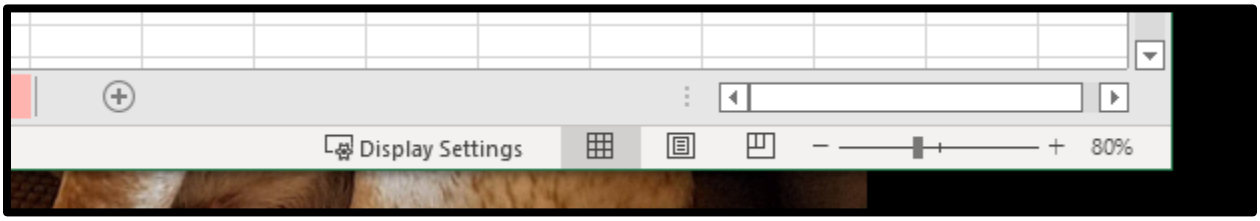
CAT Tool User Manual

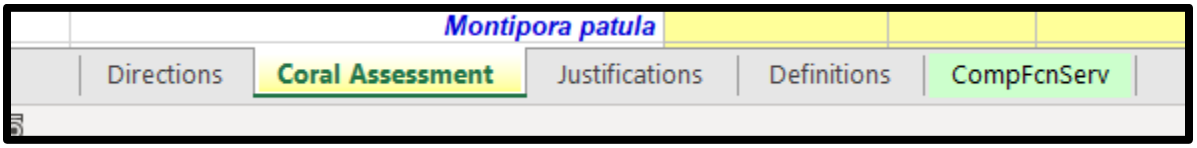
Overview of the Program:

The Coral Ecological Services and Functions Assessment Tool (CAT) is an Excel workbook with the following six tabs found at the bottom of the screen: Direction, Coral Assessment, Justifications, Definitions, CompFcnServ (Comparison of Functions and Services), and Risk Assessment. The Risk Assessment tab is used for punitive actions and not pertinent to USACE's needs so it will not be discussed further.

If the Coral Tool tabs and writing in the pages appear to small when opening the program, navigate to the bottom right side of the screen. You will see a – and + scale. Click on the + to enlarge the data fields. See the picture below.



The following screenshot is of the Coral Tool showing all tabs at the bottom of the tool. Each tab is discussed below.



Directions Tab: The first tab to the left is the Directions Tab. The Directions tab lists instructions for filling out the Coral Assessment tab in order to get the calculated Ecological Coral Value (ECV) of the corals impacted during the planned project. The steps provided instruct the user how to fill out required fields. Detailed instructions on how to fill out the tool are listed below.

Coral Assessment Tab: The Coral Assessment tab is a color coded matrix broken into 4 steps with direction for each step provided in the Directions tab. The steps for this tab are addressed below. The only fillable cells are highlighted in yellow.

Justifications Tab: The Justifications Tab is where the parameter values for the ECV are estimated. There tables describing how the size, colony form and function, rarity, and habitat types are compared within each parameter. These are the numbers that are factored into the equations into the tool based on the dropdowns chosen by the user.

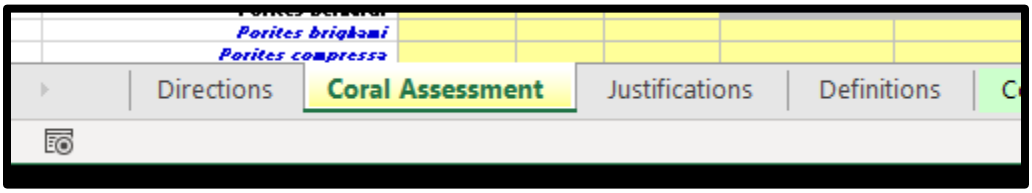
Definitions Tab: A comprehensive list of terms used within the tool.

CompFcnServ Tab: The Comparison of Ecological Functions and Services tab provides a further breakdown of coral functions and services lost due to the project. The lost functions are numerically shown in tables and figures based on colony size, colony form and rarity.

Direction for using the CAT Tool

Coral Assessment Tab:

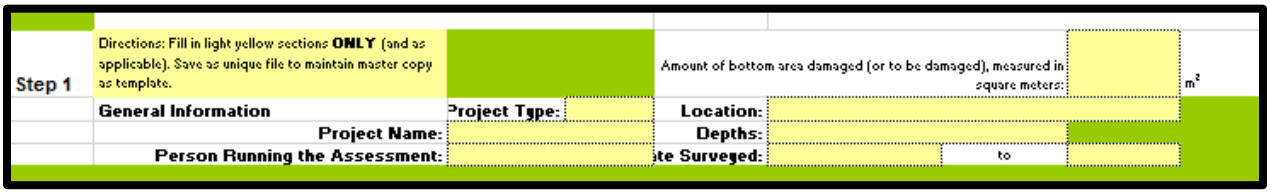
The Coral Assessment tab is this second tab from the left. Click on this tab to open the data entry tab.



This is a color coded matrix broken into 4 steps with direction for each step provided in the Directions tab. The steps for this tab are addressed below. The only fillable cells are highlighted in yellow.

