POSEIDON

USER GUIDE

(v1.8.2)

Low Poly Water system for Unity

Note:

Lite version shares the same documentation, with limited features compared to the full product.

Please see LITE VERSION for more info.

PROLOGUE

Poseidon is a complete solution for creating beautiful low poly water-scape, especially built for Unity developers. This is a must-have asset which saves you thousands hours of work and tons of effort, and gives you more time and resources to focus on other aspects of your game.

This User Guide is created to help you get started with the tool, including the most basic information about its features and workflow, as well as best practices, tips and tricks from its creator and showcasing amazing work from other successful developers.

To see the release log, please visit this page.

For business, please contact: hello@pinwheel.studio

For support, report a bug or request a feature, please contact: support@pinwheel.studio

INTRODUCTION

Poseidon is a user-friendly water system dedicated to help you create an impressive water-scape, deeply focused on a low-poly and stylized world, that can run well on both Mobile and Desktop applications, saving you a lot of time and effort!

Poseidon is carefully designed to totally eliminate the frustration of complexity, giving you the fastest and easiest experience of exploring and creating, empowered by the latest techniques from the inside, giving the highest quality of achievement. Even if you are a beginner or an advanced creator, it is just the right tool for you!

Different from other low poly water sets, Poseidon is the first one which fully supports Universal Render Pipeline and Built-in Render Pipeline, with various settings for you to customize, such as light absorption, shore blend, reflection, refraction, etc. Those features can be easily turned on and off with a simple toggle.

Poseidon also comes with sample assets and example scenes for you to play with. You can even use them in your commercial projects. Have fun!

LITE VERSION

Poseidon Lite is a simplified version provided for someone who wishes to have low poly water in their game as decoration, without the need of heavy effects or player interaction.

Below is the list of features that is INCLUDED in the lite version:

- Builtin RP and Universal RP support.
- Mesh Type: Tileable Plane.
- Mesh Pattern: Hexagon, Diamond, Quad.
- Mesh Noise.
- Follow the Main Camera.
- Custom queue index.
- Lighting Model: PBR, Blinn Phong, Lambert.
- Flat Lighting.
- Back face rendering.
- Time mode: Auto.
- Water color adjustment.
- Fresnel.
- Ripple.
- Light Absorption.
- Shoreline Foam.
- Planar Reflection.
- Refraction.

Other features, if not mentioned above, is NOT INCLUDED.

FREQUENTLY USED EDITOR MENUS

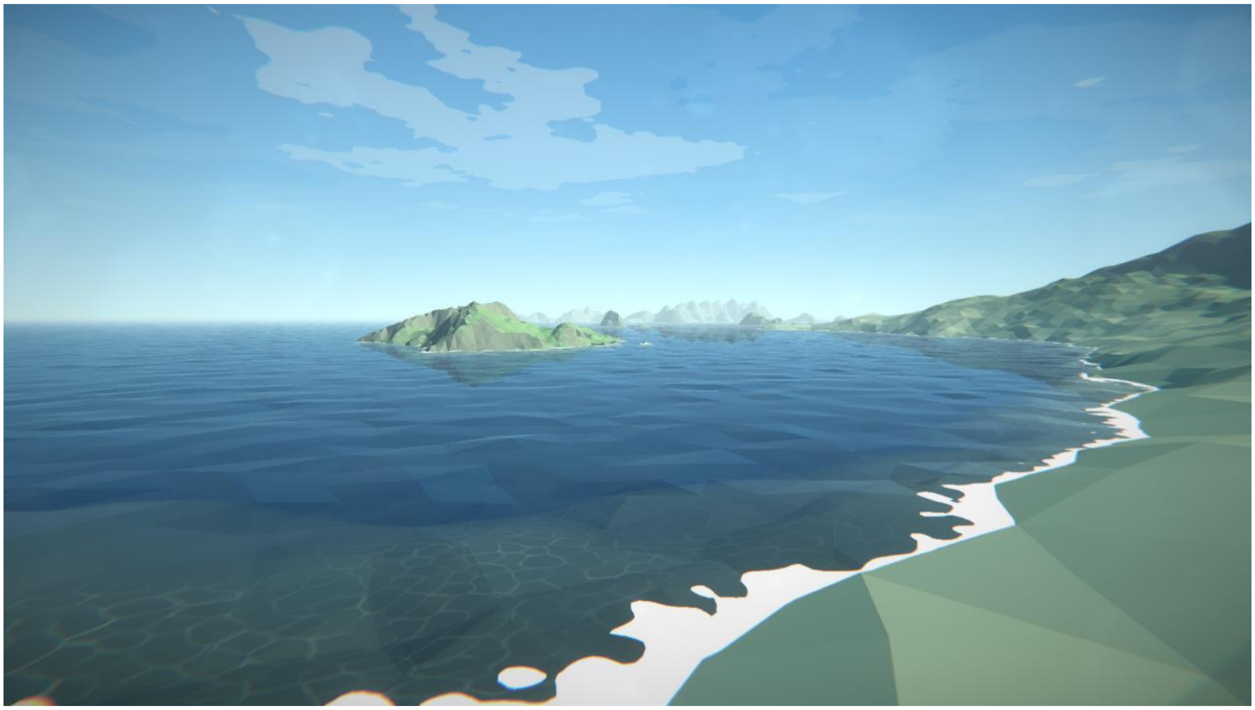
You can easily find Poseidon functionalities in these editor menus:

