	<i>Boaters may use motorized (i.e., motor boats) or non-motorized boats (i.e., canoes, kayaks, rafts) to recreate. This beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • presence of the environment • water 		<ul style="list-style-type: none"> • opportunity for recreational boating • medium and conditions for recreational boating 	
13.07 Inspirational						
13.0701 Spiritual and Ceremonial Participants and Participants of Celebration	813	<i>This beneficiary uses the environment for spiritual, ceremonial, or celebratory purposes, such as harvest festivals, seafood festivals, Native American observances, religious rites (i.e., baptisms, weddings), personal growth, etc.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity and conditions for spiritual and ceremonial practices and celebrations 	
13.0702 Artists	339, 423, 424, 512, 711	<i>Artists, amateur and professional, utilize the environment or their experience in the environment to produce art. This category may include writers, cinematographers, and recording artist among others.</i>	<ul style="list-style-type: none"> • presence of the environment • viewscapes • sounds and scents • natural materials 	<ul style="list-style-type: none"> • waves lapping, fish splashing • shells, driftwood 	<ul style="list-style-type: none"> • opportunity for a sensory experience [which may lead to the benefit of inspiration for art] • landscape that provides a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., films, soundtracks, etc.) • sounds and scents that provide a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., films, soundtracks, etc.) • natural materials that provide a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., sculpture, mixed media paintings, etc.) 	
13.08 Learning						
13.0801 Educators and Students	611	<i>This beneficiary includes both formal and self-taught educators and students. All parts of the environment are of interest.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunities to understand, communicate, and educate 	
13.0802 Researchers	541, 611	<i>Researchers are interested in the environment for academic and applied purposes and as a group do not discriminate over which parts of the environment are of interest.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • research opportunities 	
13.09 Non-Use						

13. LAKES AND PONDS

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
13.0901 People Who Care (Existence)	813, 924	<i>This non-use beneficiary believes it is important to preserve the environment because of a moral/ethical connection or for fear of unintended consequences.</i>	• presence of the environment		• knowing that the environment exists	
13.0902 People Who Care (Option / Bequest)	813, 924	<i>Option/Bequest non-use beneficiaries consider that they or future generations may visit or rely on the environment. This includes beneficiaries that value the traditional aspects or features of an activity or FEGS.</i>	• presence of the environment		• knowing that the environment exists	

14. ESTUARIES AND NEAR SHORE MARINE

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
14.01 Agricultural						
14.0103 Livestock Grazers	112	<i>This beneficiary uses the environment to graze livestock. Cultivated vegetation is NOT considered a FEGS. For agroecosystems, "planted" pastures only provide space and opportunity to grow feed (not the vegetation itself).</i>	<ul style="list-style-type: none"> • water • flora • open space 		<ul style="list-style-type: none"> • water suitable for livestock consumption • non-cultivated vegetation for livestock consumption • suitable conditions (i.e., land) to graze livestock 	
14.0104 Agricultural Processors	115, 311	<i>This beneficiary primarily consumes water for washing edible products.</i>	<ul style="list-style-type: none"> • water 		<ul style="list-style-type: none"> • water for processing edible products 	
14.0105 Aquaculturists	112	<i>Aquaculturists farm aquatic fauna, such as fish, shrimp, oysters, etc. Those who cultivate aquatic flora are accounted for under the Farmer Beneficiary Sub-Category.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity provided by the environment for cultivating aquatic organisms 	
14.02 Commercial / Industrial						
14.0201 Food Extractors	114, 311, 312, 454	<i>Food extractors utilize the natural abundance of edible organisms (i.e., non-cultivated or bred) for commercial use or sale. Includes commercial and native hunters (if legal). In aquatic environments, this beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • flora • fauna 	<ul style="list-style-type: none"> • kelp, seaweed, pickleweed • fish, oysters, clams, mussels, crabs 	<ul style="list-style-type: none"> • edible organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) for commercial use or sale • edible organisms (i.e., birds, mammals, reptiles, etc.) for commercial use or sale 	
14.0202 Timber, Fiber, and Ornamental Extractors	339, 424, 453, 454	<i>Timber, fiber, and ornamental extractors rely on the environment for products used or sold commercially. Only non-cultivated, renewable material (i.e., NOT oil, ore, gems, etc.) are considered FEGS.</i>	<ul style="list-style-type: none"> • fiber • natural materials 	<ul style="list-style-type: none"> • grasses • shells, driftwood 	<ul style="list-style-type: none"> • non-cultivated fiber for commercial use or sale • non-cultivated ornamental products or by-products (from cultivation) used ornamentally for commercial use or sale 	
14.0203 Industrial Processors	313-339	<i>This beneficiary primarily consumes water for cooling, producing pulp, etc. The water has no contact with edibles.</i>	<ul style="list-style-type: none"> • water 		<ul style="list-style-type: none"> • water suitable for cooling or processing industrial products 	
14.0204 Industrial Dischargers	211, 212, 221, 311-339	<i>Industrial dischargers use the environment [only] for discharging water, material (i.e., sand and gravel, garbage), and emissions. Hydraulic fracking practices involve industrial discharge to groundwater.</i>	<ul style="list-style-type: none"> • presence of the environment • water 		<ul style="list-style-type: none"> • opportunity to discharge into the environment • medium for receiving industrial discharge 	
14.0205 Electric and other Energy Generators	221	<i>This beneficiary relies on the environment for energy or placement of power generation structures, including dams, wind, water, or wave turbines, solar panels, geothermal systems, etc.</i>	<ul style="list-style-type: none"> • presence of the environment • water 		<ul style="list-style-type: none"> • opportunity to install power generation structures, such as dams and water turbines • flowing water that can be used for energy generation 	
14.0206 Resource-Dependent Businesses	487, 712, 713, 721, 722	<i>Without the environment, this beneficiary would not have the opportunity for businesses, including marinas, stables, and ecotourism (e.g., rafting companies, hot air balloon companies, beach resorts, hot springs, ice hotels) - but not farm or forest land.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity for placement of infrastructure and reduced/increased risk of flooding, erosion, and pest infestation on the property 	

14. ESTUARIES AND NEAR SHORE MARINE

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
14.0207 Pharmaceutical and Food Supplement Suppliers	325, 339, 424	<i>This beneficiary collects organisms from the wild that are used as or for the basis of pharmaceuticals or food supplements for commercial sale. This beneficiary relies on the natural abundance of target organisms.</i>	<ul style="list-style-type: none"> • flora • fauna 	<ul style="list-style-type: none"> • algae, kelp • fish for fish oil 	<ul style="list-style-type: none"> • organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) used in medicines or sold for medicinal purposes • organisms (i.e., birds, mammals, reptiles, etc.) or products associated with organisms (i.e., oils, fats, keratin, etc.) used in medicines or sold for medicinal purposes 	
14.0208 Fur / Hide Trappers and Hunters	114	<i>This beneficiary takes advantage of the natural abundance of fauna (i.e., not farm-raised or domesticated animals) for fur or hides for commercial use or sale.</i>	<ul style="list-style-type: none"> • fauna 	<ul style="list-style-type: none"> • alligators, crocodiles, seals 	<ul style="list-style-type: none"> • organisms (i.e., mammals and reptiles) that provide fur or hides for commercial use or sale 	
14.03 Government, Municipal, and Residential						
14.0301 Municipal Drinking Water Plant Operators	221	<i>This beneficiary is responsible for providing water to a community and may do so by collecting water from rivers, reservoirs, lakes, wells, bays, or estuaries. Water is treated and distributed. Direct precip is not generally used as a water source.</i>	<ul style="list-style-type: none"> • water 		<ul style="list-style-type: none"> • water suitable for processing (via desalination) by a municipal drinking water plant 	
14.0302 Waste Water Treatment Plant Operators	221	<i>This beneficiary uses the environment [only] for discharging treated water.</i>	<ul style="list-style-type: none"> • water 		<ul style="list-style-type: none"> • medium for discharging [treated municipal wastewater] into the environment 	
14.0303 Residential Property Owners	531, 532, 814	<i>While changes in property value are not a FEGS, residential property owners are affected by the environment in which their property resides.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity for placement of infrastructure and reduced/increased risk of flooding, erosion, and pest infestation on the property 	
14.0304 Military / Coast Guard	928	<i>The Military / Coast Guard relies on the environment for the placement of infrastructure (e.g., ports, bases, etc.) or conditions for training activities.</i>	<ul style="list-style-type: none"> • presence of the environment • open space 		<ul style="list-style-type: none"> • opportunity for placement of infrastructure • suitable conditions for training activities 	
14.04 Commercial / Military Transportation						
14.0401 Transporters of Goods	483	<i>This beneficiary uses the environment as a media to transport goods - specifically, via boats (e.g., barges), airplanes, and overland/off-road vehicles (e.g., quads).</i>	<ul style="list-style-type: none"> • presence of the environment • water 		<ul style="list-style-type: none"> • opportunity for the transportation of goods • medium for and conditions that support the transportation of goods 	
14.0402 Transporters of People	483, 487	<i>This beneficiary uses the environment as a media to transport people - specifically, via boats (e.g., cruise liners, ferries, tour boats), airplanes, and overland/off-road vehicles.</i>	<ul style="list-style-type: none"> • presence of the environment • water 		<ul style="list-style-type: none"> • opportunity for the transportation of people • medium for and conditions that support the transportation of people 	
14.05 Subsistence						

14. ESTUARIES AND NEAR SHORE MARINE

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
14.0502 Food Subsisters	None	<i>Food Subsisters use the natural abundance of [edible] flora, fungi, and fauna whether collecting, hunting, or fishing as a major supplement to their existence.</i>	<ul style="list-style-type: none"> • flora • fauna 	<ul style="list-style-type: none"> • kelp, seaweed, pickleweed • fish, oysters, clams, mussels, crabs 	<ul style="list-style-type: none"> • edible organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) that are gathered for personal use (i.e., not for sale) • edible organisms (i.e., birds, mammals, reptiles, etc.) that are hunted for personal use (i.e., not for sale) 	
14.0503 Timber, Fiber, and Fur / Hide Subsisters	None	<i>This beneficiary relies on the natural abundance of timber, fiber, and [fauna for] fur / hide for survival. Timber, fiber, and fur / hide used for building material is accounted for in this category.</i>	<ul style="list-style-type: none"> • timber • fiber • fauna 	<ul style="list-style-type: none"> • driftwood • reeds, grasses, palm leaves • alligators, crocodiles, seals 	<ul style="list-style-type: none"> • timber (i.e., trees) used for clothing/warmth, infrastructure, housing, roofing, and/or fuel for personal use (i.e., not for sale) • fiber used for clothing/warmth, infrastructure, housing, roofing, and/or fuel for personal use (i.e., not for sale) • organisms (i.e., mammals and reptiles) that provide fur or hides used for clothing/warmth, infrastructure, housing, roofing, and/or fuel for personal use (i.e., not for sale) 	
14.06 Recreational						
14.0601 Experiencers and Viewers	None	<i>This beneficiary views and experiences the environment via an activity, such as scenery gazing, hiking, bird watching, botanizing, ice skating, rock climbing, flying kites, etc. This beneficiary does not have physical contact with water.</i>	<ul style="list-style-type: none"> • presence of the environment • viewsapes • flora • fauna • sounds and scents 	<ul style="list-style-type: none"> • waves crashing, seagulls 	<ul style="list-style-type: none"> • opportunity to view the environment and organisms within it • landscape that provides a sensory experience • organisms (i.e., flowers, plants, etc.) that can be viewed • organisms (i.e., birds, mammals, reptiles, etc.) that can be viewed • sounds and scents that provide a sensory experience 	
14.0602 Food Pickers and Gatherers	None	<i>This beneficiary recreationally picks or gathers from the natural abundance of [edible] flora, fungi, and some fauna (as long as it is not fished or hunted). This beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • flora • fauna 	<ul style="list-style-type: none"> • kelp, seaweed, pickleweed • oysters, clams, mussels, crabs 	<ul style="list-style-type: none"> • edible organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) that are picked and/or gathered for personal use (i.e., not for sale) • edible organisms (i.e., insects, some aquatic organisms, etc.) that are picked and/or gathered (i.e., not hunted or fished) for personal use (i.e., not for sale) 	
14.0603 Hunters	None	<i>This beneficiary is primarily interested in hunting mammals and fowl (not flora or fungi) recreationally (i.e., not for survival). In aquatic environments, this beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • fauna 	<ul style="list-style-type: none"> • duck, geese, deer, moose 	<ul style="list-style-type: none"> • organisms (i.e., birds, mammals, reptiles, etc.) that can be hunted 	