Step 1-

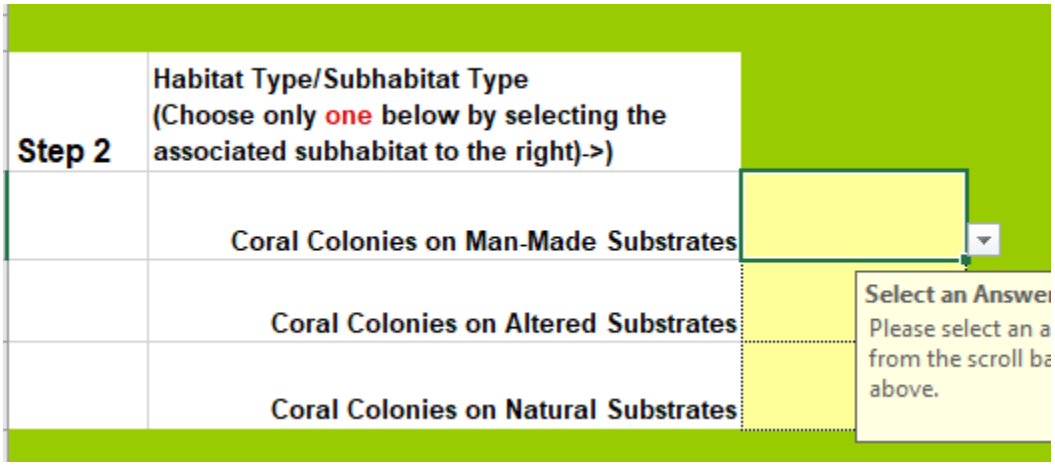
Provide the basic background information and generate a project name.



- "Project Type" is a drop down menu. Select one of the following choices: Damaged Area (Unplanned Event), Area to be Impacted (Planned Event), Compensatory Mitigation, On-Site Restoration, Off-Site Mitigation
- Enter the project name and associated ORM Number for reference
- Enter the name of the person running the Assessment Tool.
- Enter the Date of Survey for reference.
- Enter the area of impact
- **Save this workbook as a unique file in the project folder to ensure the master copy is not overwritten.**

Step 2-

Classify the habitat type being disturbed: Man-Made, Altered or Natural.



Each habitat type has an associated subhabitat dropdown menu in the right adjacent cell (C12-14). Only one subhabitat should be chosen per project spreadsheet. Definitions for the subhabitat types can be located on the **Definitions** tab.

- "Coral Colonies on Man-Made Substrates" contains a dropdown for sub-habitat type. Select one of the following choices: Artificial Reef, Pile or Column, Breakwater, Submerged Wall, Pipeline or Support Structure, Mooring Block, Submerged Debris, Other.
- "Coral Colonies in Alerted Substrates" contains a dropdown for sub-habitat type. Select one of the following choices: Ship Chanel Walls, Ship Channel Bottom, Grounding Scar or Anchorage, Natural Modified Harbor Walls, Longterm Outfall or Dump Site, Dominated By Invasive Species.
- "Coral Colonies on Natural Substrates": contains a dropdown for sub-habitat type. Select one of the following choices: Unconsolidated Substrate, Boulder, Solitary Colony, Aggregated Colonies, Reef Flat, Reef Crest, Reef Slope, Patch Reef, Spur and Groove, Reef Hole, Pinnacle Reef, Deep Reef.

When a subhabitat is selected, cells B3, F3 and P11 are populated with text while O11 is populated with a habitat score.

The habitat score is linked to a hidden sheet "Sheet3" where the various habitat values (A30-A55) are scored on a range from 0.5-5 with manmade structures assigned lower values while natural structures are assigned higher values. The higher the habitat value the higher the ECV of the corals being impacted. The value is subjective and based on the opinions of coral experts within HI. How the habitat number was determined can be found in Cell B92 to Cell AB116 on the Justifications Tab.

SAVE COPY UNDER A UNIQUE FILE NAME.

Step 3 - The data table is organized by Coral Families. The individual species to be listed for the state of Hawaii are prepopulated. Under each coral family, locate the species of coral. Fill in details about the specific size of coral and the number of coral colonies being impacted by size class. These values will need to be determined from qualified practitioners that can accurately identify corals to the species level.

Step 3	Coral Species Encountered							
	Colony Size	0 - 5 cm	>5 - 10 cm	>10 - 20 cm	>20 - 40cm	>40 - 80 cm	>80 - 160 cm	>160 cm
	f. Astrocoeniidae							
	Madracis pharensis	4	8					
	f. Pocilloporidae							
	Pocillopora damicornis							
	Pocillopora eydouxi							
	Pocillopora ligulata							
	Pocillopora meandrina							
	Pocillopora molokensis							
	f. Acroporidae							
	Montipora capitata							
	Montipora dilitata							
	Montipora flabellata							
	Montipora incrassata							
	Montipora patula							
	Montipora turgescens							
	Acropora spp.							
	f. Poritidae							
	Porites annae							
	Porites bernardi							
	Porites brighami							
	Porites compressa							
	Porites duerdeni							
	Porites lichen							
	Porites lobata							
	Porites evermanni							
	Porites monticulosa							
	Porites pukoensis							
	Porites rus							
	Porites solida							
	Porites studeri							
	f. Siderastreadae							
	Psammocora stellata							

The species by size number populates a matrix to the right which will calculate the ECV. The ECV of a species is highly variable which is why accuracy of species identification is very important.

The multipliers for each coral input can be found within the Justifications Tab: Colony Size B5-J32, Colony Form B35-L60, Rarity B64-F89, Endemic J65. As with the habitat type values, all of the above-mentioned multipliers are subjective to the opinions of the group that designed the tool. The designers list the criteria used for each justification.

In Step 4, the Total Characterization Value (sum of ECV values) result is autofilled by the spreadsheet. The ECV values of all the corals are tallied in Cell J94 (Total Characterization Value) and then also copied into Cell C117.