- **Assets>Create>Poseidon>…**: Create specific assets like Water Profile, etc.
- **GameObject>Create>3D Object>Poseidon>...**: Create water object in the scene.
- **Window>Poseidon>...**: Open additional editor window or configure Poseidon global settings.

CREATE AND CUSTOMIZE WATER OBJECT

Create Water object

To create a new Water object, go to **GameObject>3D Object>Poseidon>Calm Water [HQ]** depending on your quality requirement.

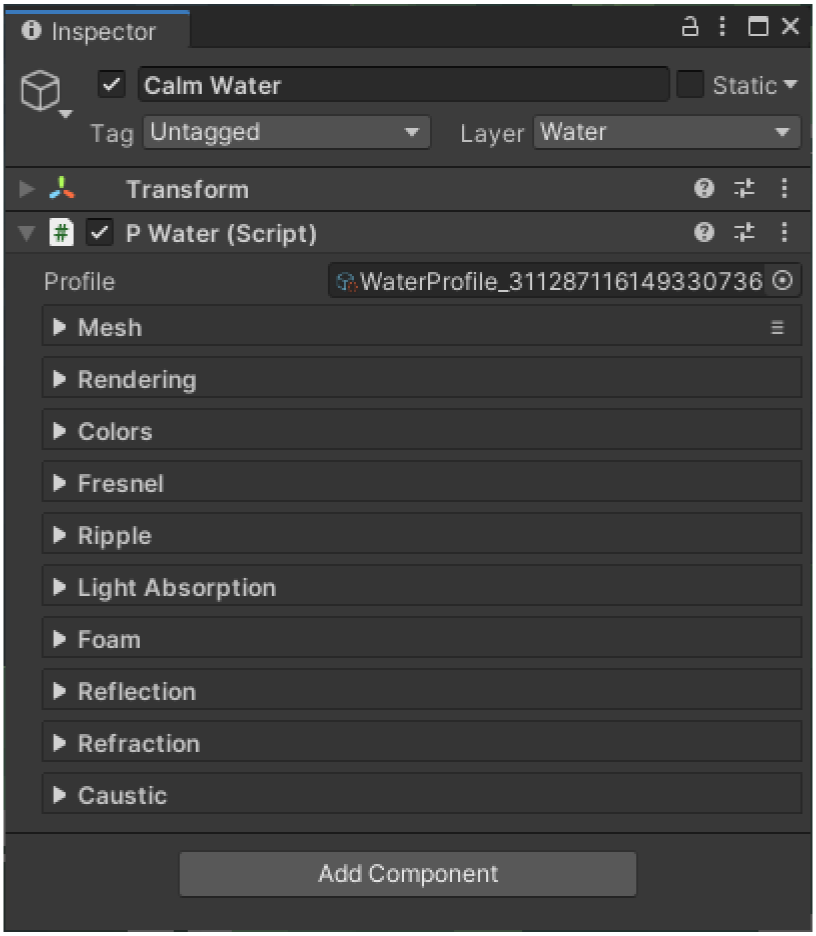


A new game object will be spawned into the scene.

