ALLEN CORAL ATLAS

What innovations have been applied to improve the Atlas's habitat maps from their 2021 version to the 2022 habitat maps?

Starting in April 2022, the Atlas's geomorphic zonation and benthic cover maps have been updated, replacing the prior versions on the Allen Coral Atlas website, originally completed in 2021. The updates are a result of user feedback on the maps and ongoing research by the mapping team. This document provides the interested user more detail on these changes.

Implications of Map Updates

The impact of the updates on the 2021 geomorphic and benthic maps (which we will now call "Version 1" or "v1") to 2022 maps (hereafter called "Version 2" or "v2") vary between regions. In general, there are minor updates at a regional scale and may be moderate updates at a local scale. Hence, for best results, it is advised that you utilize the most recent version. The changes could affect your statistical analysis or the representation of the reefs. The updates are a result of improved and fine tuned methods and are *not* the result of new input data.

Update Process

Development of the mapping process started with the first region, Southwest Pacific, published on the Allen Coral Atlas in 2019. The mapping process evolved over the course of mapping the remaining 29 regions - covering the world's tropical coral reefs. User feedback has also enabled us to improve the mapping process, leading to the recent 2022 release of map updates.

The feedback for the update was received through three avenues:

1. User feedback received via email or one-on-one meetings that identified misclassifications.
2. Local expert feedback, who were directly approached to review the maps for their local reefs - to identify and provide location of the misclassifications using a GIS environment, www.SeaSketch.org, a program designed to enable participatory marine spatial planning.
3. Inhouse Atlas team member-identified misclassifications. The various identified misclassifications were grouped and reviewed by the mapping team and potential solutions were developed and applied into the mapping process.

The updates included two types of innovations:

1. **Global innovations,** applied to all 30 mapping regions improving the geomorphic and benthic categories, including some areas were deleted, but no new areas were gained.
2. **Regional innovations** applied to 10 out of the 30 mapping regions. We rerun the mapping sequence which included the global innovation, but also resulted in new

areas gained that were previously not mapped, and more focus on adjusting misclassification based on user feedback.

These can be divided into:

1. General, applicable for any reef
2. Geomorphic zonation updates; and
3. Benthic cover type updates

General Updates

First we **removed misclassifications** by developing an improved process to identify only reef areas, including by removing large harbors. We did this by manually digitizing a mask and improving our land mask, based on Open Street Maps data, removing inland waters, and including additional areas to be mapped that were not previously mapped.