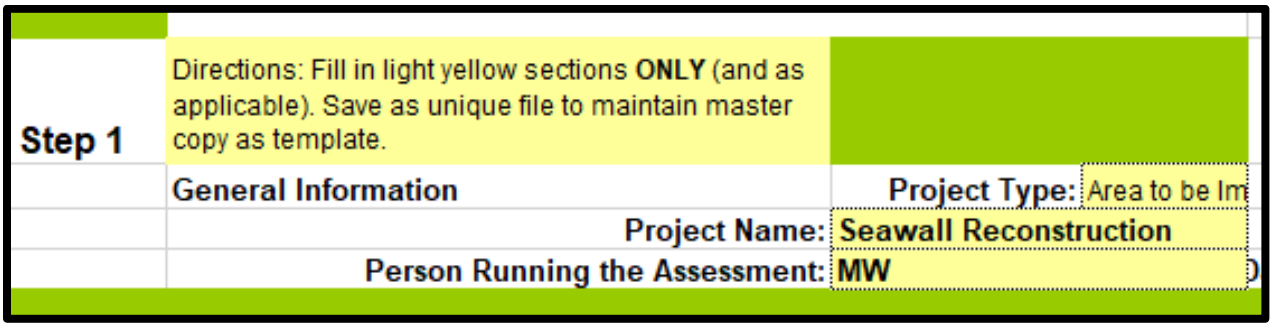
Below Step 4 there is a series of tables that show the total colonies impacted by growth form and size. Those tables are then portrayed in a 3D bar graph cell in near cell H138, located below the data entry table.

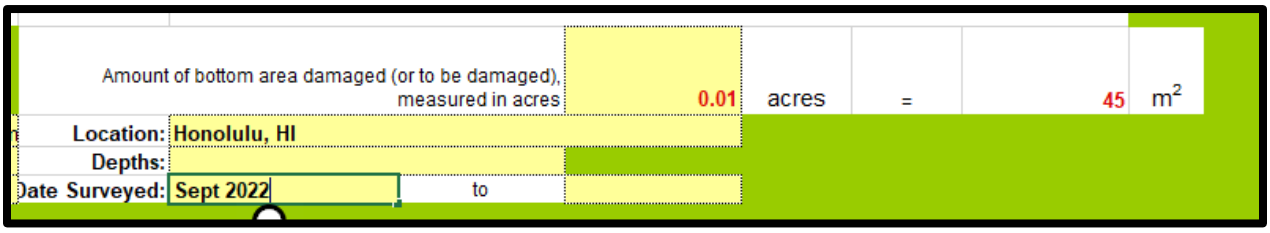
Justifications Tab: The Justifications Tab is where the parameter values for the ECV are estimated. There tables describing how the size, colony form and function, rarity, and habitat types are compared within each parameter. These are set values based and the tab is locked.

CompFcnServ Tab: The Comparison of Ecological Functions and Services tab provides a further breakdown of coral functions and services lost due to the project. The lost functions are numerically shown in tables and figures based on colony size, colony form and rarity.

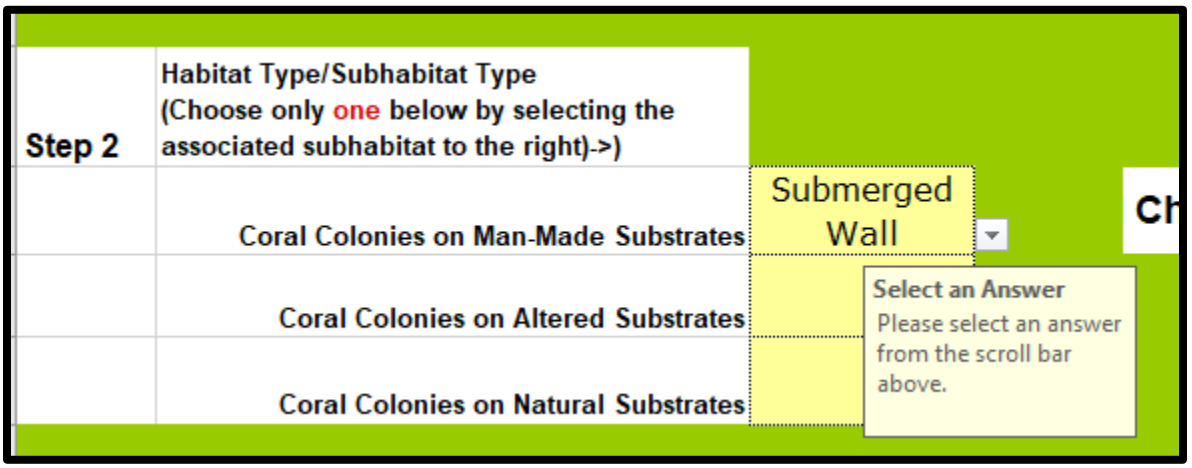
Example 1 – "WRAP HI – My example project 1"

Step 1: Enter Project Type, Name, and Person doing the Assessment. For this proposed project, the applicant proposes to reconstruct an existing seawall. The current seawall face will be resurfaced, engineering tiebacks will be reinforced, and a new footer will be installed. The area of the proposed seawall is 100-feet long by 5-feet high. The area of impact can be entered in cell M7.





Step 2: Identify the habitat type and subhabitat type. Pick the appropriate dropdown. For our project, this is a manmade structure. This is closest to the sub habitat of submerged wall. On the justifications tab is a numerical value for each subhabitat and its comparison to Regulatory Functions.



For this example, I was not sure if a seawall would classify as a breakwater or submerged wall. When reviewing the justifications tab, I found that a submerged wall would offer less value for

both Regulatory Function of Sand Formation and Wave Energy Reductions. This would classify our seawall as a submerged wall for this project.