A new Water Profile asset will be created in Assets/ folder. You should rename and store it in a different directory for ease of management.

Select the water game object, in the Inspector, you can see a variety of settings to customize it.

NOTE: The water object is designed to work without rotation. It is highly recommended to leave rotation at (0,0,0) for all features to work correctly, except when you need it for some special purposes.



☑ Calm Water ☐ Static

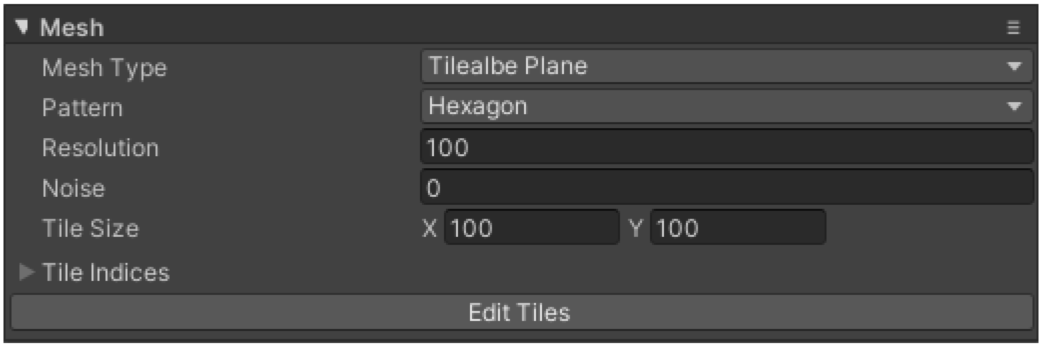
Tag Untagged Layer Water

Profile WaterProfile_311287116149330736

Mesh

Control water mesh generation. There are 4 mesh types: Tileable Plane, Area, Spline and Custom Mesh.

