

# Seabed Landforms Classification Toolset

## Quick Reference Guide

This toolset was developed using ArcGIS 10.8 and requires an Advanced licence with Spatial Analyst and 3D Analyst extensions (*3D Analyst only required for gridding DEM from XYZ*). Additional resources are available for guidance on using the toolset, including a User Manual, web explainer <https://arcg.is/1Tqmv50> and journal article <https://doi.org/10.3389/fmars.2023.1258556>.

### Set-up workspace:

1. Open ArcGIS (Advanced licence) and load Seabed Landforms Classification toolbox (Toolbox can be saved in any location)
2. Check out Spatial Analyst and 3D Analyst extensions
3. Save ArcMap Document (.mxd) in working directory (*Important: Tools need ArcMap document (.mxd) to be saved before tools will run*. Toolset will automatically populate working directory with datasets)

### Preparation (Optional):

Prepare input DEM if required (*requires ESRI grid format or raster stored in geodatabase*):

- Make DEM from XYZ data (requires 3D Analyst extension)
- Clip elevations (input values must be negative)
- Smooth DEM (recommended where speckled noise present)

### Surface elements classification:

- **Step 1: Derive terrain variables**
  - Inputs: (*requires ESRI grid format or raster stored in geodatabase*):
    - i. DEM
    - ii. BPI window sizes – user-defined values (default values based on 5 m DEM with 3x iterations of smoothing)
- **Step 2: Surface Elements:**
  - Inputs:
    - i. DEM
    - ii. Terrain variable thresholds – user-defined values (default values based on 5 m DEM with 3x iterations of smoothing)
- **Step 3: Run depth reclassification (Optional)**
  - Inputs:
    - i. DEM
    - ii. Depth interval (m)
- **Step 4: Run drainage (Optional)**
  - Inputs:
    - i. DEM
- **Step 5: Transfer files**
  - Inputs:
    - i. Specify prefix for datasets (e.g. abbreviated study area name)
  - Outputs:

- ii. surf\_elem polygon (surface elements classification)
- iii. ruggedness raster (reclass polygon in feature dataset)
- iv. finebpi raster (reclass polygon in feature dataset)
- v. broadbpi raster (reclass polygon in feature dataset)
- vi. slope raster (reclass polygon in feature dataset)
- vii. depth\_reclass polygon (optional output)
- viii. drainage raster (optional output)

## Landforms classification:

- **Step 6: Preliminary landforms – to review:**
  - Inputs:
    - i. Surface elements polygon
    - ii. DEM
    - iii. Ruggedness threshold for noise – user-defined values (default values based on 5 m DEM with 3x iterations of smoothing)
  - Manually review and edit output preliminary landforms classification to meet user-requirements. Update attribute labels within 'PrelimLand' field to ensure labels get carried across to final classification (Note: 'LAND\_2' field is a duplicate of 'PrelimLand'). Users may export a separate copy of the preliminary landforms feature class to edit (e.g. 'prelim\_landforms\_edited').
- **Step 7: Final landforms:**
  - Inputs
    - i. Reviewed/edited preliminary landforms layer
    - ii. Polygon threshold (optional) – to eliminate polygons under the user-specified area
- **Step 8: Transfer landform files:**
  - Inputs:
    - i. Specify prefix for datasets (e.g. abbreviated study area name)
  - Outputs:
    - ii. Final landforms classification
    - iii. Preliminary landforms classification
    - iv. Intermediate files (working files created during preliminary landform classification procedures).

## Plain classification (Optional):

- **Step 9: Plain landforms**
  - Inputs:
    - i. DEM (*requires ESRI grid format or raster stored in geodatabase*)
    - ii. Terrain variable thresholds – user-defined values (default values based on 5 m DEM with 3x iterations of smoothing)
    - iii. Polygon threshold (optional) – to eliminate polygons under the user-specified area
- **Step 10: Transfer plain files**
  - Inputs:
    - i. Specify prefix for datasets (e.g. abbreviated study area name)
  - Outputs:
    - i. Plain classification