14. ESTUARIES AND NEAR SHORE MARINE

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
14.0604 Anglers	None	Anglers fish recreationally (i.e., not for survival) and include catch-and-release or catch-and-consume activities. Stocked fish are not a FEGS, as they are considered a human input. This beneficiary has potential contact with water.	• fish		• fish in the water	
14.0605 Waders, Swimmers, and Divers	None	This beneficiary recreates in or under the water by either wading, swimming, or diving (i.e., snorkeling, SCUBA diving). By definition, this beneficiary has contact with water.	• presence of the environment		• opportunity and conditions for wading, swimming, and/or diving	
14.0606 Boaters	None	Boaters may use motorized (i.e., motor boats) or non-motorized boats (i.e., canoes, kayaks, rafts) to recreate. This beneficiary has potential contact with water.	• presence of the environment • water		• opportunity for recreational boating • medium and conditions for recreational boating	
14.07 Inspirational						
14.0701 Spiritual and Ceremonial Participants and Participants of Celebration	813	This beneficiary uses the environment for spiritual, ceremonial, or celebratory purposes, such as harvest festivals, seafood festivals, Native American observances, religious rites (i.e., baptisms, weddings), personal growth, etc.	• presence of the environment		• opportunity and conditions for spiritual and ceremonial practices and celebrations	
14.0702 Artists	339, 423, 424, 512, 711	Artists, amateur and professional, utilize the environment or their experience in the environment to produce art. This category may include writers, cinematographers, and recording artist among others.	• presence of the environment • viewscapes • sounds and scents • natural materials	• waves crashing, seagulls • driftwood, shells	• opportunity for a sensory experience [which may lead to the benefit of inspiration for art] • landscape that provides a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., films, soundtracks, etc.) • sounds and scents that provide a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., films, soundtracks, etc.) • natural materials that provide a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., sculpture, mixed media paintings, etc.)	
14.08 Learning						
14.0801 Educators and Students	611	This beneficiary includes both formal and self-taught educators and students. All parts of the environment are of interest.	• presence of the environment		• opportunities to understand, communicate, and educate	
14.0802 Researchers	541, 611	Researchers are interested in the environment for academic and applied purposes and as a group do not discriminate over which parts of the environment are of interest.	• presence of the environment		• research opportunities	
14.09 Non-Use						

14. ESTUARIES AND NEAR SHORE MARINE

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
14.0901 People Who Care (Existence)	813, 924	<i>This non-use beneficiary believes it is important to preserve the environment because of a moral/ethical connection or for fear of unintended consequences.</i>	• presence of the environment		• knowing that the environment exists	
14.0902 People Who Care (Option / Bequest)	813, 924	<i>Option/Bequest non-use beneficiaries consider that they or future generations may visit or rely on the environment. This includes beneficiaries that value the traditional aspects or features of an activity or FEGS.</i>	• presence of the environment		• knowing that the environment exists	

15. OPEN OCEANS AND SEAS

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
15.01 Agricultural						
15.0105 Aquaculturists	112	<i>Aquaculturists farm aquatic fauna, such as fish, shrimp, oysters, etc. Those who cultivate aquatic flora are accounted for under the Farmer Beneficiary Sub-Category.</i>	<ul style="list-style-type: none"> • presence of the environment • water 		<ul style="list-style-type: none"> • opportunity provided by the environment for cultivating aquatic organisms • medium and conditions (i.e., water quality) provided by the environment for cultivating aquatic organisms 	
15.02 Commercial / Industrial						
15.0201 Food Extractors	114, 311, 312, 454	<i>Food extractors utilize the natural abundance of edible organisms (i.e., non-cultivated or bred) for commercial use or sale. Includes commercial and native hunters (if legal). In aquatic environments, this beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • flora • fauna 	<ul style="list-style-type: none"> • kelp • fish, whales, shark 	<ul style="list-style-type: none"> • edible organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) for commercial use or sale • edible organisms (i.e., birds, mammals, reptiles, etc.) for commercial use or sale 	
15.0203 Industrial Processors	211, 212	<i>This beneficiary primarily consumes water for cooling, producing pulp, etc. The water has no contact with edibles.</i>	<ul style="list-style-type: none"> • water 		<ul style="list-style-type: none"> • water suitable for cooling or processing industrial products (specifically oil rigs, in this case) 	
15.0204 Industrial Dischargers	211, 212	<i>Industrial dischargers use the environment [only] for discharging water, material (i.e., sand and gravel, garbage), and emissions. Hydraulic fracking practices involve industrial discharge to groundwater.</i>	<ul style="list-style-type: none"> • presence of the environment • water 		<ul style="list-style-type: none"> • opportunity to discharge into the environment (by oil rigs and cruise liners, in this case) • medium for receiving industrial discharge 	
15.0205 Electric and other Energy Generators	221	<i>This beneficiary relies on the environment for energy or placement of power generation structures, including dams, wind, water, or wave turbines, solar panels, geothermal systems, etc.</i>	<ul style="list-style-type: none"> • presence of the environment • water 		<ul style="list-style-type: none"> • opportunity to install power generation structures • flowing water (i.e., waves) that can be used for energy generation 	
15.0206 Resource-Dependent Businesses	487, 712, 713, 721, 722	<i>Without the environment, this beneficiary would not have the opportunity for businesses, including marinas, stables, and ecotourism (e.g., rafting companies, hot air balloon companies, beach resorts, hot springs, ice hotels) - but not farm or forest land.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity for placement of infrastructure (specifically, cruise liners) 	
15.0207 Pharmaceutical and Food Supplement Suppliers	325, 339, 424	<i>This beneficiary collects organisms from the wild that are used as or for the basis of pharmaceuticals or food supplements for commercial sale. This beneficiary relies on the natural abundance of target organisms.</i>	<ul style="list-style-type: none"> • flora • fauna 	<ul style="list-style-type: none"> • Sargassum • fish for fish oil 	<ul style="list-style-type: none"> • organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) used in medicines or sold for medicinal purposes • organisms (i.e., birds, mammals, reptiles, etc.) or products associated with organisms (i.e., oils, fats, keratin, etc.) used in medicines or sold for medicinal purposes 	
15.03 Government, Municipal, and Residential						
15.0304 Military / Coast Guard	928	<i>The Military / Coast Guard relies on the environment for the placement of infrastructure (e.g., ports, bases, etc.) or conditions for training activities.</i>	<ul style="list-style-type: none"> • presence of the environment • open space 		<ul style="list-style-type: none"> • opportunity for placement of infrastructure • suitable conditions for training activities 	
15.04 Commercial / Military Transportation						

15. OPEN OCEANS AND SEAS

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
15.0401 Transporters of Goods	483	<i>This beneficiary uses the environment as a media to transport goods - specifically, via boats (e.g., barges), airplanes, and overland/off-road vehicles (e.g., quads).</i>	<ul style="list-style-type: none"> • presence of the environment • water 		<ul style="list-style-type: none"> • opportunity for the transportation of goods • medium for and conditions that support the transportation of goods 	
15.0402 Transporters of People	483, 487	<i>This beneficiary uses the environment as a media to transport people - specifically, via boats (e.g., cruise liners, ferries, tour boats), airplanes, and overland/off-road vehicles.</i>	<ul style="list-style-type: none"> • presence of the environment • water 		<ul style="list-style-type: none"> • opportunity for the transportation of people • medium for and conditions that support the transportation of people 	
15.06 Recreational						
15.0601 Experiencers and Viewers	None	<i>This beneficiary views and experiences the environment via an activity, such as scenery gazing, hiking, bird watching, botanizing, ice skating, rock climbing, flying kites, etc. This beneficiary does not have physical contact with water.</i>	<ul style="list-style-type: none"> • presence of the environment • viewscapes • fauna • sounds and scents 	<ul style="list-style-type: none"> • whales, sharks, dolphin 	<ul style="list-style-type: none"> • opportunity to view the environment and organisms within it • landscape that provides a sensory experience • organisms (i.e., birds, mammals, reptiles, etc.) that can be viewed • sounds and scents that provide a sensory experience 	
15.0603 Hunters	None	<i>This beneficiary is primarily interested in hunting mammals and fowl (not flora or fungi) recreationally (i.e., not for survival). In aquatic environments, this beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • fauna 	<ul style="list-style-type: none"> • whales, albatrosses 	<ul style="list-style-type: none"> • organisms (i.e., birds, mammals, reptiles, etc.) that can be hunted 	
15.0604 Anglers	None	<i>Anglers fish recreationally (i.e., not for survival) and include catch-and-release or catch-and-consume activities. Stocked fish are not a FEGS, as they are considered a human input. This beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • fish 		<ul style="list-style-type: none"> • fish in the water 	
15.0605 Waders, Swimmers, and Divers	None	<i>This beneficiary recreates in or under the water by either wading, swimming, or diving (i.e., snorkeling, SCUBA diving). By definition, this beneficiary has contact with water.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity and conditions for wading, swimming, and/or diving 	
15.0606 Boaters	None	<i>Boaters may use motorized (i.e., motor boats) or non-motorized boats (i.e., canoes, kayaks, rafts) to recreate. This beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • presence of the environment • water 		<ul style="list-style-type: none"> • opportunity for recreational boating • medium and conditions for recreational boating 	
15.07 Inspirational						
15.0701 Spiritual and Ceremonial Participants and Participants of Celebration	813	<i>This beneficiary uses the environment for spiritual, ceremonial, or celebratory purposes, such as harvest festivals, seafood festivals, Native American observances, religious rites (i.e., baptisms, weddings), personal growth, etc.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity and conditions for spiritual and ceremonial practices and celebrations 	

15. OPEN OCEANS AND SEAS

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
15.0702 Artists	339, 423, 424, 512, 711	<i>Artists, amateur and professional, utilize the environment or their experience in the environment to produce art. This category may include writers, cinematographers, and recording artist among others.</i>	<ul style="list-style-type: none"> • presence of the environment • viewscales • sounds and scents • natural materials 	<ul style="list-style-type: none"> • whale calls, waves • driftwood 	<ul style="list-style-type: none"> • opportunity for a sensory experience [which may lead to the benefit of inspiration for art] • landscape that provides a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., films, soundtracks, etc.) • sounds and scents that provide a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., films, soundtracks, etc.) • natural materials that provide a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., sculpture, mixed media paintings, etc.) 	
15.08 Learning						
15.0801 Educators and Students	611	<i>This beneficiary includes both formal and self-taught educators and students. All parts of the environment are of interest.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunities to understand, communicate, and educate 	
15.0802 Researchers	541, 611	<i>Researchers are interested in the environment for academic and applied purposes and as a group do not discriminate over which parts of the environment are of interest.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • research opportunities 	
15.09 Non-Use						
15.0901 People Who Care (Existence)	813, 924	<i>This non-use beneficiary believes it is important to preserve the environment because of a moral/ethical connection or for fear of unintended consequences.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • knowing that the environment exists 	
15.0902 People Who Care (Option / Bequest)	813, 924	<i>Option/Bequest non-use beneficiaries consider that they or future generations may visit or rely on the environment. This includes beneficiaries that value the traditional aspects or features of an activity or FEGS.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • knowing that the environment exists 	

16. GROUNDWATER

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
16.01 Agricultural						
16.0101 Irrigators	111	<i>Irrigators interact with aquatic environments, as they consume water from aquatic environments for maintaining crops, often moving water through ditches and canals. Note that Farmers and Irrigators are different beneficiaries.</i>	• water		• water for growing and maintaining crops	
16.0102 CAFO Operators	112	<i>This beneficiary raises large, dense populations of livestock in a confined area (whether indoors or outdoors).</i>	• water		• water for livestock consumption	
16.0103 Livestock Grazers	112	<i>This beneficiary uses the environment to graze livestock. Cultivated vegetation is NOT considered a FEGS. For agroecosystems, "planted" pastures only provide space and opportunity to grow feed (not the vegetation itself).</i>	• water		• water suitable for livestock consumption	
16.0104 Agricultural Processors	115, 311	<i>This beneficiary primarily consumes water for washing edible products.</i>	• water		• water for processing edible products	
16.0105 Aquaculturists	112	<i>Aquaculturists farm aquatic fauna, such as fish, shrimp, oysters, etc. Those who cultivate aquatic flora are accounted for under the Farmer Beneficiary Sub-Category.</i>	• presence of the environment • water		• opportunity provided by the environment for cultivating aquatic organisms • medium and conditions (i.e., water quality) provided by the environment for cultivating aquatic organisms	
16.02 Commercial / Industrial						
16.0203 Industrial Processors	313-339	<i>This beneficiary primarily consumes water for cooling, producing pulp, etc. The water has no contact with edibles.</i>	• water		• water suitable for cooling or processing industrial products	
16.0204 Industrial Dischargers	211, 212	<i>Industrial dischargers use the environment [only] for discharging water, material (i.e., sand and gravel, garbage), and emissions. Hydraulic fracking practices involve industrial discharge to groundwater.</i>	• presence of the environment • water		• opportunity to discharge into the environment • medium for receiving industrial discharge	
16.0205 Electric and other Energy Generators	221	<i>This beneficiary relies on the environment for energy or placement of power generation structures, including dams, wind, water, or wave turbines, solar panels, geothermal systems, etc.</i>	• water		• water that can be used for (geothermal) energy generation	
16.0206 Resource-Dependent Businesses	712, 713, 721, 722	<i>Without the environment, this beneficiary would not have the opportunity for businesses, including marinas, stables, and ecotourism (e.g., rafting companies, hot air balloon companies, beach resorts, hot springs, ice hotels) - but not farm or forest land.</i>	• presence of the environment		• opportunity for placement of infrastructure and reduced/increased risk of subsidence and sinkholes on the property	
16.0207 Pharmaceutical and Food Supplement Suppliers	325, 339, 424	<i>This beneficiary collects organisms from the wild that are used as or for the basis of pharmaceuticals or food supplements for commercial sale. This beneficiary relies on the natural abundance of target organisms.</i>	• water		• water used in medicines or sold for medicinal purposes	
16.03 Government, Municipal, and Residential						

