

# Marine-Dependent People

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## In a nutshell

- Marine-dependent people are people engaged in activities directly related to the coastal marine environment, for commerce or recreation, or indirectly by providing services that support these activities.
- Marine-dependent people play an important role by providing the demand for or facilitating the delivery of ecosystem services.
- Changes in the coastal marine environment affect marine-dependent people by altering the level of benefits able to be delivered as ecosystem services.
- Regulations to protect or restore the coastal marine environment affect the ability of marine-dependent people to access benefits provided by ecosystem services.

## Define Resource

In a departure from the approach taken in the other MARES subregions, participants in the conceptual model workshop for the SEFC elected to incorporate people explicitly as a component in the *State* element of the DPSE model framework. The “marine-dependent people” submodel includes the people in the region who engage in activities directly related to the coastal marine environment, for commercial fishing and recreation, as well as the people who are indirectly engaged because they provide support for these activities. Marine-dependent people can be classified as primary users, secondary users, or tertiary users based on the degree to which their activities take place in or near the coastal marine environment (Table 1).

Primary users are those individuals or groups who actively engage in activities in or on the water and who are directly dependent on the marine resource. The economic study of

the recreational use of the Florida reef by Johns *et al.* (2001) identified primary users as “boaters who are recreational fishers, reef divers, reef snorkelers, and/or visitors viewing the reefs on glass-bottom boats.” As defined here, primary users include similar users of other coastal marine habitats, i.e., hardbottom communities, seagrass beds, coastal wetlands, mangroves, and beaches, and commercial fishers in addition to the strictly recreational users identified by Johns *et al.* (2001).

Secondary users are one step removed from direct interaction with the marine resource, but who provide enabling support for the primary users.

Tertiary users are those who don’t directly interact with the coastal marine environment, but whose activities support the primary and secondary users.

**Table 1. Activities engaged in by marine-dependent people.**

Primary Users	Secondary Users	Tertiary Users
1. SCUBA divers/snorkelers	8. Marinas	13. Hotels
2. Recreational fishermen	9. Bait and tackle shops	14. Restaurants and fish houses
3. Swimmers, surfers, other non-motorized users	10. Boat rentals/other, commercial recreational providers	15. Souvenir shops
4. Commercial fishermen	11. Dive shops	16. Transportation services (e.g., bus, rental car, etc.)
5. Dive boat operators	12. Employees of secondary users	17. Service stores (seafood markets, grocery stores, departments, etc.)
6. Party/charter boat operators		18. Employees of tertiary users
7. Fishing guides		

Similar categories are used by others to identify people who depend directly on the coastal marine environment either for their livelihood or for recreation (cf., Johns *et al.*, 2001, 2004). The group identified as stakeholders in the Florida Department of Environmental Protection’s Coral Reef Conservation Program is more inclusive, including management agencies at the federal, state, and local level, researchers, non-governmental organizations, port authorities, environmental consultants, teachers, and water resource managers in addition to the primary users defined here (Jamie Monty, personal communication). In comparison to the marine economy as described by Pendleton (n.d.), “marine-dependent people” identified here correspond to the commercial fishery sector and coastal and estuarine recreation sector, combined. The entire marine economy defined by Pendleton includes these additional sectors—critical energy infrastructure, marine transportation, and coastal real estate—as comprising the marine economy.

## Geographic extent

Marine-dependent people make use of the entire SEFC marine ecosystem.

## Role of Marine-Dependent People in the Ecosystem

Marine-dependent people play an intermediary role in the delivery of *Ecosystem Services* provided by the coastal marine ecosystem (Figure 1; Table 2). The class of primary users

includes most of the recreational users in the coastal marine ecosystem. Primary users also include commercial fishers, who harvest the seafood that constitute the provisioning service to the general human population. The activities of primary users directly impact other components of the coastal marine environment through various Pressures. For example, the harvest activities of both recreational and commercial fishers have a significant effect on the species composition and population characteristics of fish and shellfish.