V1 released 2021   **V2 released 2022**
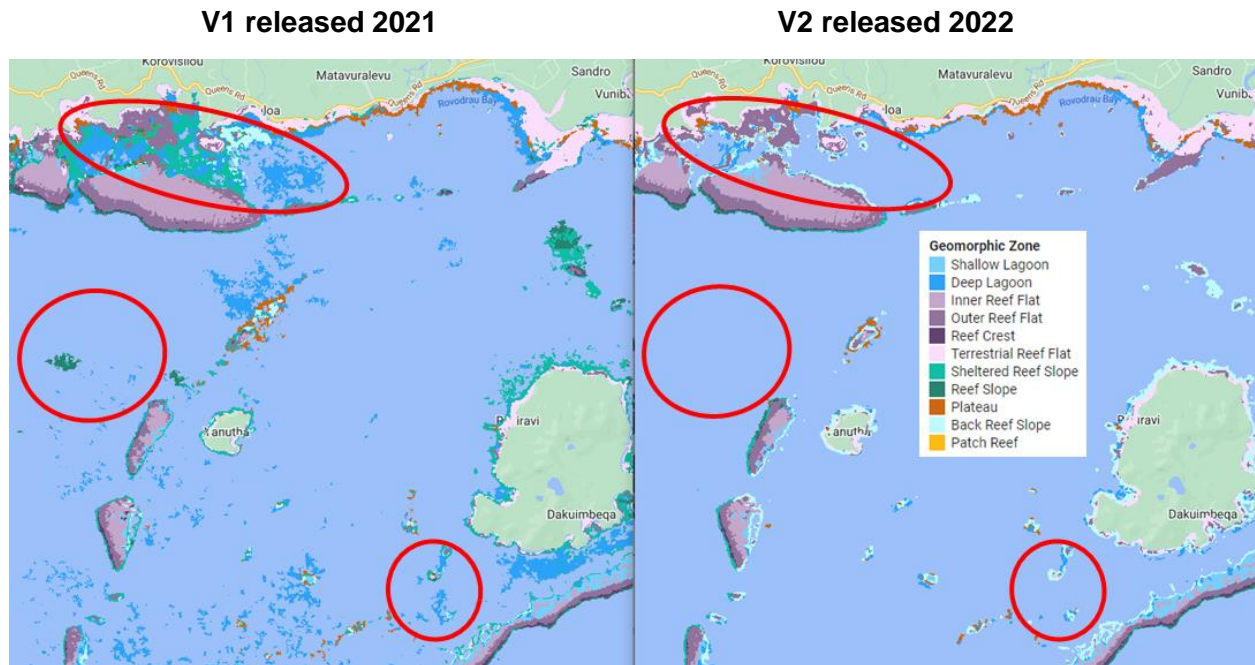
An example of removed deep and turbid water artifacts that were previously classified as a reef class. Red circles indicate specific locations.
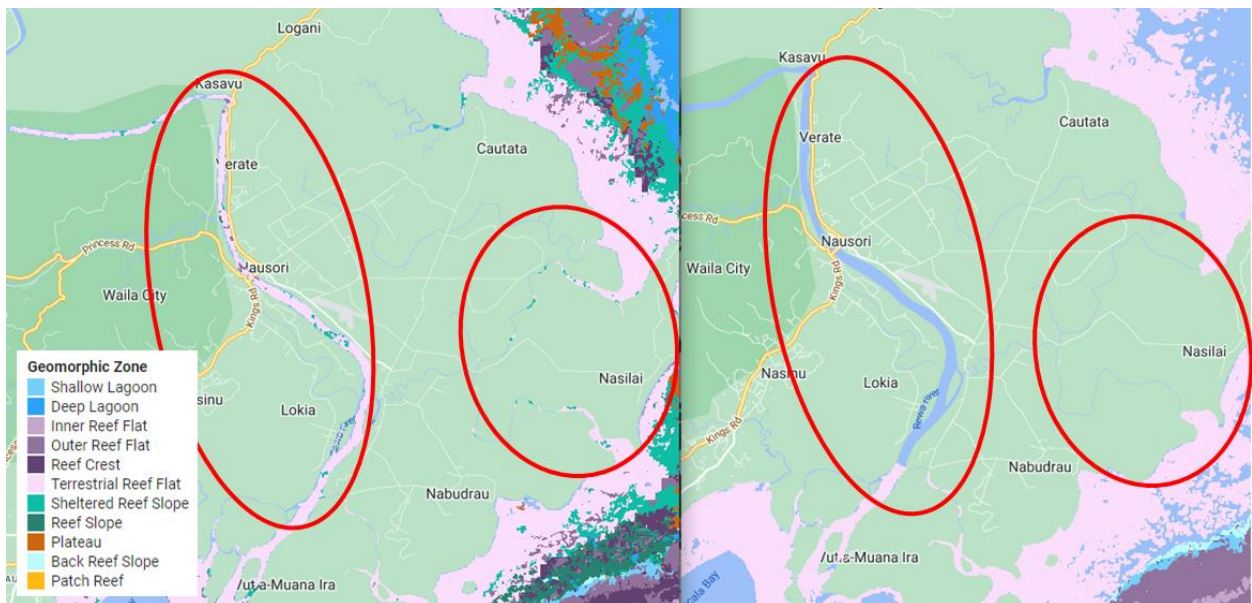
V1 released 2021   **V2 released 2022**
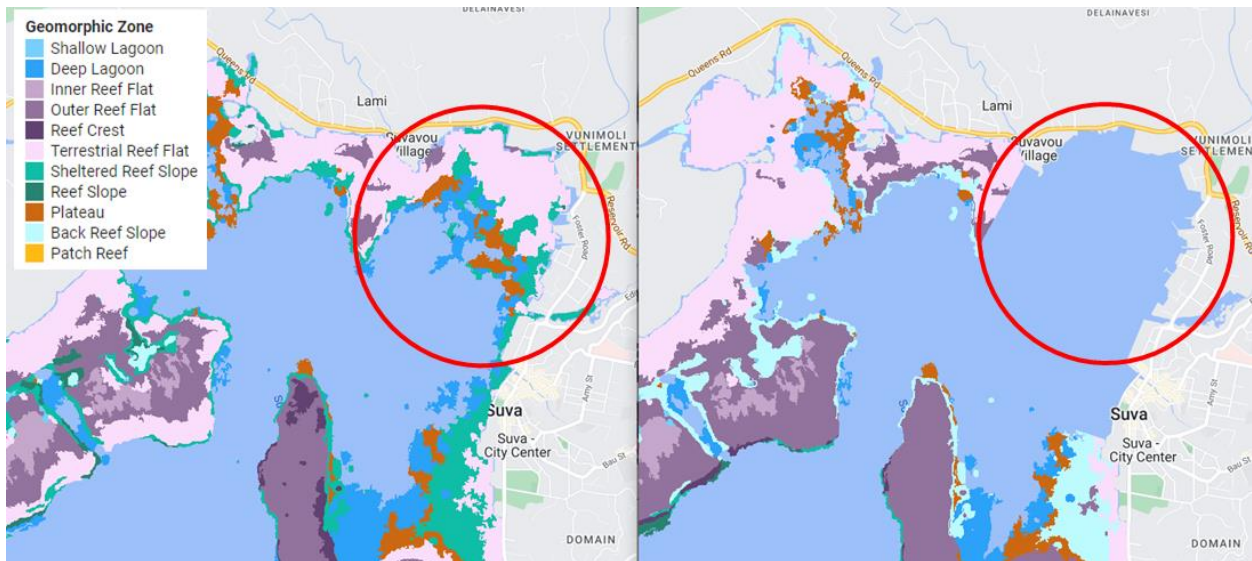
An example of a removed harbor. The red circle indicates the harbor.