Tileable Plane



▼ Mesh

Mesh Type: Tilealbe Plane

Pattern: Hexagon

Resolution: 100

Noise: 0

Tile Size: X 100 Y 100

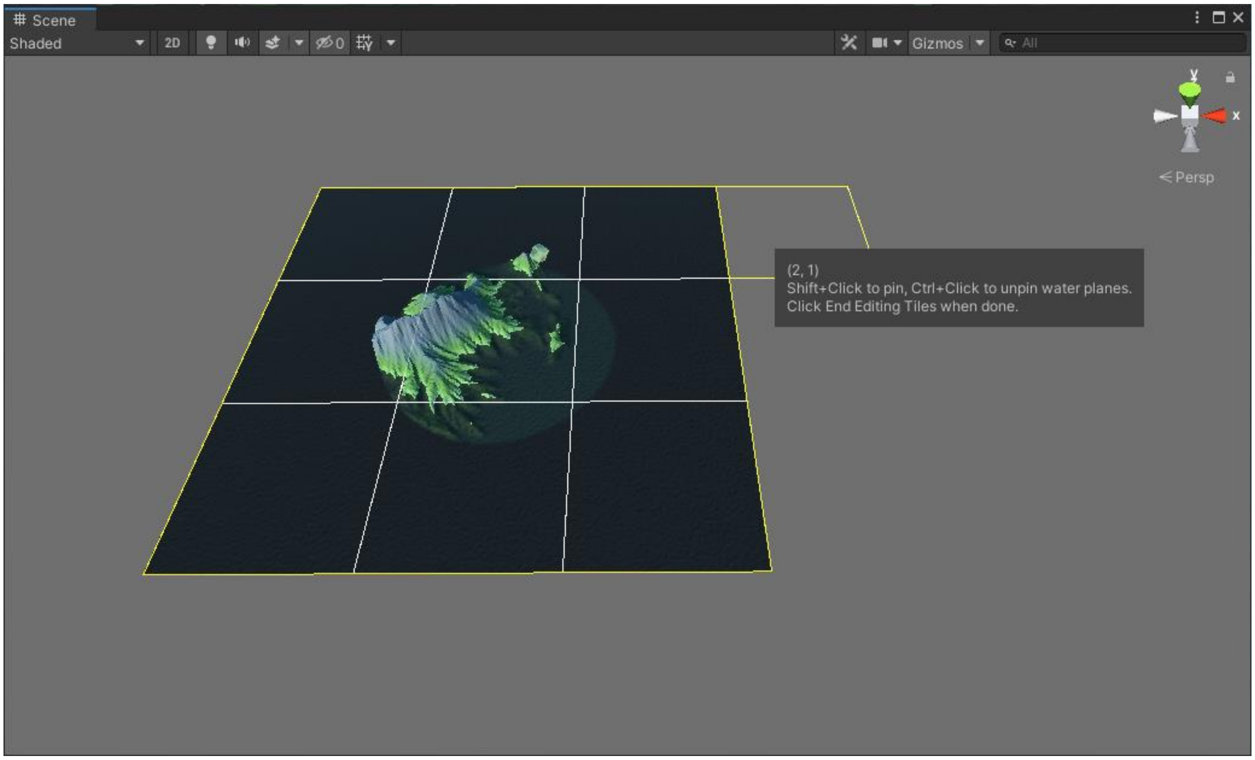
▶ Tile Indices

Edit Tiles

This mode will generate a seamless plane mesh and render it multiple times in different locations in the scene to easily cover a large area.

- Pattern: Chose mesh pattern (Hexagon, Diamond, Quad)
- Resolution: Resolution of the mesh, higher numbers give more triangles and vertices. This will be limited to 100 due to vertices count limit (65k).
- Noise: Displace vertices on XZ-plane.
- Tile Size: Width and length of a tile to render in world space.
- Follow Main Camera: If turned on, the water object will offset itself based on Main Camera position. Very useful when you want to make an ocean/open water which only need a few pre-pinned tiles. See Creating ocean/open water.
- Tile Indices: A list of already pinned tiles. Usually you don't need to modify this list, use the "Edit Tiles" button instead.

To add or remove water tiles, click on Edit Tiles.



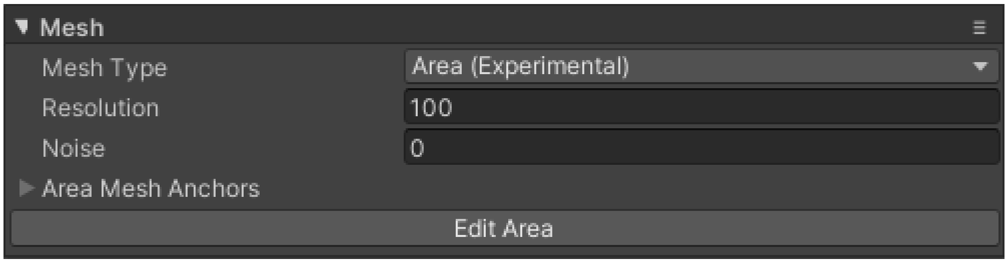
(2, 1)
Shift+Click to pin, Ctrl+Click to unpin water planes.
Click End Editing Tiles when done.

Hover your mouse over the scene view, you will see some rectangles. Use **Shift+Left Mouse** to add a tile at that location and **Ctrl+Left Mouse** to remove one.

Tip: Instead of clicking, you can drag your mouse to quickly add or remove tiles.

When you are happy with the tiles, click **End Editing Tiles** in the Inspector to finish.