The activities of secondary and tertiary users of the coastal marine environment support the activities of primary users. This support facilitates the provision of *Ecosystem Services*. Often, this is essential, as in the role of marinas and dive shops, in providing access for primary users into the coastal marine environment, but the activities of secondary and tertiary users generally occur on land as opposed to in or on marine waters.

The activities of primary, secondary, and tertiary users are affected by changes in other components of the coastal marine environment. This connection occurs through the set of “attributes people care about” that characterize the condition of other components of the environment (Table 3).

## Key Attributes of Marine-Dependent People

Two types of information can be used to quantitatively characterize marine-dependent people. The first consists of various measures of the intensity of their individual

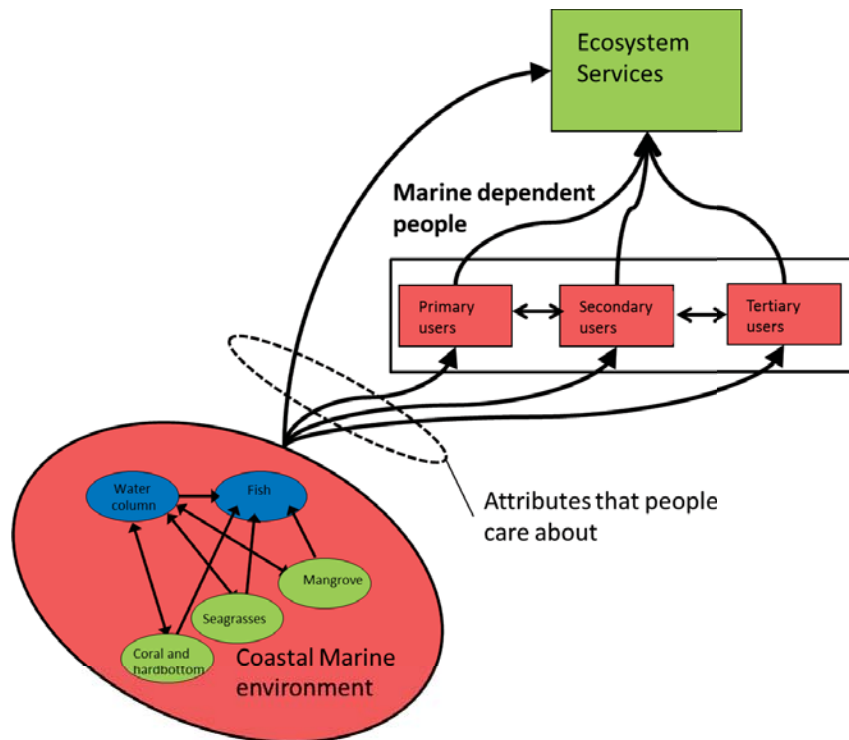


Figure 1. All marine-dependent people receive *Ecosystem Services* directly or indirectly and some act as intermediaries between these services and non-marine dependent people (e.g., commercial fishers providing fish for non-fishers).

activities. Information routinely collected on commercial fishing is an example of the first type of information. Information is collected on the types and amount of fish harvested and “landed” in port. Additional information can be collected to estimate the effort expended by commercial fishers in acquiring their catch, and this leads to the calculation of catch per unit effort, which is often taken as a measure of the abundance of the fished stock. The second type of information consists of measures of the number of people participating in these activities. Information on the number of participants can be collected directly, via surveys of actual use, and indirectly via the results of licensing activities. For example, the number of boat licenses issued annually provides information on the magnitude and trends in recreational versus commercial activities among primary users (Figure 2).