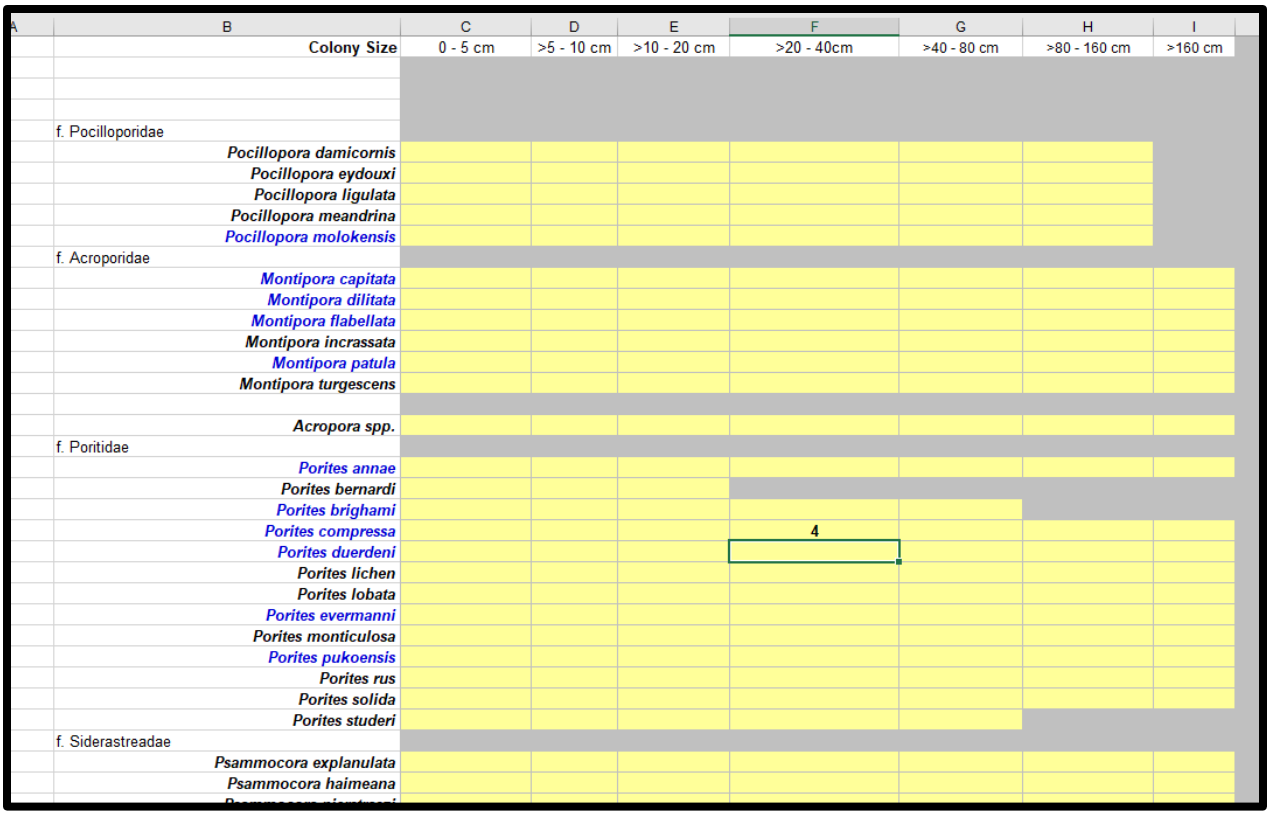
		Man-Made Structures								
Habitat Services & Functions		Artificial Reef	Pile or Column	Breakwater	Submerged Wall	Pipeline or Support Structure	Mooring Block	Submerged Debris	Ship Channel Walls	Shi Chan Botto
Regulatory Function	Sand Formation	0	0	3	0	2	1	1	2	1
	Gas Production	2	2	2	2	2	2	2	2	2
	Climate Regulation	2	2	2	2	2	2	2	3	3
	Wave Energy Regulation	0	0	3	0	2	1	1	2	0
	Nutrient/Carbon Cycling	2	2	2	2	2	2	2	2	2
Habitat Functions	Ecological/Symbiotic Interactions	2	2	2	2	2	2	2	2	1
	Cleaning Stations	1	1	1	2	3	3	3	2	0
	Shelter Refuge for flora/fauna (I.e. multiple fish/invertebrates/sea turtles, etc.)	3	2	2	2	3	2	2	2	1
	Reproductive Habitat For Fauna	2	2	2	2	2	2	2	3	1
	Foraging Habitat for Natural Assemblages	2	2	2	2	2	2	2	3	2
	Nursery Functions	4	3	2	2	2	2	2	2	1
Production Services	Food from System Inhabitants	5	2	1	1	3	1	2	2	1
	Medicinal Resources	2	2	2	2	2	2	2	2	2
	Ornamental Resources	2	2	1	2	2	2	2	1	1
Information										

Directions | Coral Assessment | **Justifications** | Definitions | CompFcnServ

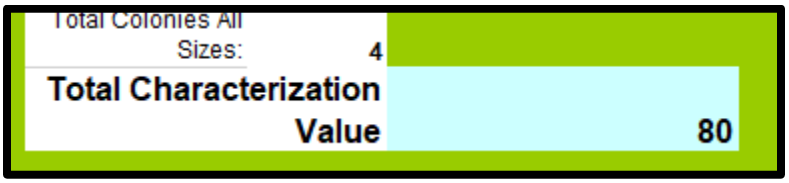
Step 3: SAVE Again.

Step 4: In this example, a qualified practitioner provided a survey which accurately identified coral species and size. The survey found four colonies of *Porites compressa* along the wall. The colonies measured between 20 and 40 centimeters.

Using the **Coral FamiliesGenera** Tab, this species would be found in the family Poritadae. This was the dominant coral in our survey. For size class, four colonies were found between the size class of 20 to 40 cm.