Area (Experimental)



▼ Mesh

Mesh Type: Area (Experimental)

Resolution: 100

Noise: 0

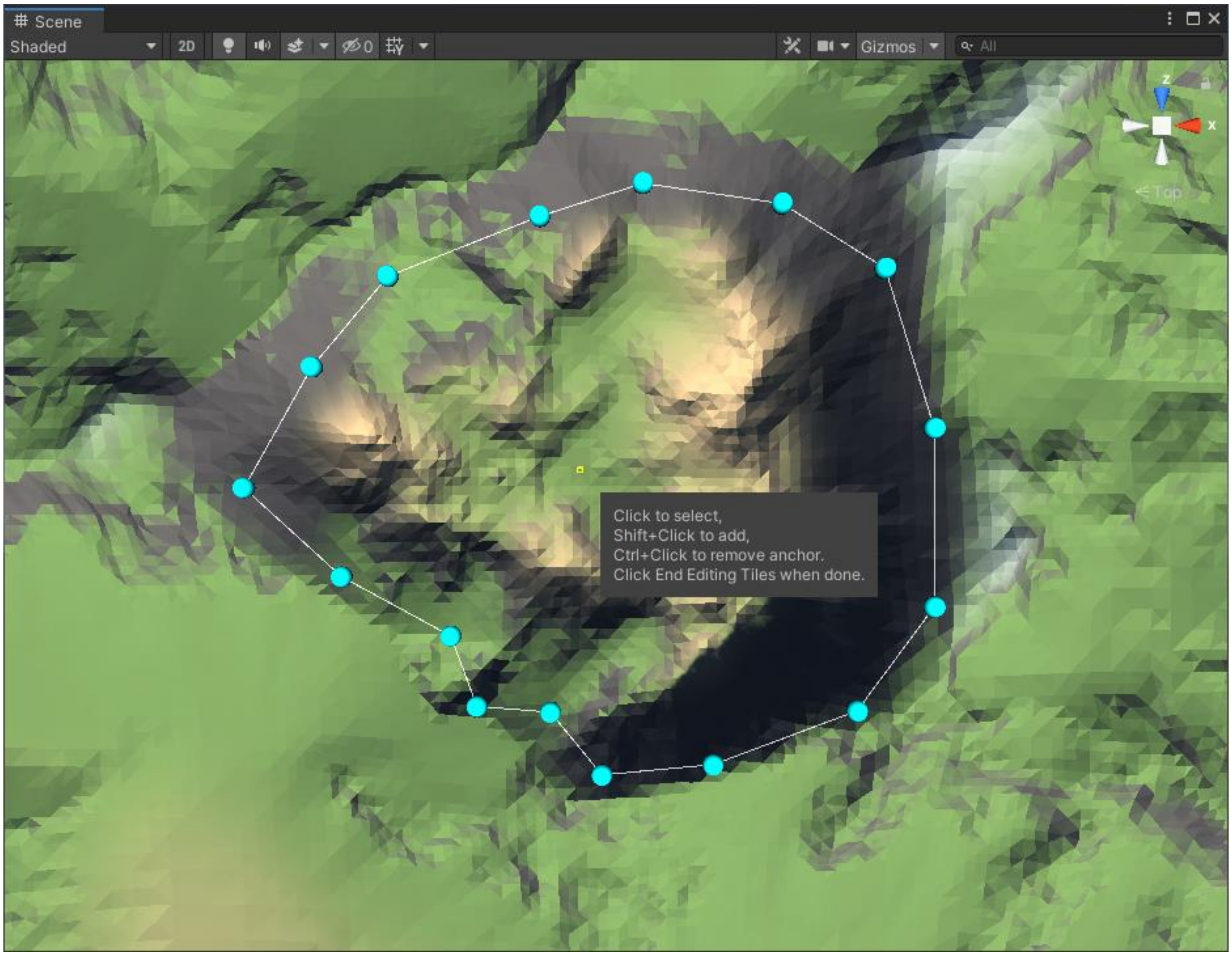
▶ Area Mesh Anchors

Edit Area

This mode allows you to generate water mesh from concave polygon. The mesh will lay flat on XZ-plane at the same Y coordinate of its water object. This is useful for things such as lakes and swimming pools where you can strip off unnecessary vertices and save some processing power in the vertex shader.