V1 released 2021   **V2 released 2022**

An example of removal of falsely classified inland waters. Red circles indicate specific examples.

Additional new areas, as a result of the new land mask based on Open Street Maps, we were able to differentiate land from reef areas, specifically for the remote reefs of the world. This means we were able to include more shallow reef areas that were not previously mapped. This was only applied for 10 out of the 30 regions.

**V1 released 2021**   **V2 released 2022**

An example of additional newly classified reef flat areas previously masked out as being land. Red circles indicate specific examples.

Geomorphic Updates

These updates include 1) identification and manual digitization of the outline of reefs with lagoons, then adjust the lagoon mask of a reef or the buffer around a lagoon mask to improve misclassifications; 2) enhancement of wave model to improve differentiation between sheltered and exposed parts of reefs, and 3) re-classification of areas previously identified as breaking waves.

V1 released 2021   **V2 released 2022**
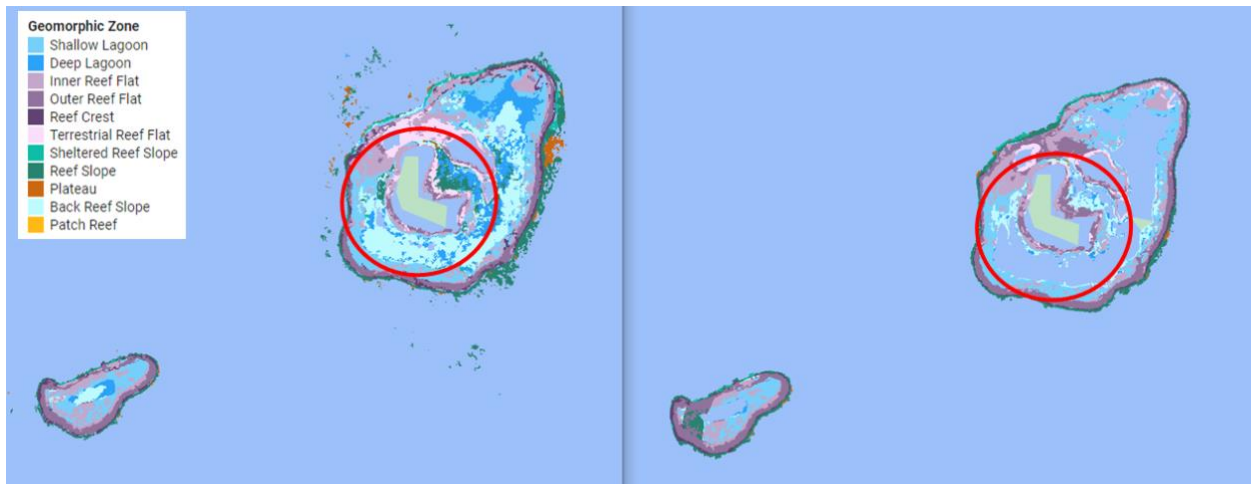
An example of reclassification of classes that should not be present within a reef including: Reef Crest, Reef Slope, Sheltered Slope occur only on inside of a reef and on outside of a reef, Back Reef Slope, Terrestrial Reef Flat, Shallow and Deep Lagoon occur only within a reef. Red circles indicate a specific example.