	B	C	D	E	F	G	H	I
	Colony Size	0 - 5 cm	>5 - 10 cm	>10 - 20 cm	>20 - 40cm	>40 - 80 cm	>80 - 160 cm	>160 cm
	f. Pocilloporidae							
	Pocillopora damicornis							
	Pocillopora eydouxi							
	Pocillopora ligulata							
	Pocillopora meandrina							
	Pocillopora molokensis							
	f. Acroporidae							
	Montipora capitata							
	Montipora dilitata							
	Montipora flabellata							
	Montipora incrassata							
	Montipora patula							
	Montipora turgescens							
	Acropora spp.							
	f. Poritidae							
	Porites annae							
	Porites bernardi							
	Porites brighami							
	Porites compressa				4			
	Porites duerdeni							
	Porites lichen							
	Porites lobata							
	Porites evermanni							
	Porites monticulosa							
	Porites pukoensis							
	Porites rus							
	Porites solida							
	Porites studeri							
	f. Siderastreadae							
	Psammocora explanulata							
	Psammocora haimeana							



Total Colonies All Sizes:	4
Total Characterization Value	**80**

**To ensure you entered all of your values – check to see if "total colonies all sizes" matches the total on the survey you are inputting.

The multipliers for each coral input can be found within the Justifications Tab: Colony Size B5-J32, Colony Form B35-L60, Rarity B64-F89, Endemic J65.

Example 1: *Porites Compressa.* Four corals measuring 20 to 40 cm were located on the seawall.

ECV = Sum of Subhabitat (H) x [Coral Colony Characteristics (Form (F) x Size (S) x Rarity (R))] x Endemism (e).

$ECV_{Example\ 1}$ = 0.5 (habitat type=O11) x [5(colony size=R17) x 4(number colonies in size class) x 1(rarity=Q9) x 4 (form=T20)] x 2 (Endemic=S9)

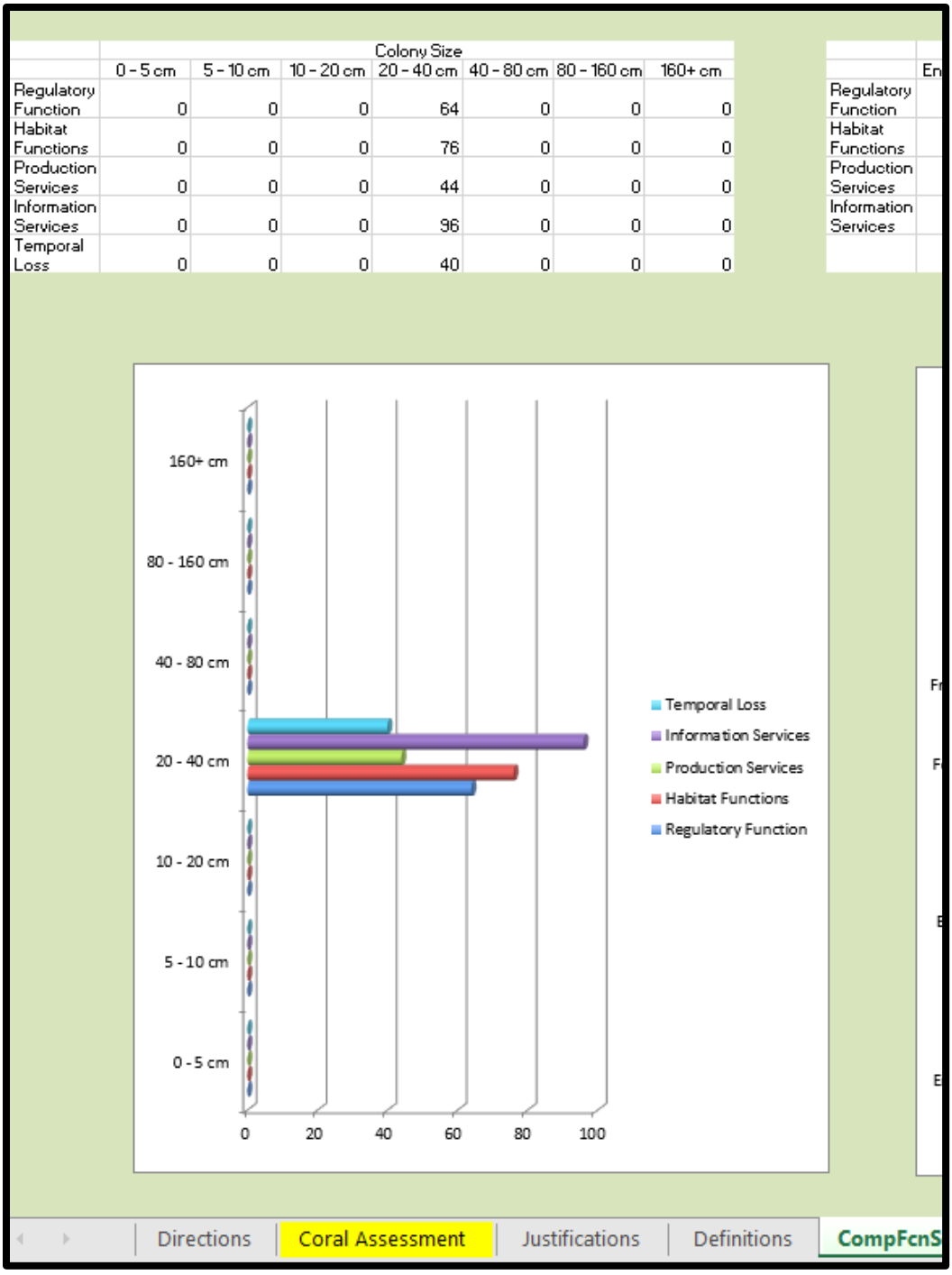
=0.5 x (5x4x1x4) x2

$ECV_{Example\ 1}$= 80

With the removal of these colonies from the project site, we have a ECV loss of 80. Proposed mitigation would require the applicant to replace an ECV of 80.