Information collected on marine-dependent people can be analyzed to estimate the magnitude, or value, of their activities in economic terms. This allows for comparisons to be made about the scale of the activities of marine-dependent people versus other sectors of the marine economy (cf., Pendleton, nd.) and other sectors of the general

regional economy. The studies by Johns *et al.* (2001, 2004) employed extensive survey research to measure the economic contribution and the use values of artificial and natural reefs over the 12-month period of June 2000 to May 2001. The reef users surveyed were boaters who are recreational fishers (commercial fishers were not included), reef divers, reef snorkelers, and/or visitors viewing the reefs on glass-bottom boats. Economic contribution was measured by total sales, income, employment, and tax revenues generated within each county. In addition, the opinions of resident reef-using

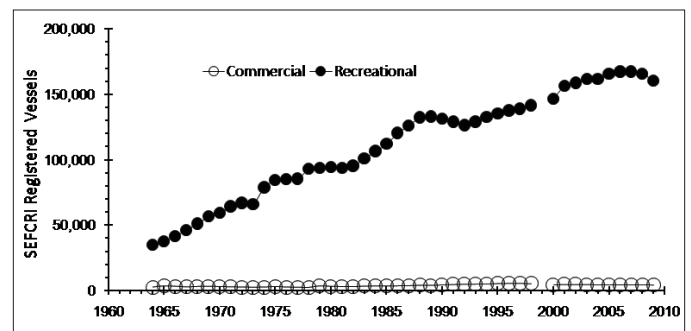


Figure 2. Licensed commercial and recreational vessels (data compiled by J. Ault).

**Table 2. Ecosystem services in which primary, secondary, and tertiary users serve as intermediaries in their delivery (numbers refer to users identified in Table 1).**

Ecosystem Service	Primary Users	Secondary Users	Tertiary Users
1. Beautiful, unique environment			15
2. Opportunity for beach activities and shoreline views	7	10	13, 14, 16
3. Opportunity for wildlife recreation activities		10	16
4. Protection of wildlife species			
5. Opportunity for bird-watching activities		10	16
6. Opportunity for recreational fishing, diving, snorkeling, and boating	5, 6, 7	8, 9, 10, 11	16
7. Clean air and quality of life			
8. Resources for research and development (e.g., inventions, new cures for illness)			
9. Living laboratory for education (K-12, colleges, and universities)			
10. Protection of wildlife species and habitats for current and future generations			
11. Protection of property from storm damages			
12. Supply of a variety of high-quality seafood	4		
13. Storm water retention, water treatment, nutrient cycling, and compliance with regulations			
14. Stable climate			
15. Opportunity to harvest commercial fish species	6, 7	8	
16. Opportunity to catch recreational fish species	6, 7	8, 9, 10	
17. Opportunity for subsistence fishing		8, 9	

boat owners regarding the existence or establishment of “no-take” zones as a tool to protect existing artificial and natural reefs were presented.

## Drivers of Change in Primary Use

Changes in primary use occur in response to environmental changes, regulations, and economic and/or social factors that affect demand for *Ecosystem Services* provided by the coastal marine environment. As a *State* component in the DPSE framework, marine-dependent people are sensitive to the effects that *Drivers* and *Pressures* exert on other

components of coastal marine environment of the SEFC. The *Response* by management agencies can affect access to the coastal marine environment by marine-dependent people, sometimes by providing facilities and enforcing regulations that increase access and sometimes by enforcing regulations that restrict access. Frequently, as in the case of the sanctuary preservation areas implemented by the Florida Keys National Marine Sanctuary, the main effect of regulation is to manage conflicts between competing uses of the coastal marine environment.

In addition to these environmental factors, the uses of the coastal marine environment by marine-dependent people are also affected by economic and other social factors that influence the demand for *Ecosystem Services*. This is a

**Table 3. Attributes people care about specific to primary, secondary, and tertiary users (numbers refer to users identified in Table 1).**