16. GROUNDWATER

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
16.0301 Municipal Drinking Water Plant Operators	221	<i>This beneficiary is responsible for providing water to a community and may do so by collecting water from rivers, reservoirs, lakes, wells, bays, or estuaries. Water is treated and distributed. Direct precip is not generally used as a water source.</i>	<ul style="list-style-type: none"> • water 		<ul style="list-style-type: none"> • water suitable for processing by a municipal drinking water plant 	
16.0303 Residential Property Owners	531, 532, 814	<i>While changes in property value are not a FEGS, residential property owners are affected by the environment in which their property resides.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity for placement of infrastructure and reduced/increased risk of subsidence and sinkholes on the property 	
16.05 Subsistence						
16.0501 Water Subsisters	None	<i>Water Subsisters rely on a natural source for drinking water and may use wells or cisterns for storage (i.e., they do not receive municipal drinking water). Water purity is important, as water is not or only minimally treated.</i>	<ul style="list-style-type: none"> • water 		<ul style="list-style-type: none"> • water suitable for drinking (i.e., human consumption) 	
16.06 Recreational						
16.0601 Experiencers and Viewers	None	<i>This beneficiary views and experiences the environment via an activity, such as scenery gazing, hiking, bird watching, botanizing, ice skating, rock climbing, flying kites, etc. This beneficiary does not have physical contact with water.</i>	<ul style="list-style-type: none"> • presence of the environment • viewscales • sounds and scents 	<ul style="list-style-type: none"> • geysers 	<ul style="list-style-type: none"> • opportunity to view the environment and organisms within it, and groundwater phenomena • landscape that provides a sensory experience • sounds and scents that provide a sensory experience 	
16.0605 Waders, Swimmers, and Divers	None	<i>This beneficiary recreates in or under the water by either wading, swimming, or diving (i.e., snorkeling, SCUBA diving). By definition, this beneficiary has contact with water.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity and conditions for wading and swimming (particularly in hot or mineral springs), and/or diving (particularly in caves) 	
16.0606 Boaters	None	<i>Boaters may use motorized (i.e., motor boats) or non-motorized boats (i.e., canoes, kayaks, rafts) to recreate. This beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • presence of the environment • water 		<ul style="list-style-type: none"> • opportunity for recreational boating (i.e., in caves) • medium and conditions for recreational boating (i.e., in caves) 	
16.07 Inspirational						
16.0701 Spiritual and Ceremonial Participants and Participants of Celebration	813	<i>This beneficiary uses the environment for spiritual, ceremonial, or celebratory purposes, such as harvest festivals, seafood festivals, Native American observances, religious rites (i.e., baptisms, weddings), personal growth, etc.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity and conditions for spiritual and ceremonial practices and celebrations 	

16. GROUNDWATER

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
16.0702 Artists	339, 423, 424, 512, 711	<i>Artists, amateur and professional, utilize the environment or their experience in the environment to produce art. This category may include writers, cinematographers, and recording artist among others.</i>	<ul style="list-style-type: none"> • presence of the environment • viewscapes • sounds and scents 	<ul style="list-style-type: none"> • water dripping in caves, geysers 	<ul style="list-style-type: none"> • opportunity for a sensory experience [which may lead to the benefit of inspiration for art] • landscape that provides a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., films, soundtracks, etc.) • sounds and scents that provide a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., films, soundtracks, etc.) 	
16.08 Learning						
16.0801 Educators and Students	611	<i>This beneficiary includes both formal and self-taught educators and students. All parts of the environment are of interest.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunities to understand, communicate, and educate 	
16.0802 Researchers	541, 611	<i>Researchers are interested in the environment for academic and applied purposes and as a group do not discriminate over which parts of the environment are of interest.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • research opportunities 	
16.09 Non-Use						
16.0901 People Who Care (Existence)	813, 924	<i>This non-use beneficiary believes it is important to preserve the environment because of a moral/ethical connection or for fear of unintended consequences.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • knowing that the environment exists 	
16.0902 People Who Care (Option / Bequest)	813, 924	<i>Option/Bequest non-use beneficiaries consider that they or future generations may visit or rely on the environment. This includes beneficiaries that value the traditional aspects or features of an activity or FEGS.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • knowing that the environment exists 	

21. FORESTS

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
21.01 Agricultural						
21.0107 Foresters	113	Foresters introduce tree cultivars and nurture those cultivars as they grow into trees, which are harvested. The rotation for the tree crops may be as short as 10 years or many decades.	<ul style="list-style-type: none"> • soil • open space 		<ul style="list-style-type: none"> • suitable soil in which trees can be cultivated (NOT cultivated trees themselves) • suitable conditions (i.e., land) in which trees grow and to cultivate trees 	
21.02 Commercial / Industrial						
21.0201 Food Extractors	113, 114, 311, 312, 454	Food extractors utilize the natural abundance of edible organisms (i.e., non-cultivated or bred) for commercial use or sale. Includes commercial and native hunters (if legal). In aquatic environments, this beneficiary has potential contact with water.	<ul style="list-style-type: none"> • flora • fauna • fungi 	<ul style="list-style-type: none"> • garlic mustard, pawpaw, blackberries, maple sap • deer, bear, rabbit, elk, grouse, turkey, boar 	<ul style="list-style-type: none"> • edible organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) for commercial use or sale • edible organisms (i.e., birds, mammals, reptiles, etc.) for commercial use or sale • edible organisms (i.e., mushrooms, shelf fungus, puffballs, etc.) for commercial use or sale 	
21.0202 Timber, Fiber, and Ornamental Extractors	113, 339, 424, 453, 454	Timber, fiber, and ornamental extractors rely on the environment for products used or sold commercially. Only non-cultivated, renewable material (i.e., NOT oil, ore, gems, etc.) are considered FEGS.	<ul style="list-style-type: none"> • fiber • natural materials • timber 	<ul style="list-style-type: none"> • cork • rubber, lichens, mosses • firs, pines, oaks 	<ul style="list-style-type: none"> • non-cultivated fiber for commercial use or sale • non-cultivated ornamental products or by-products (from cultivation) used ornamentally for commercial use or sale • non-cultivated timber (i.e., trees) for commercial use or sale 	
21.0206 Resource-Dependent Businesses	487, 712, 713, 721, 722	Without the environment, this beneficiary would not have the opportunity for businesses, including marinas, stables, and ecotourism (e.g., rafting companies, hot air balloon companies, beach resorts, hot springs, ice hotels) - but not farm or forest land.	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity for placement of infrastructure and reduced/increased risk of erosion, fire, and pest infestation on the property 	
21.0207 Pharmaceutical and Food Supplement Suppliers	325, 339, 424	This beneficiary collects organisms from the wild that are used as or for the basis of pharmaceuticals or food supplements for commercial sale. This beneficiary relies on the natural abundance of target organisms.	<ul style="list-style-type: none"> • flora • fauna • fungi 	<ul style="list-style-type: none"> • ginseng, bloodroot, cocoa • deer antler velvet, bear bladders 	<ul style="list-style-type: none"> • organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) used in medicines or sold for medicinal purposes • organisms (i.e., birds, mammals, reptiles, etc.) or products associated with organisms (i.e., oils, fats, keratin, etc.) used in medicines or sold for medicinal purposes • organisms (i.e., mushrooms, shelf fungus, puffballs, etc.) used in medicines or sold for medicinal purposes 	
21.0208 Fur / Hide Trappers and Hunters	114	This beneficiary takes advantage of the natural abundance of fauna (i.e., not farm-raised or domesticated animals) for fur or hides for commercial use or sale.	<ul style="list-style-type: none"> • fauna 	<ul style="list-style-type: none"> • mink, fox, coyote, bear 	<ul style="list-style-type: none"> • organisms (i.e., mammals and reptiles) that provide fur or hides for commercial use or sale 	
21.03 Government, Municipal, and Residential						

21. FORESTS

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
21.0303 Residential Property Owners	531, 532, 814	<i>While changes in property value are not a FEGS, residential property owners are affected by the environment in which their property resides.</i>	<ul style="list-style-type: none"> presence of the environment 		<ul style="list-style-type: none"> opportunity for placement of infrastructure and reduced/increased risk of erosion, fire, and pest infestation on the property 	
21.0304 Military / Coast Guard	928	<i>The Military / Coast Guard relies on the environment for the placement of infrastructure (e.g., ports, bases, etc.) or conditions for training activities.</i>	<ul style="list-style-type: none"> presence of the environment open space 		<ul style="list-style-type: none"> opportunity for placement of infrastructure suitable conditions for training activities 	
21.05 Subsistence						
21.0502 Food Subsisters	None	<i>Food Subsisters use the natural abundance of [edible] flora, fungi, and fauna whether collecting, hunting, or fishing as a major supplement to their existence.</i>	<ul style="list-style-type: none"> flora fauna fungi 	<ul style="list-style-type: none"> garlic mustard, pawpaw, blackberries deer, bear, rabbit, elk, grouse, turkey, boar 	<ul style="list-style-type: none"> edible organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) that are gathered for personal use (i.e., not for sale) edible organisms (i.e., birds, mammals, reptiles, etc.) that are hunted for personal use (i.e., not for sale) edible organisms (i.e., mushrooms, shelf fungus, puffballs, etc.) that are hunted or gathered for personal use (i.e., not for sale) 	
21.0503 Timber, Fiber, and Fur / Hide Subsisters	None	<i>This beneficiary relies on the natural abundance of timber, fiber, and [fauna for] fur / hide for survival. Timber, fiber, and fur / hide used for building material is accounted for in this category.</i>	<ul style="list-style-type: none"> timber fiber fauna 	<ul style="list-style-type: none"> firs, pines, oaks grasses, leaves, vines, hemp deer, bear, rabbit, elk 	<ul style="list-style-type: none"> timber (i.e., trees) used for clothing/warmth, infrastructure, housing, roofing, and/or fuel for personal use (i.e., not for sale) fiber used for clothing/warmth, infrastructure, housing, roofing, and/or fuel for personal use (i.e., not for sale) organisms (i.e., mammals and reptiles) that provide fur or hides used for clothing/warmth, infrastructure, housing, roofing, and/or fuel for personal use (i.e., not for sale) 	
21.06 Recreational						
21.0601 Experiencers and Viewers	None	<i>This beneficiary views and experiences the environment via an activity, such as scenery gazing, hiking, bird watching, botanizing, ice skating, rock climbing, flying kites, etc. This beneficiary does not have physical contact with water.</i>	<ul style="list-style-type: none"> presence of the environment viewscapes flora fauna fungi sounds and scents 	<ul style="list-style-type: none"> leaves rustling, birds singing, wind, decay 	<ul style="list-style-type: none"> opportunity to view the environment and organisms within it landscape that provides a sensory experience organisms (i.e., flowers, plants, etc.) that can be viewed organisms (i.e., birds, mammals, reptiles, etc.) that can be viewed organisms (i.e., mushrooms, shelf fungus, puffballs, etc.) that can be viewed sounds and scents that provide a sensory experience 	

21. FORESTS

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
21.0602 Food Pickers and Gatherers	None	<i>This beneficiary recreationally picks or gathers from the natural abundance of [edible] flora, fungi, and some fauna (as long as it is not fished or hunted). This beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • flora • fauna • fungi 	<ul style="list-style-type: none"> • garlic mustard, pawpaw, blackberries 	<ul style="list-style-type: none"> • edible organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) that are picked and/or gathered for personal use (i.e., not for sale) • edible organisms (i.e., insects, some aquatic organisms, etc.) that are picked and/or gathered (i.e., not hunted or fished) for personal use (i.e., not for sale) • edible organisms (i.e., mushrooms, shelf fungus, puffballs, etc.) that are gathered for personal use (i.e., not for sale) 	
21.0603 Hunters	None	<i>This beneficiary is primarily interested in hunting mammals and fowl (not flora or fungi) recreationally (i.e., not for survival). In aquatic environments, this beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • fauna 	<ul style="list-style-type: none"> • deer, bear, rabbit, elk, grouse, turkey, boar 	<ul style="list-style-type: none"> • organisms (i.e., birds, mammals, reptiles, etc.) that can be hunted 	
21.07 Inspirational						
21.0701 Spiritual and Ceremonial Participants and Participants of Celebration	813	<i>This beneficiary uses the environment for spiritual, ceremonial, or celebratory purposes, such as harvest festivals, seafood festivals, Native American observances, religious rites (i.e., baptisms, weddings), personal growth, etc.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity and conditions for spiritual and ceremonial practices and celebrations 	
21.0702 Artists	339, 423, 424, 512, 711	<i>Artists, amateur and professional, utilize the environment or their experience in the environment to produce art. This category may include writers, cinematographers, and recording artist among others.</i>	<ul style="list-style-type: none"> • presence of the environment • viewscapes • sounds and scents • natural materials 	<ul style="list-style-type: none"> • leaves rustling, birds singing, wind, decay • mosses, lichens, leaves, branches 	<ul style="list-style-type: none"> • opportunity for a sensory experience [which may lead to the benefit of inspiration for art] • landscape that provides a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., films, soundtracks, etc.) • sounds and scents that provide a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., films, soundtracks, etc.) • natural materials that provide a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., sculpture, mixed media paintings, etc.) 	
21.08 Learning						
21.0801 Educators and Students	611	<i>This beneficiary includes both formal and self-taught educators and students. All parts of the environment are of interest.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunities to understand, communicate, and educate 	