- Resolution: Resolution of the mesh, higher numbers give more triangles and vertices. This will be limited to 100 due to vertices count limit (65k).
- Noise: Displace vertices on XZ-plane.

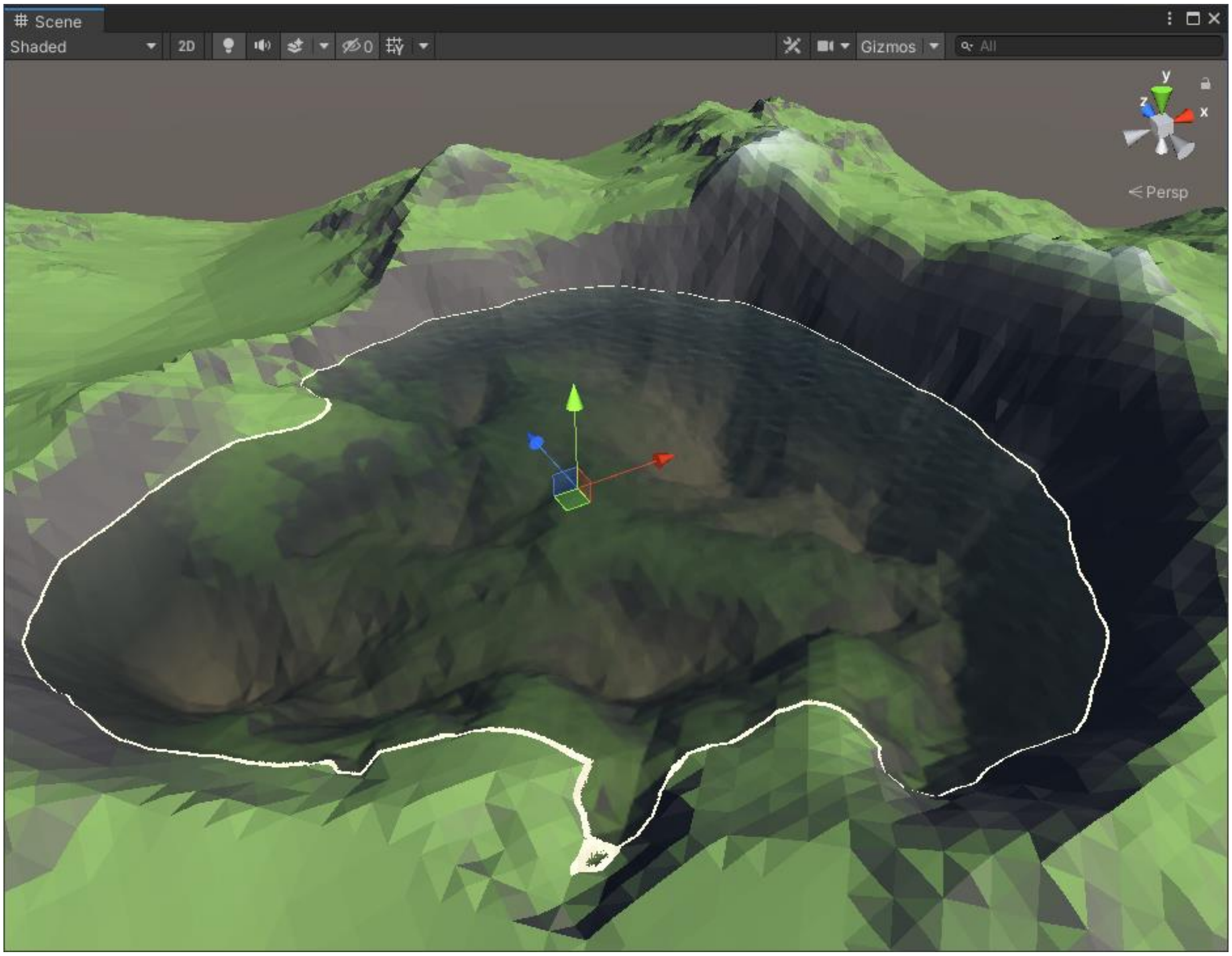
To edit the mesh, click on the **Edit Area** button.