V1 released 2021 **V2 released 2022**
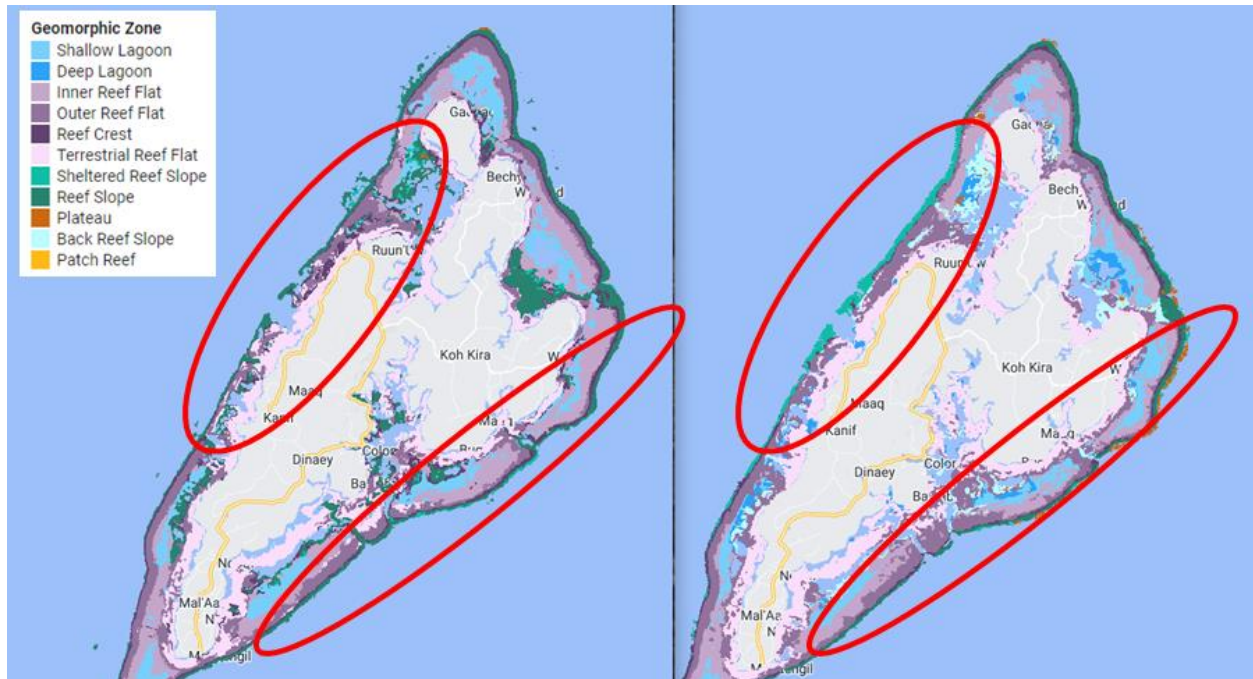
An example of reclassification of sheltered and reef slope classes based on an improved wave model, able to split a region slope based on the level of exposure to waves. Red circles indicate specific examples.

Benthic Updates

These updates include: 1) improvements as a result of geomorphic updates; 2) reclassification of hard substrate that were falsely classified as seagrass, and where seagrass has a preference for soft substrate; 3) reclassification of rubble and sand on steep slopes to rock and rubble, respectively, due to slope affecting the presence of mobile substrate; 4) reclassification of falsely classified sand (breaking waves) on reef crest to its surrounding hardbottom class, as it is a high energy zone where mobile substrate tends not to be present.
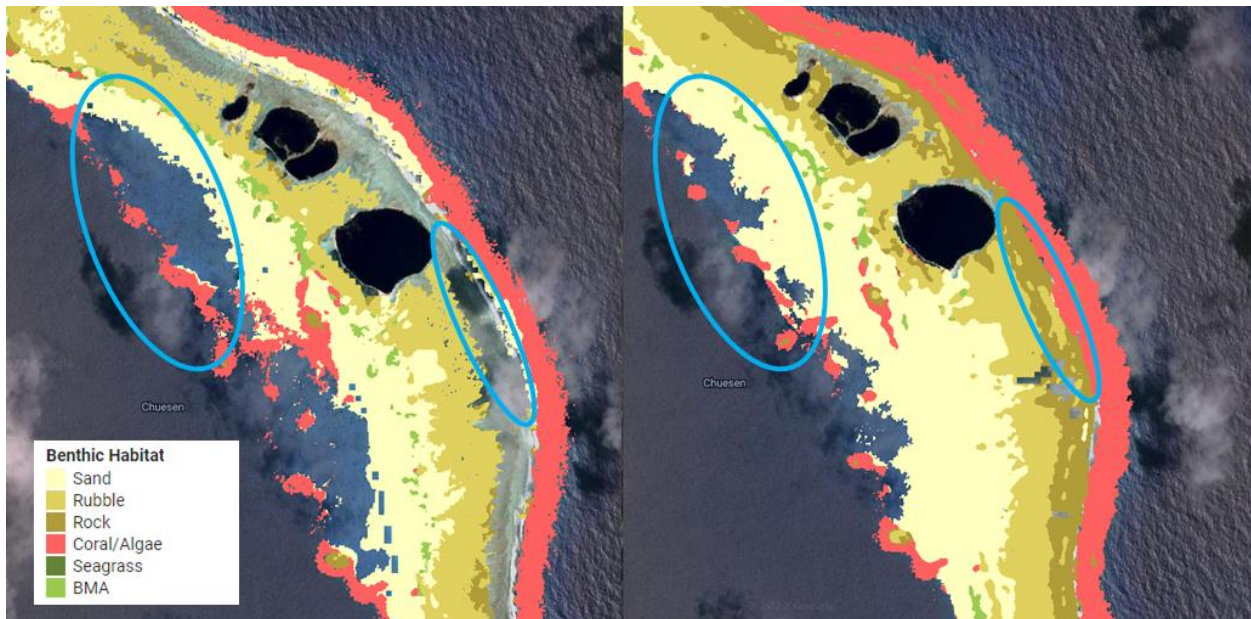
V1 released 2021　　　　　　　**V2 released 2022**