21. FORESTS

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
21.0802 Researchers	541, 611	<i>Researchers are interested in the environment for academic and applied purposes and as a group do not discriminate over which parts of the environment are of interest.</i>	• presence of the environment		• research opportunities	
21.09 Non-Use						
21.0901 People Who Care (Existence)	813, 924	<i>This non-use beneficiary believes it is important to preserve the environment because of a moral/ethical connection or for fear of unintended consequences.</i>	• presence of the environment		• knowing that the environment exists	
21.0902 People Who Care (Option / Bequest)	813, 924	<i>Option/Bequest non-use beneficiaries consider that they or future generations may visit or rely on the environment. This includes beneficiaries that value the traditional aspects or features of an activity or FEGS.</i>	• presence of the environment		• knowing that the environment exists	

22. AGROECOSYSTEMS

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
22.01 Agricultural						
22.0103 Livestock Grazers	112	<i>This beneficiary uses the environment to graze livestock. Cultivated vegetation is NOT considered a FEGS. For agroecosystems, "planted" pastures only provide space and opportunity to grow feed (not the vegetation itself).</i>	<ul style="list-style-type: none"> • soil • open space 		<ul style="list-style-type: none"> • suitable soil in which fields of feed (i.e., on which livestock will directly graze) can be grown (NOT feed itself) • suitable conditions (i.e., land) to graze livestock 	
22.0106 Farmers	111, 113	<i>Farmers may plant annual crops (e.g., corn, soybeans, rice) or introduce cultivars that produce perennial, long-term crops (e.g., hay, grapes, cranberries, watercress, Christmas trees). Note that Farmers and Irrigators are different beneficiaries.</i>	<ul style="list-style-type: none"> • soil • open space • pollinators • depredators and (pest) predators 		<ul style="list-style-type: none"> • suitable soil in which annual or perennial crops (NOT crops themselves) can be grown • suitable conditions (i.e., land) in which to grow annual or perennial crops (NOT crops themselves) • wild pollinators that provide opportunity to grow annual or perennial crops • wild depredators and (pest) predators that provide opportunity to grow annual or perennial crops 	
22.02 Commercial / Industrial						
22.0202 Timber, Fiber, and Ornamental Extractors	113, 339, 424, 453, 454	<i>Timber, fiber, and ornamental extractors rely on the environment for products used or sold commercially. Only non-cultivated, renewable material (i.e., NOT oil, ore, gems, etc.) are considered FEGS.</i>	<ul style="list-style-type: none"> • natural materials 		<ul style="list-style-type: none"> • non-cultivated ornamental products or by-products (from cultivation) used ornamentally for commercial use or sale 	
22.0205 Electric and other Energy Generators	221	<i>This beneficiary relies on the environment for energy or placement of power generation structures, including dams, wind, water, or wave turbines, solar panels, geothermal systems, etc.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity to install power generation structures 	
22.0206 Resource-Dependent Businesses	487, 712, 713, 721, 722	<i>Without the environment, this beneficiary would not have the opportunity for businesses, including marinas, stables, and ecotourism (e.g., rafting companies, hot air balloon companies, beach resorts, hot springs, ice hotels) - but not farm or forest land.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity for placement of infrastructure and reduced/increased risk of erosion, fire, and pest infestation on the property 	
22.03 Government, Municipal, and Residential						
22.0303 Residential Property Owners	531, 532, 814	<i>While changes in property value are not a FEGS, residential property owners are affected by the environment in which their property resides.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity for placement of infrastructure and reduced/increased risk of erosion, fire, and pest infestation on the property 	
22.06 Recreational						

22. AGROECOSYSTEMS

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
22.0601 Experiencers and Viewers	None	<i>This beneficiary views and experiences the environment via an activity, such as scenery gazing, hiking, bird watching, botanizing, ice skating, rock climbing, flying kites, etc. This beneficiary does not have physical contact with water.</i>	<ul style="list-style-type: none"> • presence of the environment • viewscapes • flora • fauna • fungi • sounds and scents 		<ul style="list-style-type: none"> • opportunity to view the environment and organisms within it • landscape that provides a sensory experience • organisms (i.e., flowers, plants, etc.) that can be viewed • organisms (i.e., birds, mammals, reptiles, etc.) that can be viewed • organisms (i.e., mushrooms, shelf fungus, puffballs, etc.) that can be viewed • sounds and scents that provide a sensory experience 	
22.0603 Hunters	None	<i>This beneficiary is primarily interested in hunting mammals and fowl (not flora or fungi) recreationally (i.e., not for survival). In aquatic environments, this beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • fauna 	<ul style="list-style-type: none"> • pheasant, deer, elk, rabbit 	<ul style="list-style-type: none"> • organisms (i.e., birds, mammals, reptiles, etc.) that can be hunted 	
22.07 Inspirational						
22.0701 Spiritual and Ceremonial Participants and Participants of Celebration	813	<i>This beneficiary uses the environment for spiritual, ceremonial, or celebratory purposes, such as harvest festivals, seafood festivals, Native American observances, religious rites (i.e., baptisms, weddings), personal growth, etc.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity and conditions for spiritual and ceremonial practices and celebrations 	
22.0702 Artists	339, 423, 424, 512, 711	<i>Artists, amateur and professional, utilize the environment or their experience in the environment to produce art. This category may include writers, cinematographers, and recording artist among others.</i>	<ul style="list-style-type: none"> • presence of the environment • viewscapes • sounds and scents • natural materials 	<ul style="list-style-type: none"> • corn sheaths, dried flowers 	<ul style="list-style-type: none"> • opportunity for a sensory experience [which may lead to the benefit of inspiration for art] • landscape that provides a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., films, soundtracks, etc.) • sounds and scents that provide a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., films, soundtracks, etc.) • natural materials that provide a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., sculpture, mixed media paintings, etc.) 	
22.08 Learning						
22.0801 Educators and Students	611	<i>This beneficiary includes both formal and self-taught educators and students. All parts of the environment are of interest.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunities to understand, communicate, and educate 	

22. AGROECOSYSTEMS

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
22.0802 Researchers	541, 611	<i>Researchers are interested in the environment for academic and applied purposes and as a group do not discriminate over which parts of the environment are of interest.</i>	<ul style="list-style-type: none"> presence of the environment 		<ul style="list-style-type: none"> research opportunities 	
22.09 Non-Use						
22.0901 People Who Care (Existence)	813, 924	<i>This non-use beneficiary believes it is important to preserve the environment because of a moral/ethical connection or for fear of unintended consequences.</i>	<ul style="list-style-type: none"> presence of the environment 		<ul style="list-style-type: none"> knowing that the environment exists 	
22.0902 People Who Care (Option / Bequest)	813, 924	<i>Option/Bequest non-use beneficiaries consider that they or future generations may visit or rely on the environment. This includes beneficiaries that value the traditional aspects or features of an activity or FEGS.</i>	<ul style="list-style-type: none"> presence of the environment 		<ul style="list-style-type: none"> knowing that the environment exists 	

23. CREATED GREENSPACE

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
23.02 Commercial / Industrial						
23.0205 Electric and other Energy Generators	221	<i>This beneficiary relies on the environment for energy or placement of power generation structures, including dams, wind, water, or wave turbines, solar panels, geothermal systems, etc.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity to install power generation structures 	
23.0206 Resource-Dependent Businesses	487, 712, 713, 721, 722	<i>Without the environment, this beneficiary would not have the opportunity for businesses, including marinas, stables, and ecotourism (e.g., rafting companies, hot air balloon companies, beach resorts, hot springs, ice hotels) - but not farm or forest land.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity for placement of infrastructure and reduced/increased risk of pest infestation on the property 	
23.03 Government, Municipal, and Residential						
23.0303 Residential Property Owners	531, 532, 814	<i>While changes in property value are not a FEGS, residential property owners are affected by the environment in which their property resides.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity for placement of infrastructure and reduced/increased risk of pest infestation on the property 	
23.0304 Military / Coast Guard	928	<i>The Military / Coast Guard relies on the environment for the placement of infrastructure (e.g., ports, bases, etc.) or conditions for training activities.</i>	<ul style="list-style-type: none"> • presence of the environment • open space 		<ul style="list-style-type: none"> • opportunity for placement of infrastructure • suitable conditions for training activities 	
23.05 Subsistence						
23.0502 Food Subsisters	None	<i>Food Subsisters use the natural abundance of [edible] flora, fungi, and fauna whether collecting, hunting, or fishing as a major supplement to their existence.</i>	<ul style="list-style-type: none"> • flora • fungi 		<ul style="list-style-type: none"> • edible organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) that are gathered for personal use (i.e., not for sale) • edible organisms (i.e., mushrooms, shelf fungus, puffballs, etc.) that are hunted or gathered for personal use (i.e., not for sale) 	
23.06 Recreational						
23.0601 Experiencers and Viewers	None	<i>This beneficiary views and experiences the environment via an activity, such as scenery gazing, hiking, bird watching, botanizing, ice skating, rock climbing, flying kites, etc. This beneficiary does not have physical contact with water.</i>	<ul style="list-style-type: none"> • presence of the environment • viewscapes • flora • fauna • fungi • sounds and scents 		<ul style="list-style-type: none"> • opportunity to view the environment and organisms within it • landscape that provides a sensory experience • organisms (i.e., flowers, plants, etc.) that can be viewed • organisms (i.e., birds, mammals, reptiles, etc.) that can be viewed • organisms (i.e., mushrooms, shelf fungus, puffballs, etc.) that can be viewed • sounds and scents that provide a sensory experience 	

23. CREATED GREENSPACE

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
23.0602 Food Pickers and Gatherers	None	<i>This beneficiary recreationally picks or gathers from the natural abundance of [edible] flora, fungi, and some fauna (as long as it is not fished or hunted). This beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • flora • fungi 		<ul style="list-style-type: none"> • edible organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) that are picked and/or gathered for personal use (i.e., not for sale) • edible organisms (i.e., mushrooms, shelf fungus, puffballs, etc.) that are gathered for personal use (i.e., not for sale) 	
23.07 Inspirational						
23.0701 Spiritual and Ceremonial Participants and Participants of Celebration	813	<i>This beneficiary uses the environment for spiritual, ceremonial, or celebratory purposes, such as harvest festivals, seafood festivals, Native American observances, religious rites (i.e., baptisms, weddings), personal growth, etc.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity and conditions for spiritual and ceremonial practices and celebrations 	
23.0702 Artists	339, 423, 424, 512, 711	<i>Artists, amateur and professional, utilize the environment or their experience in the environment to produce art. This category may include writers, cinematographers, and recording artist among others.</i>	<ul style="list-style-type: none"> • presence of the environment • viewscapes • sounds and scents • natural materials 		<ul style="list-style-type: none"> • opportunity for a sensory experience [which may lead to the benefit of inspiration for art] • landscape that provides a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., films, soundtracks, etc.) • sounds and scents that provide a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., films, soundtracks, etc.) • natural materials that provide a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., sculpture, mixed media paintings, etc.) 	
23.08 Learning						
23.0801 Educators and Students	611	<i>This beneficiary includes both formal and self-taught educators and students. All parts of the environment are of interest.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunities to understand, communicate, and educate 	
23.0802 Researchers	541, 611	<i>Researchers are interested in the environment for academic and applied purposes and as a group do not discriminate over which parts of the environment are of interest.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • research opportunities 	
23.09 Non-Use						
23.0901 People Who Care (Existence)	813, 924	<i>This non-use beneficiary believes it is important to preserve the environment because of a moral/ethical connection or for fear of unintended consequences.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • knowing that the environment exists 	

23. CREATED GREENSPACE

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
23.0902 People Who Care (Option / Bequest)	813, 924	<i>Option/Bequest non-use beneficiaries consider that they or future generations may visit or rely on the environment. This includes beneficiaries that value the traditional aspects or features of an activity or FEGS.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • knowing that the environment exists 	