Click to select,
Shift+Click to add,
Ctrl+Click to remove anchor.
Click End Editing Tiles when done.

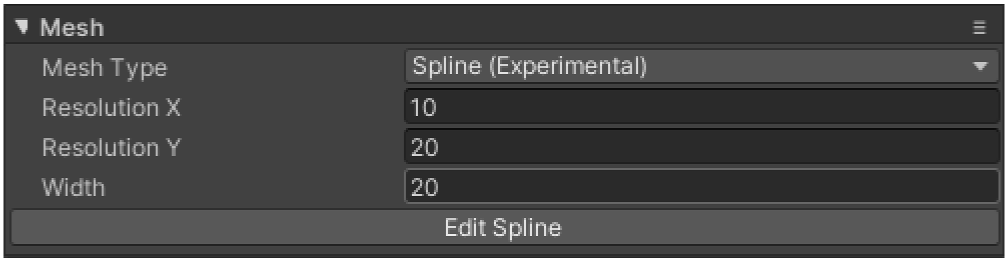
In the Scene View, use **Shift+Left Mouse** and **Ctrl+Left Mouse** to add/remove anchor points. Anchor points will be connected to form a concave polygon. At least 3 anchor points are required to generate area mesh. Click **End Editing Area** when done.

Remember that anchors will be laid on XZ-plane, so switch to Top view for a better sense of your area. You can adjust the water object position and scale after this to fit it in your scene.



In this picture, the water object was moved up and scale up a bit to fit in place.

Spline (Experimental)



Mesh

Mesh Type: Spline (Experimental)

Resolution X: 10

Resolution Y: 20

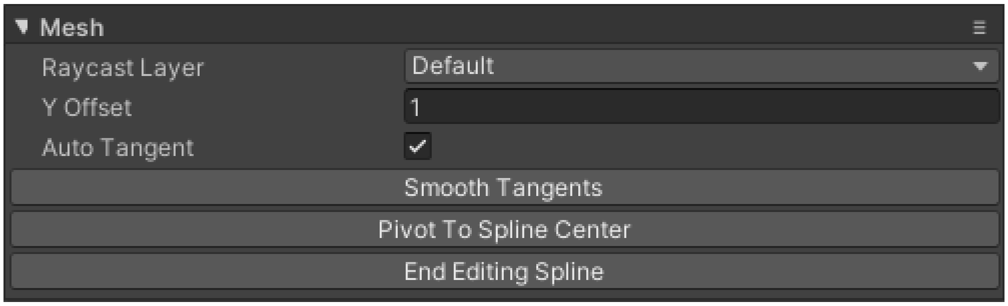
Width: 20

This mode allows you to create water meshes that follow a spline to form rivers and streams. The flow is not constrained to XZ-plane, but in any direction. Branching is also possible but will need some adjustment to hide the intersection.

- Resolution X/Y: Resolution of each segment mesh.