The following graphs demonstrate the loss in a visual manner.

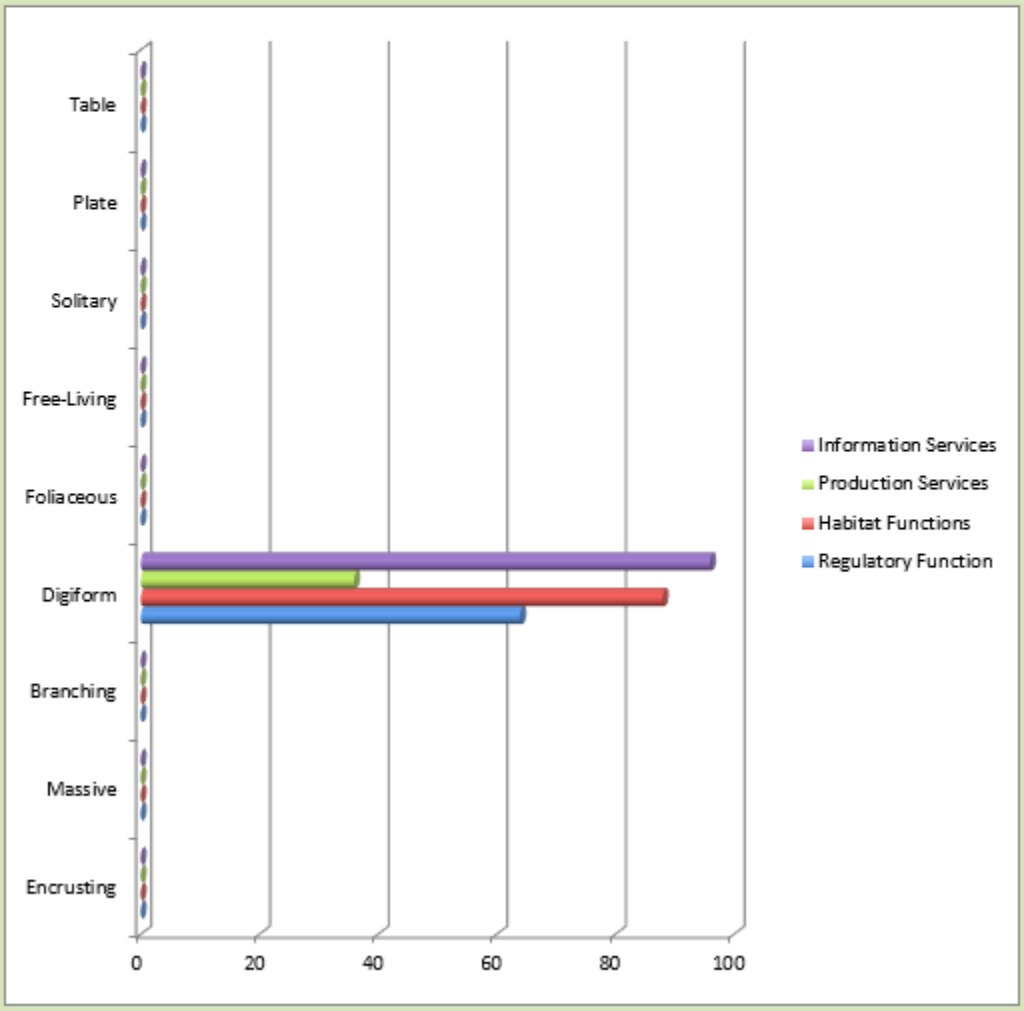
The Colony Size Services and Functions summary and graph below shows the quantified loss of Temporal Loss, Information Services, Production Services, Habitat Functions, Regulatory Functions.



	Colony Size						
	0 - 5 cm	5 - 10 cm	10 - 20 cm	20 - 40 cm	40 - 80 cm	80 - 160 cm	160+ cm
Regulatory Function	0	0	0	64	0	0	0
Habitat Functions	0	0	0	76	0	0	0
Production Services	0	0	0	44	0	0	0
Information Services	0	0	0	96	0	0	0
Temporal Loss	0	0	0	40	0	0	0

The Colony Form Services and Functions shows the quantified loss of Information Services, Production Services, Habitat Functions, Regulatory Functions.

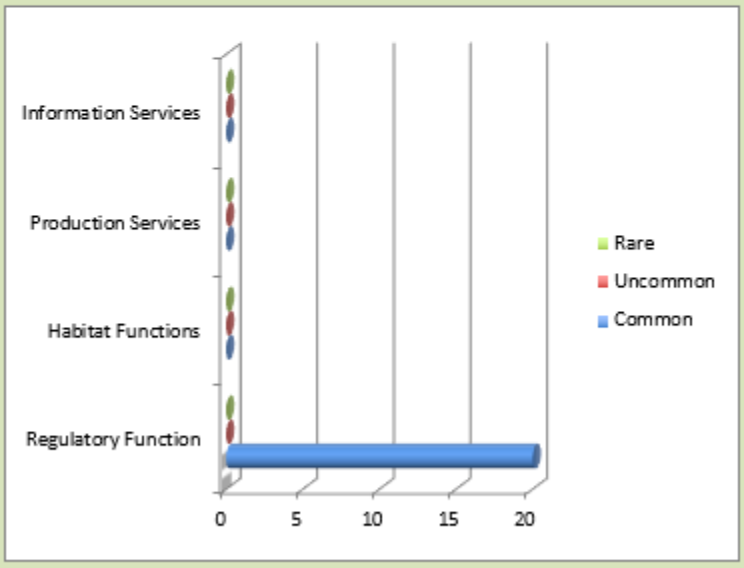
	Colony Form								
	Encrusting	Massive	Branching	Digiform	Foliaceous	Free-Living	Solitary	Plate	Table
Regulatory Function	0	0	0	64	0	0	0	0	0
Habitat Functions	0	0	0	88	0	0	0	0	0
Production Services	0	0	0	36	0	0	0	0	0
Information Services	0	0	0	96	0	0	0	0	0