24. GRASSLANDS

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
24.01 Agricultural						
24.0103 Livestock Grazers	112	<i>This beneficiary uses the environment to graze livestock. Cultivated vegetation is NOT considered a FEGS. For agroecosystems, "planted" pastures only provide space and opportunity to grow feed (not the vegetation itself).</i>	<ul style="list-style-type: none"> • flora • open space 		<ul style="list-style-type: none"> • non-cultivated vegetation for livestock consumption • suitable conditions (i.e., land) to graze livestock 	
24.0106 Farmers	111	<i>Farmers may plant annual crops (e.g., corn, soybeans, rice) or introduce cultivars that produce perennial, long-term crops (e.g., hay, grapes, cranberries, watercress, Christmas trees). Note that Farmers and Irrigators are different beneficiaries.</i>	<ul style="list-style-type: none"> • soil • open space • pollinators • depredators and (pest) predators 		<ul style="list-style-type: none"> • suitable soil in which annual or perennial crops (NOT crops themselves) can be grown • suitable conditions (i.e., land) in which to grow annual or perennial crops (NOT crops themselves) • wild pollinators that provide opportunity to grow annual or perennial crops • wild depredators and (pest) predators that provide opportunity to grow crops 	
24.02 Commercial / Industrial						
24.0201 Food Extractors	113, 114, 311, 312, 454	<i>Food extractors utilize the natural abundance of edible organisms (i.e., non-cultivated or bred) for commercial use or sale. Includes commercial and native hunters (if legal). In aquatic environments, this beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • flora • fauna • fungi 	<ul style="list-style-type: none"> • berries, tubers • eggs, duck, buffalo, grasshoppers 	<ul style="list-style-type: none"> • edible organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) for commercial use or sale • edible organisms (i.e., birds, mammals, reptiles, etc.) for commercial use or sale • edible organisms (i.e., mushrooms, shelf fungus, puffballs, etc.) for commercial use or sale 	
24.0202 Timber, Fiber, and Ornamental Extractors	113, 339, 424, 453, 454	<i>Timber, fiber, and ornamental extractors rely on the environment for products used or sold commercially. Only non-cultivated, renewable material (i.e., NOT oil, ore, gems, etc.) are considered FEGS.</i>	<ul style="list-style-type: none"> • fiber • natural materials 	<ul style="list-style-type: none"> • grasses • flowers, seeds 	<ul style="list-style-type: none"> • non-cultivated fiber for commercial use or sale • non-cultivated ornamental products or by-products (from cultivation) used ornamentally for commercial use or sale 	
24.0205 Electric and other Energy Generators	221	<i>This beneficiary relies on the environment for energy or placement of power generation structures, including dams, wind, water, or wave turbines, solar panels, geothermal systems, etc.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity to install power generation structures 	
24.0206 Resource-Dependent Businesses	487, 712, 713, 721, 722	<i>Without the environment, this beneficiary would not have the opportunity for businesses, including marinas, stables, and ecotourism (e.g., rafting companies, hot air balloon companies, beach resorts, hot springs, ice hotels) - but not farm or forest land.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity for placement of infrastructure and reduced/increased risk of fire and pest infestation on the property 	

24. GRASSLANDS

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
24.0207 Pharmaceutical and Food Supplement Suppliers	325, 339, 424	<i>This beneficiary collects organisms from the wild that are used as or for the basis of pharmaceuticals or food supplements for commercial sale. This beneficiary relies on the natural abundance of target organisms.</i>	<ul style="list-style-type: none"> • flora • fauna • fungi 	<ul style="list-style-type: none"> • sagewort, Ipomoea leptophylla • deer antler velvet 	<ul style="list-style-type: none"> • organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) used in medicines or sold for medicinal purposes • organisms (i.e., birds, mammals, reptiles, etc.) or products associated with organisms (i.e., oils, fats, keratin, etc.) used in medicines or sold for medicinal purposes • organisms (i.e., mushrooms, shelf fungus, puffballs, etc.) used in medicines or sold for medicinal purposes 	
24.0208 Fur / Hide Trappers and Hunters	114	<i>This beneficiary takes advantage of the natural abundance of fauna (i.e., not farm-raised or domesticated animals) for fur or hides for commercial use or sale.</i>	<ul style="list-style-type: none"> • fauna 	<ul style="list-style-type: none"> • fox, buffalo, wolf, coyotes 	<ul style="list-style-type: none"> • organisms (i.e., mammals and reptiles) that provide fur or hides for commercial use or sale 	
24.03 Government, Municipal, and Residential						
24.0303 Residential Property Owners	531, 532, 814	<i>While changes in property value are not a FEGS, residential property owners are affected by the environment in which their property resides.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity for placement of infrastructure and reduced/increased risk of fire and pest infestation on the property 	
24.0304 Military / Coast Guard	928	<i>The Military / Coast Guard relies on the environment for the placement of infrastructure (e.g., ports, bases, etc.) or conditions for training activities.</i>	<ul style="list-style-type: none"> • presence of the environment • open space 		<ul style="list-style-type: none"> • opportunity for placement of infrastructure • suitable conditions for training activities 	
24.05 Subsistence						
24.0502 Food Subsisters	None	<i>Food Subsisters use the natural abundance of [edible] flora, fungi, and fauna whether collecting, hunting, or fishing as a major supplement to their existence.</i>	<ul style="list-style-type: none"> • flora • fauna • fungi 	<ul style="list-style-type: none"> • rabbit, deer, buffalo, elk, bison, buffalo 	<ul style="list-style-type: none"> • edible organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) that are gathered for personal use (i.e., not for sale) • edible organisms (i.e., birds, mammals, reptiles, etc.) that are hunted for personal use (i.e., not for sale) • edible organisms (i.e., mushrooms, shelf fungus, puffballs, etc.) that are hunted or gathered for personal use (i.e., not for sale) 	

24. GRASSLANDS

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
24.0503 Timber, Fiber, and Fur / Hide Subsisters	None	<i>This beneficiary relies on the natural abundance of timber, fiber, and [fauna for] fur / hide for survival. Timber, fiber, and fur / hide used for building material is accounted for in this category.</i>	<ul style="list-style-type: none"> • timber • fiber • fauna 	<ul style="list-style-type: none"> • rabbit, deer, buffalo, elk, bison, buffalo 	<ul style="list-style-type: none"> • timber (i.e., trees) used for clothing/warmth, infrastructure, housing, roofing, and/or fuel for personal use (i.e., not for sale) • fiber used for clothing/warmth, infrastructure, housing, roofing, and/or fuel for personal use (i.e., not for sale) • organisms (i.e., mammals and reptiles) that provide fur or hides used for clothing/warmth, infrastructure, housing, roofing, and/or fuel for personal use (i.e., not for sale) 	
24.06 Recreational						
24.0601 Experiencers and Viewers	None	<i>This beneficiary views and experiences the environment via an activity, such as scenery gazing, hiking, bird watching, botanizing, ice skating, rock climbing, flying kites, etc. This beneficiary does not have physical contact with water.</i>	<ul style="list-style-type: none"> • presence of the environment • views/capes • flora • fauna • fungi • sounds and scents 		<ul style="list-style-type: none"> • opportunity to view the environment and organisms within it • landscape that provides a sensory experience • organisms (i.e., flowers, plants, etc.) that can be viewed • organisms (i.e., birds, mammals, reptiles, etc.) that can be viewed • organisms (i.e., mushrooms, shelf fungus, puffballs, etc.) that can be viewed • sounds and scents that provide a sensory experience 	
24.0602 Food Pickers and Gatherers	None	<i>This beneficiary recreationally picks or gathers from the natural abundance of [edible] flora, fungi, and some fauna (as long as it is not fished or hunted). This beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • flora • fauna • fungi 		<ul style="list-style-type: none"> • edible organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) that are picked and/or gathered for personal use (i.e., not for sale) • edible organisms (i.e., insects, some aquatic organisms, etc.) that are picked and/or gathered (i.e., not hunted or fished) for personal use (i.e., not for sale) • edible organisms (i.e., mushrooms, shelf fungus, puffballs, etc.) that are gathered for personal use (i.e., not for sale) 	
24.0603 Hunters	None	<i>This beneficiary is primarily interested in hunting mammals and fowl (not flora or fungi) recreationally (i.e., not for survival). In aquatic environments, this beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • fauna 		<ul style="list-style-type: none"> • organisms (i.e., birds, mammals, reptiles, etc.) that can be hunted 	
24.07 Inspirational						

24. GRASSLANDS

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
24.0701 Spiritual and Ceremonial Participants and Participants of Celebration	813	<i>This beneficiary uses the environment for spiritual, ceremonial, or celebratory purposes, such as harvest festivals, seafood festivals, Native American observances, religious rites (i.e., baptisms, weddings), personal growth, etc.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity and conditions for spiritual and ceremonial practices and celebrations 	
24.0702 Artists	339, 423, 424, 512, 711	<i>Artists, amateur and professional, utilize the environment or their experience in the environment to produce art. This category may include writers, cinematographers, and recording artist among others.</i>	<ul style="list-style-type: none"> • presence of the environment • viewscapes • sounds and scents • natural materials 		<ul style="list-style-type: none"> • opportunity for a sensory experience [which may lead to the benefit of inspiration for art] • landscape that provides a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., films, soundtracks, etc.) • sounds and scents that provide a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., films, soundtracks, etc.) • natural materials that provide a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., sculpture, mixed media paintings, etc.) 	
24.08 Learning						
24.0801 Educators and Students	611	<i>This beneficiary includes both formal and self-taught educators and students. All parts of the environment are of interest.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunities to understand, communicate, and educate 	
24.0802 Researchers	541, 611	<i>Researchers are interested in the environment for academic and applied purposes and as a group do not discriminate over which parts of the environment are of interest.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • research opportunities 	
24.09 Non-Use						
24.0901 People Who Care (Existence)	813, 924	<i>This non-use beneficiary believes it is important to preserve the environment because of a moral/ethical connection or for fear of unintended consequences.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • knowing that the environment exists 	
24.0902 People Who Care (Option / Bequest)	813, 924	<i>Option/Bequest non-use beneficiaries consider that they or future generations may visit or rely on the environment. This includes beneficiaries that value the traditional aspects or features of an activity or FEGS.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • knowing that the environment exists 	

25. SCRUBLANDS / SHRUBLANDS

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
25.01 Agricultural						
25.0102 CAFO Operators	112	<i>This beneficiary raises large, dense populations of livestock in a confined area (whether indoors or outdoors).</i>	• open space		• suitable conditions (i.e., land) to hold livestock and site the CAFO operation	
25.0103 Livestock Grazers	112	<i>This beneficiary uses the environment to graze livestock. Cultivated vegetation is NOT considered a FEGS. For agroecosystems, "planted" pastures only provide space and opportunity to grow feed (not the vegetation itself).</i>	• flora • open space	• grasses	• non-cultivated vegetation for livestock consumption • suitable conditions (i.e., land) to graze livestock	
25.02 Commercial / Industrial						
25.0201 Food Extractors	114, 311, 312, 454	<i>Food extractors utilize the natural abundance of edible organisms (i.e., non-cultivated or bred) for commercial use or sale. Includes commercial and native hunters (if legal). In aquatic environments, this beneficiary has potential contact with water.</i>	• flora	• juniper berries	• edible organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) for commercial use or sale	
25.0202 Timber, Fiber, and Ornamental Extractors	339, 424, 453, 454	<i>Timber, fiber, and ornamental extractors rely on the environment for products used or sold commercially. Only non-cultivated, renewable material (i.e., NOT oil, ore, gems, etc.) are considered FEGS.</i>	• timber • fiber • natural materials	• juniper trees • grasses	• non-cultivated timber (i.e., trees) for commercial use or sale • non-cultivated fiber for commercial use or sale • non-cultivated ornamental products or by-products (from cultivation) used ornamentally for commercial use or sale	
25.0205 Electric and other Energy Generators	221	<i>This beneficiary relies on the environment for energy or placement of power generation structures, including dams, wind, water, or wave turbines, solar panels, geothermal systems, etc.</i>	• presence of the environment		• opportunity to install power generation structures	
25.0206 Resource-Dependent Businesses	487, 712, 713, 721, 722	<i>Without the environment, this beneficiary would not have the opportunity for businesses, including marinas, stables, and ecotourism (e.g., rafting companies, hot air balloon companies, beach resorts, hot springs, ice hotels) - but not farm or forest land.</i>	• presence of the environment		• opportunity for placement of infrastructure and reduced/increased risk of fire and pest infestation on the property	
25.0207 Pharmaceutical and Food Supplement Suppliers	325, 339, 424	<i>This beneficiary collects organisms from the wild that are used as or for the basis of pharmaceuticals or food supplements for commercial sale. This beneficiary relies on the natural abundance of target organisms.</i>	• flora	• juniper, tea tree	• organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) used in medicines or sold for medicinal purposes	
25.0208 Fur / Hide Trappers and Hunters	114	<i>This beneficiary takes advantage of the natural abundance of fauna (i.e., not farm-raised or domesticated animals) for fur or hides for commercial use or sale.</i>	• fauna	• bobcats, coyotes	• organisms (i.e., mammals and reptiles) that provide fur or hides for commercial use or sale	
25.03 Government, Municipal, and Residential						
25.0303 Residential Property Owners	531, 532, 814	<i>While changes in property value are not a FEGS, residential property owners are affected by the environment in which their property resides.</i>	• presence of the environment		• opportunity for placement of infrastructure and reduced/increased risk of fire and pest infestation on the property	