Attributes People Care About	Primary Users	Secondary Users	Tertiary Users
Aesthetics—on land	3		13, 14
Aesthetics—water-based recreation	1, 2, 3	8, 9, 10, 11	
Lots of healthy coral	1, 3, 5		
Lots of and large variety of fish	1, 2, 3, 4, 5, 6, 7		14, 17
Lots of and large variety of large wildlife (manatees, dolphins, sea turtles, game fish, sharks)	1, 2, 3, 5, 6, 7		
Quality of beaches and shoreline	3		13, 14
Ecosystem resilience to disturbance	1, 2, 3, 4, 5, 6, 7		
Coastal erosion and storm protection—buildings and boats	4, 5, 6, 7		
Air quality and odor			13, 14
Environmental education and research	4, 5, 6, 7		
Seafood safety			14, 17
Large variety and numbers of birds	3		
Critical habitat for protected species (e.g., tree snails, smalltooth sawfish, sea turtle, Cape Sable seaside sparrow, orchids, goliath grouper)	1, 3, 5, 6, 7		
Natural filter for wastewater and storm water runoff			
Carbon sequestration			
Nutrient regulation—Converts nutrients to benign forms			

huge, complex, uncharted territory. Demand might be best characterized as a *Driver* that must be measured. We might be able to understand what causes a change in demand after the fact, but it is unlikely that we will be able to describe causal mechanisms for changes in demand that are predictive in any way.

## Mechanisms Leading to Changes in Primary Use

Changes in the use of *Ecosystem Services* by primary users that are not related to changes in demand can be described in terms of changes in satisfaction by the user. Satisfaction is typically viewed as one of the most important management goals when providing quality recreational opportunities. Unfortunately, satisfaction is a difficult concept to measure. Simply asking an individual how satisfied they are does not inform a manager why they are or aren't satisfied, or

what contributed to their response. Other factors must be considered that include subjective personal and social aspects of a user's experience; these include conflict, crowding, expectations, normative standards, etc. While these other factors can be easily justified on their own (particularly for the commercial operators), they need to be considered when seeking to understand satisfaction.

The recreational user seeks satisfaction in the experience of obtaining a desired *Ecosystem Service* facilitated/delivered through resource management. The satisfaction sought by a recreational user has two parts: the environmental and the social. The first, the environmental, is determined by the attributes typically thought of as being provided via a marine ecosystem; these are characterized by the "attributes people care about." The second, the social, is determined by interactions with other people. These are related to conditions that individuals often think of as services when participating in their activity. It should be noted that there are additional social "services" that should be considered

for inclusion. These might include relaxation, solitude, education, family time, etc. These services are not based directly on physical attributes, but rather management goals in combination with the resource.

### Crowding

Perceived crowding is a concept that is at best only weakly related to user density. Instead, it is related to factors such as goal interference, expectations and discrepancies, normative standards, etc. The “*Ecosystem Service*” being desired by users, and delivered through resource management, would be a mix of user types, use levels, and experiences consistent with what the combination of the resource and management goals are intended to provide.

### Conflict

Conflict is typically defined by the mixing of motorized and non-motorized users. The two typically don't prefer to mix. A second characteristic of conflict is that it is typically asymmetrical in that one group (fishermen, for example) will experience conflict while the other group (motor boaters or skiers, for example) will not experience conflict. Conflict is related to perceived crowding, which is then related to satisfaction.

### Expectation

Humans do things in the expectation that certain outcomes (*Ecosystem Services*) will follow. Users in this case have certain expectations for certain *Ecosystem Services*. They might expect certain numbers of fish to catch, or numbers (not too many or too few) of other divers to be in the water at the same time, or a healthy and pristine ecosystem. This does not mean that user expectations should automatically be met. Expectations are often unrealistic or inappropriate for

a given environmental condition or management mandate. Instead, expectations should be considered in the sense that they influence how users evaluate conflict, crowding, or satisfaction. Thus, expectations aren't a true *Ecosystem Service* but rather an intervening variable in understanding other ecosystem services.

### Normative Standards

Normative standards are socially agreed upon standards of what should be. Users can generally agree on what constitutes an acceptable level of coral bleaching, or use levels, or coastal impacts due to human use, or management mandates for particular resource types or classifications. It is usually necessary and best to examine norms according to meaningful subgroups, since an overall average user really doesn't exist. Like expectations, norms are not *Ecosystem Services*. They are the standards against the extent to which *Ecosystem Services* are being delivered or met. They are a comparative device.

## References

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