An example of benthic area reclassification: seagrass is limited in hard substrate zones, such as reef crest and outer reef flat because seagrass habitat is more likely in soft substrate; sand is removed near breaking waves on reef crest. Red circles indicate specific examples.
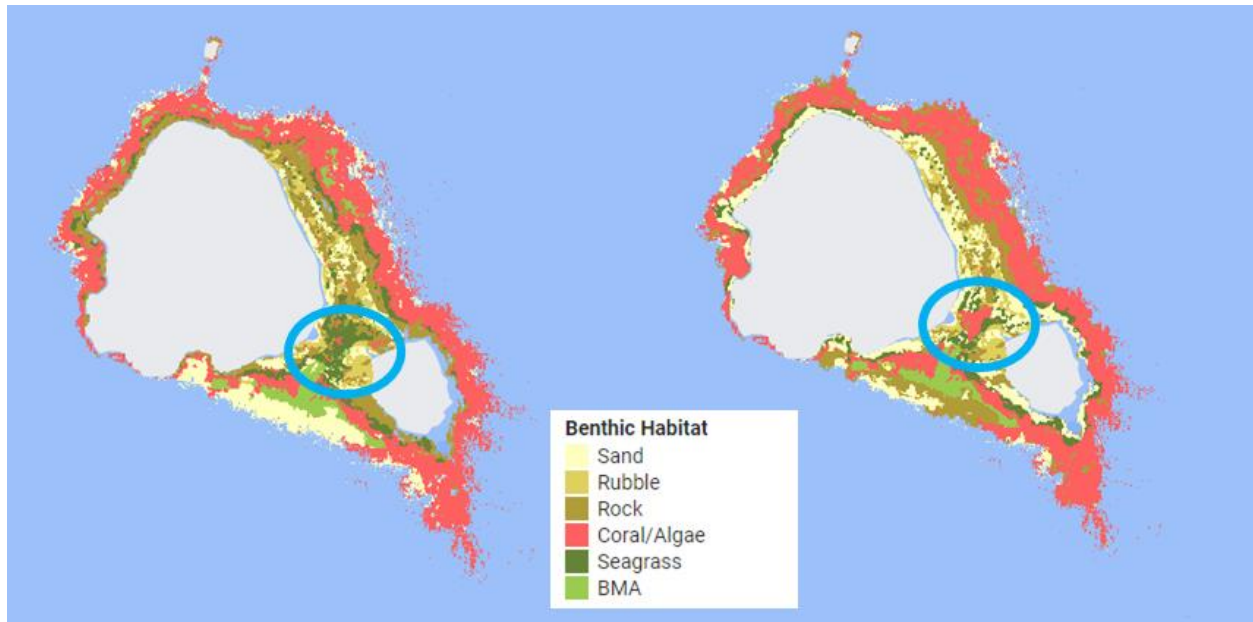
V1 released 2021　　　　　　　**V2 released 2022**

An example of additional newly classified benthic classes previously masked out as being land. Blue circles indicate specific examples.

V1 released 2021   **V2 released 2022**

An example of expert feedback highlighting areas that were misclassified. Here, seagrass should be coral.

Due to the application of the geomorphic and benthic innovations, some of the expert feedback comments were automatically addressed.

We are grateful for the feedback we have received that has led to these updates. If you have additional comments, please write to us at feedback@allencoralatlas.org.

Thank you for your interest in the Allen Coral Atlas.