25. SCRUBLANDS / SHRUBLANDS

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
25.0304 Military / Coast Guard	928	<i>The Military / Coast Guard relies on the environment for the placement of infrastructure (e.g., ports, bases, etc.) or conditions for training activities.</i>	<ul style="list-style-type: none"> • presence of the environment • open space 		<ul style="list-style-type: none"> • opportunity for placement of infrastructure • suitable conditions for training activities 	
25.04 Commercial / Military Transportation						
25.0401 Transporters of Goods	482, 484, 485, 486	<i>This beneficiary uses the environment as a media to transport goods - specifically, via boats (e.g., barges), airplanes, and overland/off-road vehicles (e.g., quads).</i>	<ul style="list-style-type: none"> • presence of the environment • land 		<ul style="list-style-type: none"> • opportunity for the transportation of goods • medium for and conditions that support the transportation of goods 	
25.0402 Transporters of People	482, 484, 485, 487	<i>This beneficiary uses the environment as a media to transport people - specifically, via boats (e.g., cruise liners, ferries, tour boats), airplanes, and overland/off-road vehicles.</i>	<ul style="list-style-type: none"> • presence of the environment • land 		<ul style="list-style-type: none"> • opportunity for the transportation of people • medium for and conditions that support the transportation of people 	
25.05 Subsistence						
25.0502 Food Subsisters	None	<i>Food Subsisters use the natural abundance of [edible] flora, fungi, and fauna whether collecting, hunting, or fishing as a major supplement to their existence.</i>	<ul style="list-style-type: none"> • flora • fauna 	<ul style="list-style-type: none"> • rabbit 	<ul style="list-style-type: none"> • edible organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) that are gathered for personal use (i.e., not for sale) • edible organisms (i.e., birds, mammals, reptiles, etc.) that are hunted for personal use (i.e., not for sale) 	
25.0503 Timber, Fiber, and Fur / Hide Subsisters	None	<i>This beneficiary relies on the natural abundance of timber, fiber, and [fauna for] fur / hide for survival. Timber, fiber, and fur / hide used for building material is accounted for in this category.</i>	<ul style="list-style-type: none"> • timber • fiber • fauna 	<ul style="list-style-type: none"> • grasses, cacti • rabbit, bobcat 	<ul style="list-style-type: none"> • timber (i.e., trees) used for clothing/warmth, infrastructure, housing, roofing, and/or fuel for personal use (i.e., not for sale) • fiber used for clothing/warmth, infrastructure, housing, roofing, and/or fuel for personal use (i.e., not for sale) • organisms (i.e., mammals and reptiles) that provide fur or hides used for clothing/warmth, infrastructure, housing, roofing, and/or fuel for personal use (i.e., not for sale) 	
25.06 Recreational						
25.0601 Experiencers and Viewers	None	<i>This beneficiary views and experiences the environment via an activity, such as scenery gazing, hiking, bird watching, botanizing, ice skating, rock climbing, flying kites, etc. This beneficiary does not have physical contact with water.</i>	<ul style="list-style-type: none"> • presence of the environment • viewscapes • flora • fauna • sounds and scents 		<ul style="list-style-type: none"> • opportunity to view the environment and organisms within it • landscape that provides a sensory experience • organisms (i.e., flowers, plants, etc.) that can be viewed • organisms (i.e., birds, mammals, reptiles, etc.) that can be viewed • sounds and scents that provide a sensory experience 	

25. SCRUBLANDS / SHRUBLANDS

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
25.0602 Food Pickers and Gatherers	None	<i>This beneficiary recreationally picks or gathers from the natural abundance of [edible] flora, fungi, and some fauna (as long as it is not fished or hunted). This beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • flora • fauna 		<ul style="list-style-type: none"> • edible organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) that are picked and/or gathered for personal use (i.e., not for sale) • edible organisms (i.e., insects, some aquatic organisms, etc.) that are picked and/or gathered (i.e., not hunted or fished) for personal use (i.e., not for sale) 	
25.0603 Hunters	None	<i>This beneficiary is primarily interested in hunting mammals and fowl (not flora or fungi) recreationally (i.e., not for survival). In aquatic environments, this beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • fauna 		<ul style="list-style-type: none"> • organisms (i.e., birds, mammals, reptiles, etc.) that can be hunted 	
25.07 Inspirational						
25.0701 Spiritual and Ceremonial Participants and Participants of Celebration	813	<i>This beneficiary uses the environment for spiritual, ceremonial, or celebratory purposes, such as harvest festivals, seafood festivals, Native American observances, religious rites (i.e., baptisms, weddings), personal growth, etc.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity and conditions for spiritual and ceremonial practices and celebrations 	
25.0702 Artists	339, 423, 424, 512, 711	<i>Artists, amateur and professional, utilize the environment or their experience in the environment to produce art. This category may include writers, cinematographers, and recording artist among others.</i>	<ul style="list-style-type: none"> • presence of the environment • viewsapes • sounds and scents • natural materials 		<ul style="list-style-type: none"> • opportunity for a sensory experience [which may lead to the benefit of inspiration for art] • landscape that provides a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., films, soundtracks, etc.) • sounds and scents that provide a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., films, soundtracks, etc.) • natural materials that provide a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., sculpture, mixed media paintings, etc.) 	
25.08 Learning						
25.0801 Educators and Students	611	<i>This beneficiary includes both formal and self-taught educators and students. All parts of the environment are of interest.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunities to understand, communicate, and educate 	
25.0802 Researchers	541, 611	<i>Researchers are interested in the environment for academic and applied purposes and as a group do not discriminate over which parts of the environment are of interest.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • research opportunities 	
25.09 Non-Use						

25. SCRUBLANDS / SHRUBLANDS

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
25.0901 People Who Care (Existence)	813, 924	<i>This non-use beneficiary believes it is important to preserve the environment because of a moral/ethical connection or for fear of unintended consequences.</i>	• presence of the environment		• knowing that the environment exists	
25.0902 People Who Care (Option / Bequest)	813, 924	<i>Option/Bequest non-use beneficiaries consider that they or future generations may visit or rely on the environment. This includes beneficiaries that value the traditional aspects or features of an activity or FEGS.</i>	• presence of the environment		• knowing that the environment exists	

26. BARREN / ROCK AND SAND

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
26.01 Agricultural						
26.0102 CAFO Operators	112	<i>This beneficiary raises large, dense populations of livestock in a confined area (whether indoors or outdoors).</i>	• open space		• suitable conditions (i.e., land) to hold livestock and site the CAFO operation	
26.02 Commercial / Industrial						
26.0202 Timber, Fiber, and Ornamental Extractors	339, 424, 453, 454	<i>Timber, fiber, and ornamental extractors rely on the environment for products used or sold commercially. Only non-cultivated, renewable material (i.e., NOT oil, ore, gems, etc.) are considered FEGS.</i>	• natural materials	• shells, driftwood	• non-cultivated ornamental products or by-products (from cultivation) used ornamentally for commercial use or sale	
26.0205 Electric and other Energy Generators	221	<i>This beneficiary relies on the environment for energy or placement of power generation structures, including dams, wind, water, or wave turbines, solar panels, geothermal systems, etc.</i>	• presence of the environment		• opportunity to install power generation structures	
26.0206 Resource-Dependent Businesses	487, 712, 713, 721, 722	<i>Without the environment, this beneficiary would not have the opportunity for businesses, including marinas, stables, and ecotourism (e.g., rafting companies, hot air balloon companies, beach resorts, hot springs, ice hotels) - but not farm or forest land.</i>	• presence of the environment		• opportunity for placement of infrastructure and reduced/increased risk of erosion, fire, and pest infestation on the property	
26.0207 Pharmaceutical and Food Supplement Suppliers	325, 339, 424	<i>This beneficiary collects organisms from the wild that are used as or for the basis of pharmaceuticals or food supplements for commercial sale. This beneficiary relies on the natural abundance of target organisms.</i>	• flora • fauna	• cacti, aloe vera • snake venom	• organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) used in medicines or sold for medicinal purposes • organisms (i.e., birds, mammals, reptiles, etc.) or products associated with organisms (i.e., oils, fats, keratin, etc.) used in medicines or sold for medicinal purposes	
26.0208 Fur / Hide Trappers and Hunters	114	<i>This beneficiary takes advantage of the natural abundance of fauna (i.e., not farm-raised or domesticated animals) for fur or hides for commercial use or sale.</i>	• fauna	• armadillos, coyotes, snakes	• organisms (i.e., mammals and reptiles) that provide fur or hides for commercial use or sale	
26.03 Government, Municipal, and Residential						
26.0303 Residential Property Owners	531, 532, 814	<i>While changes in property value are not a FEGS, residential property owners are affected by the environment in which their property resides.</i>	• presence of the environment		• opportunity for placement of infrastructure and reduced/increased risk of erosion, fire, and pest infestation on the property	
26.0304 Military / Coast Guard	928	<i>The Military / Coast Guard relies on the environment for the placement of infrastructure (e.g., ports, bases, etc.) or conditions for training activities.</i>	• presence of the environment • open space		• opportunity for placement of infrastructure • suitable conditions for training activities	
26.04 Commercial / Military Transportation						
26.0401 Transporters of Goods	482, 484, 485, 486	<i>This beneficiary uses the environment as a media to transport goods - specifically, via boats (e.g., barges), airplanes, and overland/off-road vehicles (e.g., quads).</i>	• presence of the environment • land		• opportunity for the transportation of goods • medium for and conditions that support the transportation of goods	

26. BARREN / ROCK AND SAND

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
26.0402 Transporters of People	482, 484, 485, 487	<i>This beneficiary uses the environment as a media to transport people - specifically, via boats (e.g., cruise liners, ferries, tour boats), airplanes, and overland/off-road vehicles.</i>	<ul style="list-style-type: none"> • presence of the environment • land 		<ul style="list-style-type: none"> • opportunity for the transportation of people • medium for and conditions that support the transportation of people 	
26.06 Recreational						
26.0601 Experiencers and Viewers	None	<i>This beneficiary views and experiences the environment via an activity, such as scenery gazing, hiking, bird watching, botanizing, ice skating, rock climbing, flying kites, etc. This beneficiary does not have physical contact with water.</i>	<ul style="list-style-type: none"> • presence of the environment • viewscapes • flora • fauna • sounds and scents 		<ul style="list-style-type: none"> • opportunity to view the environment and organisms within it • landscape that provides a sensory experience • organisms (i.e., flowers, plants, etc.) that can be viewed • organisms (i.e., birds, mammals, reptiles, etc.) that can be viewed • sounds and scents that provide a sensory experience 	
26.0603 Hunters	None	<i>This beneficiary is primarily interested in hunting mammals and fowl (not flora or fungi) recreationally (i.e., not for survival). In aquatic environments, this beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • fauna 	<ul style="list-style-type: none"> • armadillos, coyotes, snakes 	<ul style="list-style-type: none"> • organisms (i.e., birds, mammals, reptiles, etc.) that can be hunted 	
26.07 Inspirational						
26.0701 Spiritual and Ceremonial Participants and Participants of Celebration	813	<i>This beneficiary uses the environment for spiritual, ceremonial, or celebratory purposes, such as harvest festivals, seafood festivals, Native American observances, religious rites (i.e., baptisms, weddings), personal growth, etc.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity and conditions for spiritual and ceremonial practices and celebrations 	
26.0702 Artists	339, 423, 424, 512, 711	<i>Artists, amateur and professional, utilize the environment or their experience in the environment to produce art. This category may include writers, cinematographers, and recording artist among others.</i>	<ul style="list-style-type: none"> • presence of the environment • viewscapes • sounds and scents • natural materials 		<ul style="list-style-type: none"> • opportunity for a sensory experience [which may lead to the benefit of inspiration for art] • landscape that provides a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., films, soundtracks, etc.) • sounds and scents that provide a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., films, soundtracks, etc.) • natural materials that provide a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., sculpture, mixed media paintings, etc.) 	
26.08 Learning						
26.0801 Educators and Students	611	<i>This beneficiary includes both formal and self-taught educators and students. All parts of the environment are of interest.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunities to understand, communicate, and educate 	

26. BARREN / ROCK AND SAND

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
26.0802 Researchers	541, 611	<i>Researchers are interested in the environment for academic and applied purposes and as a group do not discriminate over which parts of the environment are of interest.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • research opportunities 	
26.09 Non-Use						
26.0901 People Who Care (Existence)	813, 924	<i>This non-use beneficiary believes it is important to preserve the environment because of a moral/ethical connection or for fear of unintended consequences.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • knowing that the environment exists 	
26.0902 People Who Care (Option / Bequest)	813, 924	<i>Option/Bequest non-use beneficiaries consider that they or future generations may visit or rely on the environment. This includes beneficiaries that value the traditional aspects or features of an activity or FEGS.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • knowing that the environment exists 	