CompFcnServ

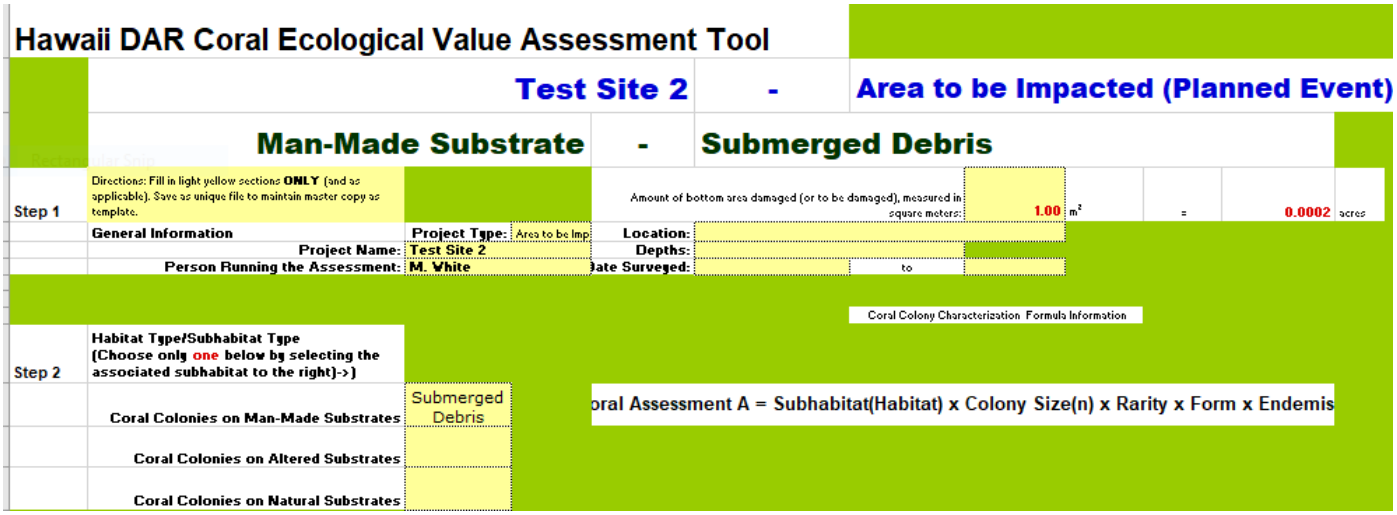
The Species Rarity Services and Functions shows the quantified loss of the corals, including Information Services, Production Services, Habitat Functions, Regulatory Functions.

	Rarity				Endemism	
	Common	Uncommon	Rare		no	yes
Regulatory Function	20	0	0			
Habitat Functions	0	0	0			
Production Services	0	0	0			
Information Services	0	0	0			



Example 2

Step 1: Enter Project Type, Name, and Person doing the Assessment. For this proposed project, the applicant proposes to remove submerged debris within a 1 meter square area. The area of impact can be entered in cell H4.



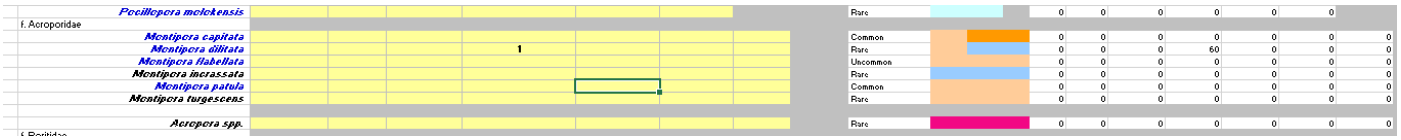
Step 2: Identify the habitat type and subhabitat type. Pick the appropriate dropdown. For our project, this is habitat type of "Coral Colonies on Man Made Structures" with the subhabitat as "Submerged Debris". On the justifications tab is a numerical value for each subhabitat and its comparison to Regulatory Functions.

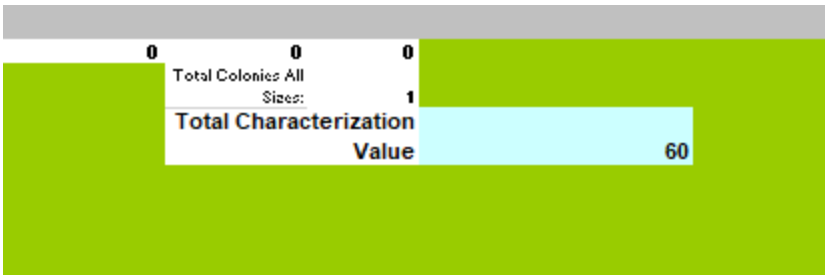
Step 3: SAVE Again.

Step 4: In this example, a qualified practitioner provided a survey which accurately identified coral species and size. The survey found two colonies of coral of the same size (35cm), a *Montiora dilitata* and a *Montipora patula*. We are going to run this simulation for each coral, on the same substrate, but of different species to see the difference of ECV.

Montiora dilitata

This coral is endemic to Hawaii. For size class, one colony was found between the size class of 20 to 40 cm. Enter a "1" in the appropriate Coral Species name and size class.





Example 2a: *Montiora dilitata* is a rare, endemic, digiform coral. A 35cm coral of this size on submerged debris would have an ECV value of 60.