27. TUNDRA

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
27.01 Agricultural						
27.0103 Livestock Grazers	112	<i>This beneficiary uses the environment to graze livestock. Cultivated vegetation is NOT considered a FEGS. For agroecosystems, "planted" pastures only provide space and opportunity to grow feed (not the vegetation itself).</i>	<ul style="list-style-type: none"> • flora • open space 	<ul style="list-style-type: none"> • grasses, sedges 	<ul style="list-style-type: none"> • non-cultivated vegetation for livestock consumption • suitable conditions (i.e., land) to graze livestock 	
27.02 Commercial / Industrial						
27.0201 Food Extractors	114, 311, 312, 454	<i>Food extractors utilize the natural abundance of edible organisms (i.e., non-cultivated or bred) for commercial use or sale. Includes commercial and native hunters (if legal). In aquatic environments, this beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • flora • fauna 	<ul style="list-style-type: none"> • blueberries, bearberries • duck, caribou, reindeer 	<ul style="list-style-type: none"> • edible organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) for commercial use or sale • edible organisms (i.e., birds, mammals, reptiles, etc.) for commercial use or sale 	
27.0202 Timber, Fiber, and Ornamental Extractors	114, 311, 312, 454	<i>Timber, fiber, and ornamental extractors rely on the environment for products used or sold commercially. Only non-cultivated, renewable material (i.e., NOT oil, ore, gems, etc.) are considered FEGS.</i>	<ul style="list-style-type: none"> • fiber • natural materials 	<ul style="list-style-type: none"> • sphagnum, grasses • lichens 	<ul style="list-style-type: none"> • non-cultivated fiber for commercial use or sale • non-cultivated ornamental products or by-products (from cultivation) used ornamentally for commercial use or sale 	
27.0205 Electric and other Energy Generators	221	<i>This beneficiary relies on the environment for energy or placement of power generation structures, including dams, wind, water, or wave turbines, solar panels, geothermal systems, etc.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity to install power generation structures 	
27.0206 Resource-Dependent Businesses	487, 712, 713, 721, 722	<i>Without the environment, this beneficiary would not have the opportunity for businesses, including marinas, stables, and ecotourism (e.g., rafting companies, hot air balloon companies, beach resorts, hot springs, ice hotels) - but not farm or forest land.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity for placement of infrastructure and reduced/increased risk of pest infestation on the property 	
27.0207 Pharmaceutical and Food Supplement Suppliers	325, 339, 424	<i>This beneficiary collects organisms from the wild that are used as or for the basis of pharmaceuticals or food supplements for commercial sale. This beneficiary relies on the natural abundance of target organisms.</i>	<ul style="list-style-type: none"> • flora • fauna 	<ul style="list-style-type: none"> • lichens, mosses • [rein]deer antler velvet 	<ul style="list-style-type: none"> • organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) used in medicines or sold for medicinal purposes • organisms (i.e., birds, mammals, reptiles, etc.) or products associated with organisms (i.e., oils, fats, keratin, etc.) used in medicines or sold for medicinal purposes 	
27.0208 Fur / Hide Trappers and Hunters	114	<i>This beneficiary takes advantage of the natural abundance of fauna (i.e., not farm-raised or domesticated animals) for fur or hides for commercial use or sale.</i>	<ul style="list-style-type: none"> • fauna 	<ul style="list-style-type: none"> • bear, caribou, fox, musk ox, ptarmigan 	<ul style="list-style-type: none"> • organisms (i.e., mammals and reptiles) that provide fur or hides for commercial use or sale 	
27.03 Government, Municipal, and Residential						
27.0303 Residential Property Owners	531, 532, 414	<i>While changes in property value are not a FEGS, residential property owners are affected by the environment in which their property resides.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity for placement of infrastructure and reduced/increased risk of pest infestation on the property 	

27. TUNDRA

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
27.0304 Military / Coast Guard	928	<i>The Military / Coast Guard relies on the environment for the placement of infrastructure (e.g., ports, bases, etc.) or conditions for training activities.</i>	<ul style="list-style-type: none"> • presence of the environment • open space 		<ul style="list-style-type: none"> • opportunity for placement of infrastructure • suitable conditions for training activities 	
27.04 Commercial / Military Transportation						
27.0401 Transporters of Goods	482, 484, 485, 486	<i>This beneficiary uses the environment as a media to transport goods - specifically, via boats (e.g., barges), airplanes, and overland/off-road vehicles (e.g., quads).</i>	<ul style="list-style-type: none"> • presence of the environment • land 		<ul style="list-style-type: none"> • opportunity for the transportation of goods • medium for and conditions that support the transportation of goods 	
27.0402 Transporters of People	482, 484, 485, 487	<i>This beneficiary uses the environment as a media to transport people - specifically, via boats (e.g., cruise liners, ferries, tour boats), airplanes, and overland/off-road vehicles.</i>	<ul style="list-style-type: none"> • presence of the environment • land 		<ul style="list-style-type: none"> • opportunity for the transportation of people • medium for and conditions that support the transportation of people 	
27.05 Subsistence						
27.0502 Food Subsisters	None	<i>Food Subsisters use the natural abundance of [edible] flora, fungi, and fauna whether collecting, hunting, or fishing as a major supplement to their existence.</i>	<ul style="list-style-type: none"> • flora • fauna 	<ul style="list-style-type: none"> • bear, caribou, fox, musk ox, ptarmigan 	<ul style="list-style-type: none"> • edible organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) that are gathered for personal use (i.e., not for sale) • edible organisms (i.e., birds, mammals, reptiles, etc.) that are hunted for personal use (i.e., not for sale) 	
27.0503 Timber, Fiber, and Fur / Hide Subsisters	None	<i>This beneficiary relies on the natural abundance of timber, fiber, and [fauna for] fur / hide for survival. Timber, fiber, and fur / hide used for building material is accounted for in this category.</i>	<ul style="list-style-type: none"> • timber • fiber • fauna 	<ul style="list-style-type: none"> • sedges, grasses • bear, caribou, fox, musk ox, ptarmigan 	<ul style="list-style-type: none"> • timber (i.e., trees) used for clothing/warmth, infrastructure, housing, roofing, and/or fuel for personal use (i.e., not for sale) • fiber used for clothing/warmth, infrastructure, housing, roofing, and/or fuel for personal use (i.e., not for sale) • organisms (i.e., mammals and reptiles) that provide fur or hides used for clothing/warmth, infrastructure, housing, roofing, and/or fuel for personal use (i.e., not for sale) 	
27.06 Recreational						
27.0601 Experiencers and Viewers	None	<i>This beneficiary views and experiences the environment via an activity, such as scenery gazing, hiking, bird watching, botanizing, ice skating, rock climbing, flying kites, etc. This beneficiary does not have physical contact with water.</i>	<ul style="list-style-type: none"> • presence of the environment • viewscapes • flora • fauna • sounds and scents 		<ul style="list-style-type: none"> • opportunity to view the environment and organisms within it • landscape that provides a sensory experience • organisms (i.e., flowers, plants, etc.) that can be viewed • organisms (i.e., birds, mammals, reptiles, etc.) that can be viewed • sounds and scents that provide a sensory experience 	

27. TUNDRA

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
27.0602 Food Pickers and Gatherers	None	<i>This beneficiary recreationally picks or gathers from the natural abundance of [edible] flora, fungi, and some fauna (as long as it is not fished or hunted). This beneficiary has potential contact with water.</i>	• flora		• edible organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) that are picked and/or gathered for personal use (i.e., not for sale)	
27.0603 Hunters	None	<i>This beneficiary is primarily interested in hunting mammals and fowl (not flora or fungi) recreationally (i.e., not for survival). In aquatic environments, this beneficiary has potential contact with water.</i>	• fauna	• bear, caribou, fox, musk ox, ptarmigan	• organisms (i.e., birds, mammals, reptiles, etc.) that can be hunted	
27.07 Inspirational						
27.0701 Spiritual and Ceremonial Participants and Participants of Celebration	813	<i>This beneficiary uses the environment for spiritual, ceremonial, or celebratory purposes, such as harvest festivals, seafood festivals, Native American observances, religious rites (i.e., baptisms, weddings), personal growth, etc.</i>	• presence of the environment		• opportunity and conditions for spiritual and ceremonial practices and celebrations	
27.0702 Artists	339, 423, 424, 512, 711	<i>Artists, amateur and professional, utilize the environment or their experience in the environment to produce art. This category may include writers, cinematographers, and recording artist among others.</i>	• presence of the environment • viewsapes • sounds and scents • natural materials		• opportunity for a sensory experience [which may lead to the benefit of inspiration for art] • landscape that provides a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., films, soundtracks, etc.) • sounds and scents that provide a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., films, soundtracks, etc.) • natural materials that provide a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., sculpture, mixed media paintings, etc.)	
27.08 Learning						
27.0801 Educators and Students	611	<i>This beneficiary includes both formal and self-taught educators and students. All parts of the environment are of interest.</i>	• presence of the environment		• opportunities to understand, communicate, and educate	
27.0802 Researchers	541, 611	<i>Researchers are interested in the environment for academic and applied purposes and as a group do not discriminate over which parts of the environment are of interest.</i>	• presence of the environment		• research opportunities	
27.09 Non-Use						
27.0901 People Who Care (Existence)	813, 924	<i>This non-use beneficiary believes it is important to preserve the environment because of a moral/ethical connection or for fear of unintended consequences.</i>	• presence of the environment		• knowing that the environment exists	

27. TUNDRA

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
27.0902 People Who Care (Option / Bequest)	813, 924	<i>Option/Bequest non-use beneficiaries consider that they or future generations may visit or rely on the environment. This includes beneficiaries that value the traditional aspects or features of an activity or FEGS.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • knowing that the environment exists 	

28. ICE AND SNOW

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
28.02 Commercial / Industrial						
28.0206 Resource-Dependent Businesses	487, 712, 713, 721, 722	<i>Without the environment, this beneficiary would not have the opportunity for businesses, including marinas, stables, and ecotourism (e.g., rafting companies, hot air balloon companies, beach resorts, hot springs, ice hotels) - but not farm or forest land.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity for placement of infrastructure and reduced/increased risk of avalanches on the property 	
28.0208 Fur / Hide Trappers and Hunters	114	<i>This beneficiary takes advantage of the natural abundance of fauna (i.e., not farm-raised or domesticated animals) for fur or hides for commercial use or sale.</i>	<ul style="list-style-type: none"> • fauna 	<ul style="list-style-type: none"> • arctic fox, wolverines, bears 	<ul style="list-style-type: none"> • organisms (i.e., mammals and reptiles) that provide fur or hides for commercial use or sale 	
28.03 Government, Municipal, and Residential						
28.0303 Residential Property Owners	531, 532, 814	<i>While changes in property value are not a FEGS, residential property owners are affected by the environment in which their property resides.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity for placement of infrastructure and reduced/increased risk of avalanches on the property 	
28.0304 Military / Coast Guard	928	<i>The Military / Coast Guard relies on the environment for the placement of infrastructure (e.g., ports, bases, etc.) or conditions for training activities.</i>	<ul style="list-style-type: none"> • presence of the environment • open space 		<ul style="list-style-type: none"> • opportunity for placement of infrastructure • suitable conditions for training activities 	
28.04 Commercial / Military Transportation						
28.0401 Transporters of Goods	482, 484, 485, 486	<i>This beneficiary uses the environment as a media to transport goods - specifically, via boats (e.g., barges), airplanes, and overland/off-road vehicles (e.g., quads).</i>	<ul style="list-style-type: none"> • presence of the environment • land 		<ul style="list-style-type: none"> • opportunity for the transportation of goods • medium for and conditions that support the transportation of goods 	
28.0402 Transporters of People	482, 484, 485, 487	<i>This beneficiary uses the environment as a media to transport people - specifically, via boats (e.g., cruise liners, ferries, tour boats), airplanes, and overland/off-road vehicles.</i>	<ul style="list-style-type: none"> • presence of the environment • land 		<ul style="list-style-type: none"> • opportunity for the transportation of people • medium for and conditions that support the transportation of people 	
28.05 Subsistence						
28.0501 Water Subsisters	None	<i>Water Subsisters rely on a natural source for drinking water and may use wells or cisterns for storage (i.e., they do not receive municipal drinking water). Water purity is important, as water is not or only minimally treated.</i>	<ul style="list-style-type: none"> • water 		<ul style="list-style-type: none"> • water (from melting snow and ice) suitable for drinking (i.e., human consumption) 	
28.0502 Food Subsisters	None	<i>Food Subsisters use the natural abundance of [edible] flora, fungi, and fauna whether collecting, hunting, or fishing as a major supplement to their existence.</i>	<ul style="list-style-type: none"> • fauna 	<ul style="list-style-type: none"> • caribou, yak, fox, polar bears 	<ul style="list-style-type: none"> • edible organisms (i.e., birds, mammals, reptiles, etc.) that are hunted for personal use (i.e., not for sale) 	
28.0503 Timber, Fiber, and Fur / Hide Subsisters	None	<i>This beneficiary relies on the natural abundance of timber, fiber, and [fauna for] fur / hide for survival. Timber, fiber, and fur / hide used for building material is accounted for in this category.</i>	<ul style="list-style-type: none"> • fauna 	<ul style="list-style-type: none"> • caribou, yak, fox, polar bears 	<ul style="list-style-type: none"> • organisms (i.e., mammals and reptiles) that provide fur or hides used for clothing/warmth, infrastructure, housing, roofing, and/or fuel for personal use (i.e., not for sale) 	

28. ICE AND SNOW

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
28.0504 Building Material Subsisters	None	<i>This beneficiary relies on the environment to provide renewable, non-cellular material (primarily snow and ice) used for infrastructure and housing for personal use (i.e., not for commercial sale).</i>	• substrate	• snow and ice	• renewable, non-cellular material used for infrastructure, housing, and roofing (i.e., not for sale)	
28.06 Recreational						
28.0601 Experiencers and Viewers	None	<i>This beneficiary views and experiences the environment via an activity, such as scenery gazing, hiking, bird watching, botanizing, ice skating, rock climbing, flying kites, etc. This beneficiary does not have physical contact with water.</i>	• presence of the environment • viewscapes • fauna • sounds and scents		• opportunity to view the environment and organisms within it • landscape that provides a sensory experience • organisms (i.e., birds, mammals, reptiles, etc.) that can be viewed • sounds and scents that provide a sensory experience	
28.0603 Hunters	None	<i>This beneficiary is primarily interested in hunting mammals and fowl (not flora or fungi) recreationally (i.e., not for survival). In aquatic environments, this beneficiary has potential contact with water.</i>	• fauna	• caribou, yak, fox, polar bears	• organisms (i.e., birds, mammals, reptiles, etc.) that can be hunted	
28.07 Inspirational						
28.0701 Spiritual and Ceremonial Participants and Participants of Celebration	813	<i>This beneficiary uses the environment for spiritual, ceremonial, or celebratory purposes, such as harvest festivals, seafood festivals, Native American observances, religious rites (i.e., baptisms, weddings), personal growth, etc.</i>	• presence of the environment		• opportunity and conditions for spiritual and ceremonial practices and celebrations	
28.0702 Artists	339, 423, 424, 512, 711	<i>Artists, amateur and professional, utilize the environment or their experience in the environment to produce art. This category may include writers, cinematographers, and recording artist among others.</i>	• presence of the environment • viewscapes • sounds and scents • natural materials	• ice cracking • ice	• opportunity for a sensory experience [which may lead to the benefit of inspiration for art] • landscape that provides a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., films, soundtracks, etc.) • sounds and scents that provide a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., films, soundtracks, etc.) • natural materials that provide a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., sculpture, mixed media paintings, etc.)	
28.08 Learning						
28.0801 Educators and Students	611	<i>This beneficiary includes both formal and self-taught educators and students. All parts of the environment are of interest.</i>	• presence of the environment		• opportunities to understand, communicate, and educate	

28. ICE AND SNOW

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
28.0802 Researchers	541, 611	<i>Researchers are interested in the environment for academic and applied purposes and as a group do not discriminate over which parts of the environment are of interest.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • research opportunities 	
28.09 Non-Use						
28.0901 People Who Care (Existence)	813, 924	<i>This non-use beneficiary believes it is important to preserve the environment because of a moral/ethical connection or for fear of unintended consequences.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • knowing that the environment exists 	
28.0902 People Who Care (Option / Bequest)	813, 924	<i>Option/Bequest non-use beneficiaries consider that they or future generations may visit or rely on the environment. This includes beneficiaries that value the traditional aspects or features of an activity or FEGS.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • knowing that the environment exists 	

31. ATMOSPHERE

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
31.01 Agricultural						
31.0102 CAFO Operators	112	<i>This beneficiary raises large, dense populations of livestock in a confined area (whether indoors or outdoors).</i>	<ul style="list-style-type: none"> • water • presence of the environment • air • weather 		<ul style="list-style-type: none"> • water (via precipitation) for livestock consumption • opportunity to discharge odors into the environment • medium for and capacity to dissipate odors produced by [dense herds of] livestock • for outdoor CAFOs, suitable atmospheric conditions [in temperature, precipitation, or wind] for livestock survival 	
31.0103 Livestock Grazers	112	<i>This beneficiary uses the environment to graze livestock. Cultivated vegetation is NOT considered a FEGS. For agroecosystems, "planted" pastures only provide space and opportunity to grow feed (not the vegetation itself).</i>	<ul style="list-style-type: none"> • weather 		<ul style="list-style-type: none"> • for outdoor CAFOs, suitable atmospheric conditions [in temperature, precipitation, or wind] for livestock survival 	
31.0106 Farmers	111, 113	<i>Farmers may plant annual crops (e.g., corn, soybeans, rice) or introduce cultivars that produce perennial, long-term crops (e.g., hay, grapes, cranberries, watercress, Christmas trees). Note that Farmers and Irrigators are different beneficiaries.</i>	<ul style="list-style-type: none"> • water • weather 		<ul style="list-style-type: none"> • water (via precipitation) for crops • suitable atmospheric conditions [in temperature, precipitation, or wind] for farming activities 	
31.0107 Foresters	113	<i>Foresters introduce tree cultivars and nurture those cultivars as they grow into trees, which are harvested. The rotation for the tree crops may be as short as 10 years or many decades.</i>	<ul style="list-style-type: none"> • water • weather 		<ul style="list-style-type: none"> • water (via precipitation) for trees • suitable atmospheric conditions [in temperature, precipitation, or wind] for forestry activities 	
31.02 Commercial / Industrial						
31.0203 Residential Property Owners	531, 532, 814	<i>This beneficiary primarily consumes water for cooling, producing pulp, etc. The water has no contact with edibles.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • reduced/increased risk of damage of the property, for example, by lightning strikes 	
31.0204 Industrial Dischargers	211, 212, 221, 311-339	<i>Industrial dischargers use the environment [only] for discharging water, material (i.e., sand and gravel, garbage), and emissions. Hydraulic fracking practices involve industrial discharge to groundwater.</i>	<ul style="list-style-type: none"> • presence of the environment • air 		<ul style="list-style-type: none"> • opportunity to discharge into the environment • medium for receiving industrial discharge 	
31.0205 Electric and other Energy Generators	221	<i>This beneficiary relies on the environment for energy or placement of power generation structures, including dams, wind, water, or wave turbines, solar panels, geothermal systems, etc.</i>	<ul style="list-style-type: none"> • presence of the environment • wind 		<ul style="list-style-type: none"> • opportunity to install power generation structures • suitable wind speeds for power generation 	
31.0206 Resource-Dependent Businesses	487, 712, 713, 721, 722	<i>Without the environment, this beneficiary would not have the opportunity for businesses, including marinas, stables, and ecotourism (e.g., rafting companies, hot air balloon companies, beach resorts, hot springs, ice hotels) - but not farm or forest land.</i>	<ul style="list-style-type: none"> • presence of the environment • weather • air 		<ul style="list-style-type: none"> • reduced/increased risk of damage of the property, for example, by lightning strikes • suitable atmospheric conditions [in temperature, precipitation, or wind] for establishing and maintaining property • suitable [clean /clear] air for establishing and maintaining property, and the opportunity for viewscapes 	

31. ATMOSPHERE

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
31.03 Government, Municipal, and Residential						
31.0304 Military / Coast Guard	928	<i>The Military / Coast Guard relies on the environment for the placement of infrastructure (e.g., ports, bases, etc.) or conditions for training activities.</i>	<ul style="list-style-type: none"> • presence of the environment • open space 		<ul style="list-style-type: none"> • opportunity for training activities • suitable conditions for training activities 	
31.04 Commercial / Military Transportation						
31.0401 Transporters of Goods	481	<i>This beneficiary uses the environment as a media to transport goods - specifically, via boats (e.g., barges), airplanes, and overland/off-road vehicles (e.g., quads).</i>	<ul style="list-style-type: none"> • presence of the environment • air 		<ul style="list-style-type: none"> • opportunity for the transportation of goods • medium for and conditions that support the transportation of goods 	
31.0402 Transporters of People	481, 487	<i>This beneficiary uses the environment as a media to transport people - specifically, via boats (e.g., cruise liners, ferries, tour boats), airplanes, and overland/off-road vehicles.</i>	<ul style="list-style-type: none"> • presence of the environment • air 		<ul style="list-style-type: none"> • opportunity for the transportation of people • medium for and conditions that support the transportation of people 	
31.05 Subsistence						
31.0501 Water Subsisters	None	<i>Water Subsisters rely on a natural source for drinking water and may use wells or cisterns for storage (i.e., they do not receive municipal drinking water). Water purity is important, as water is not or only minimally treated.</i>	<ul style="list-style-type: none"> • water 		<ul style="list-style-type: none"> • water (from precipitation) suitable for drinking (i.e., human consumption), specifically via cisterns 	
31.06 Recreational						
31.0601 Experiencers and Viewers	None	<i>This beneficiary views and experiences the environment via an activity, such as scenery gazing, hiking, bird watching, botanizing, ice skating, rock climbing, flying kites, etc. This beneficiary does not have physical contact with water.</i>	<ul style="list-style-type: none"> • presence of the environment • viewscapes • fauna • atmospheric phenomena • sounds and scents • air • wind 	<ul style="list-style-type: none"> • clouds, sunsets 	<ul style="list-style-type: none"> • opportunity to view the environment and organisms within it, and atmospheric phenomena • sky that provides a sensory experience • organisms (specifically, birds) that can be viewed • atmospheric phenomena that can be viewed • sounds and scents that provide a sensory experience • suitable [clean / clear] air for visibility • wind for wind-dependent sports and recreation 	
31.0606 Boaters	None	<i>Boaters may use motorized (i.e., motor boats) or non-motorized boats (i.e., canoes, kayaks, rafts) to recreate. This beneficiary has potential contact with water.</i>	<ul style="list-style-type: none"> • wind 		<ul style="list-style-type: none"> • opportunity and conditions provided by wind for recreational [sail]boating 	
31.07 Inspirational						
31.0701 Spiritual and Ceremonial Participants and Participants of Celebration	813	<i>This beneficiary uses the environment for spiritual, ceremonial, or celebratory purposes, such as harvest festivals, seafood festivals, Native American observances, religious rites (i.e., baptisms, weddings), personal growth, etc.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunity and conditions for spiritual and ceremonial practices and celebrations 	

31. ATMOSPHERE

Beneficiary Categories and Sub-Categories	Potentially Relevant NAICS Code(s)	General Beneficiary Description	FEGS	Examples of FEGS	Importance of FEGS to the Beneficiary	Potential Metric(s) and/or Indicator(s)
31.0702 Artists	512, 711	<i>Artists, amateur and professional, utilize the environment or their experience in the environment to produce art. This category may include writers, cinematographers, and recording artist among others.</i>	<ul style="list-style-type: none"> • presence of the environment • viewscapes • sounds and scents 	<ul style="list-style-type: none"> • thunder, wind blowing 	<ul style="list-style-type: none"> • opportunity for a sensory experience [which may lead to the benefit of inspiration for art] • sky that provides a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., films, soundtracks, etc.) • sounds and scents that provide a sensory experience [which may lead to the benefit of inspiration for art] or can be directly used in art (e.g., films, soundtracks, etc.) 	
31.08 Learning						
31.0801 Educators and Students	611	<i>This beneficiary includes both formal and self-taught educators and students. All parts of the environment are of interest.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • opportunities to understand, communicate, and educate 	
31.0802 Researchers	541, 611	<i>Researchers are interested in the environment for academic and applied purposes and as a group do not discriminate over which parts of the environment are of interest.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • research opportunities 	
31.09 Non-Use						
31.0901 People Who Care (Existence)	813, 924	<i>This non-use beneficiary believes it is important to preserve the environment because of a moral/ethical connection or for fear of unintended consequences.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • knowing that the environment exists 	
31.0902 People Who Care (Option / Bequest)	813, 924	<i>Option/Bequest non-use beneficiaries consider that they or future generations may visit or rely on the environment. This includes beneficiaries that value the traditional aspects or features of an activity or FEGS.</i>	<ul style="list-style-type: none"> • presence of the environment 		<ul style="list-style-type: none"> • knowing that the environment exists 	
31.10 Humanity						
31.1001 All Humans	None	<i>All humans includes everyone, regardless of whether they actively recognize or appreciate the FEGS, because the FEGS are available to everyone and used by everyone to live.</i>	<ul style="list-style-type: none"> • air 		<ul style="list-style-type: none"> • suitable [healthful] air to breathe 	