ECV = Subhabitat (H) x [(# Colonies Found) x (Colony Form Services and Functions) x (Rarity of Species) x (Size Services and Functions)] x Endemism (2).

ECV = O11*(F29*T20*Q9*R17)*S9

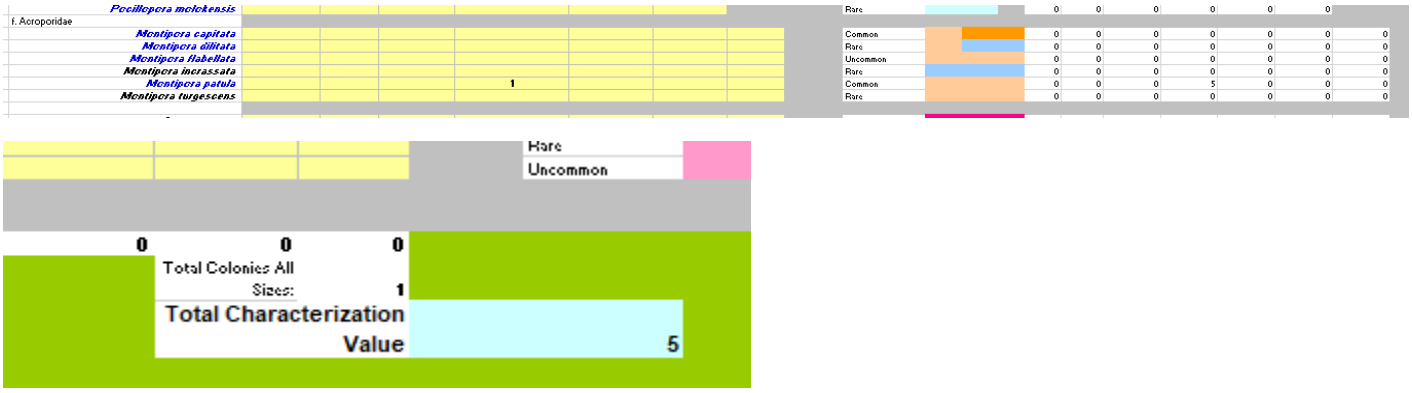
$ECV_{Example\ 2a}$ = (habitat type=O11 = 0.5) x [(colonies in size class = F29 = 1) x (form=T20= 4) x (rarity = Q9 = 3) x (Size Services = R17 = 4)] x (Endemic = S9 = 2)

$ECV_{Example\ 2a}$ = 0.5 (1 x 4 x 3 x 4) x 2

$ECV_{Example\ 2a}$ = 60

Montiora patula

This coral is endemic to Hawaii. For size class, one colony was found between the size class of 20 to 40 cm. Enter a "1" in the appropriate Coral Species name and size class.



Example 2b: *Montipora patula* is a common, endemic, encrusting coral. A 35cm coral of this size on submerged debris would have an ECV value of 5.

ECV = Subhabitat (H) x [(# Colonies Found) x (Colony Form Services and Functions) x (Rarity of Species) x (Size Services and Functions)] x Endemism (2).

ECV = O11*(F32*O20*Q9*R17)*S9

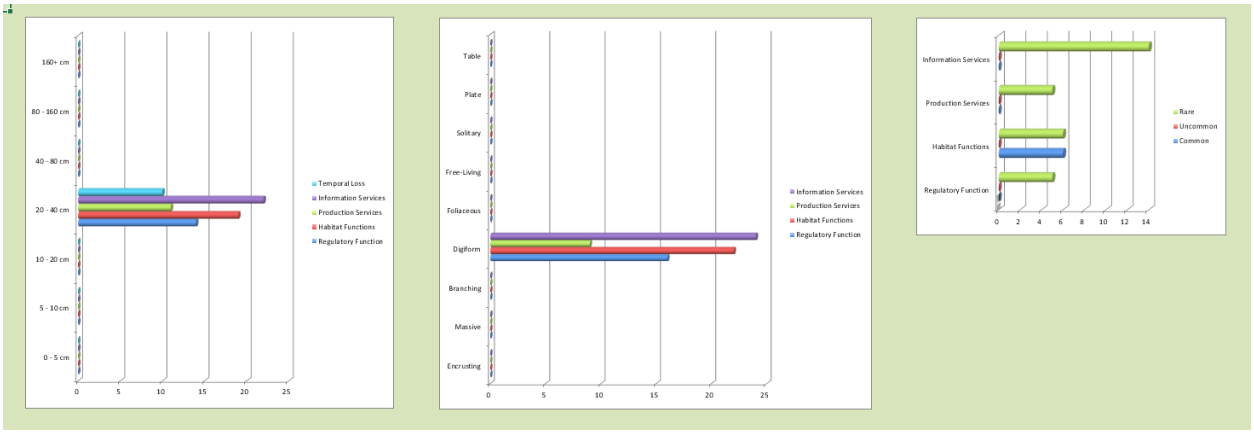
$ECV_{Example\ 2a}$ = (habitat type=O11 = 0.5) x [(colonies in size class = F32 = 1) x (form=O20= 1) x (rarity = Q9 = 1) x (Size Services = R17 = 5)] x (Endemic = S9 = 2)

$ECV_{Example\ 2a}$ = 0.5 (1 x 1 x 1 x 5) x 2

$ECV_{Example\ 2a}$ = 5

From the examples 2a and 2b above, we can see the two different species will have two different ecological values when on the same substrate. Note the differences in the graphs below as Ecological Functions and Services are compared between species. This can help guide mitigation requirements.

Example 2a: Ecological Functions and Services by Colony Size, Colony Form and Species Rarity for *Montiora dilitata.*



Example 2a: Ecological Functions and Services by Colony Size, Colony Form and Species Rarity for *Montipora patula.*