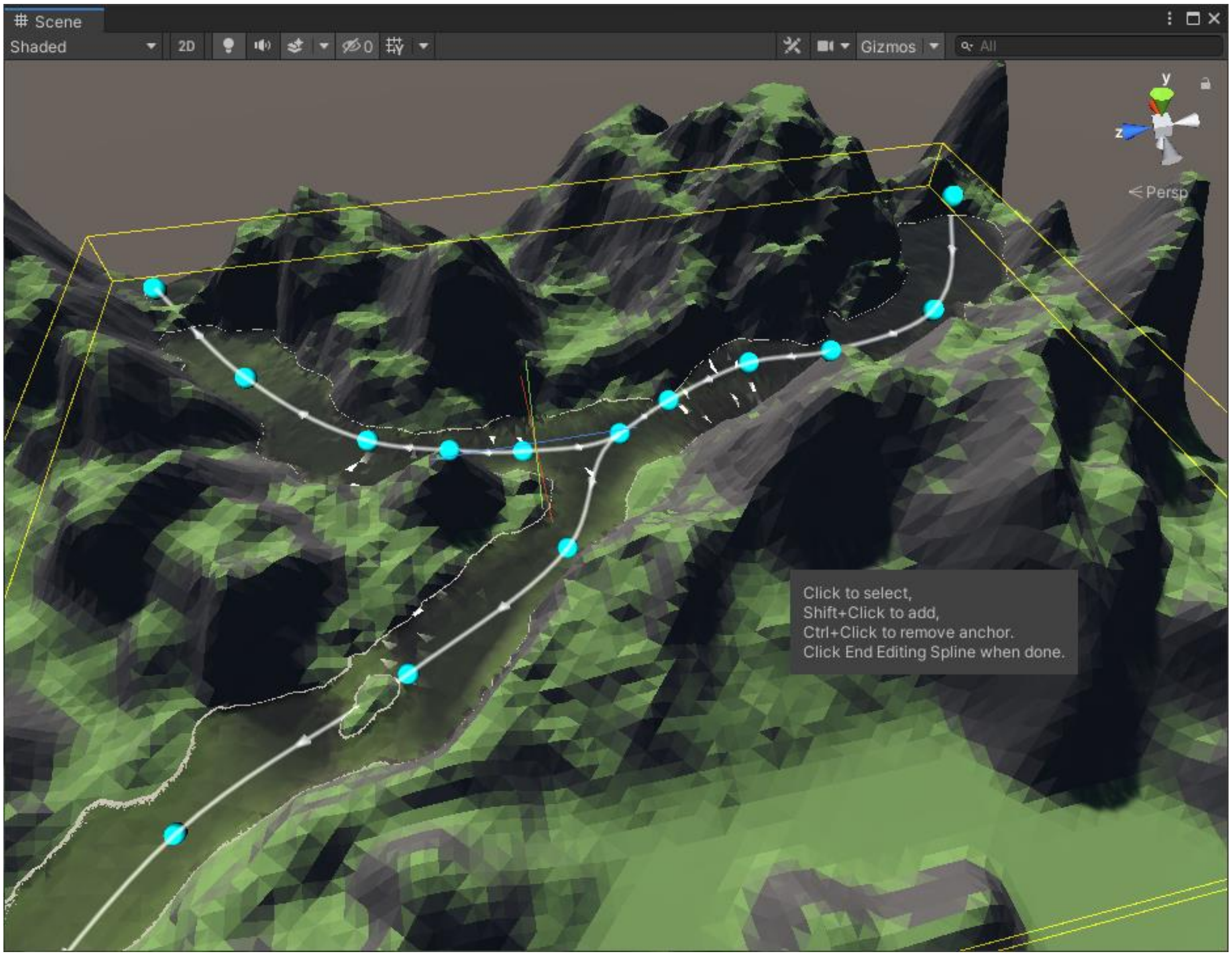
- Width: Width of the spline.

To edit the spline, click on **Edit Spline**.



Raycast Layer: Default
Y Offset: 1
Auto Tangent: ☑

- Raycast Layer: Which object layer to perform raycast.
- Y Offset: Move the newly added anchor along Y axis by this value.
- Auto Tangent: Smooth the spline when it is modified.



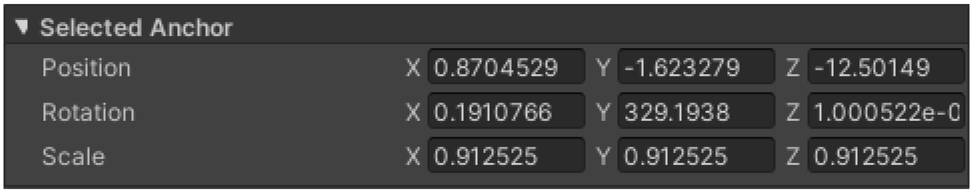
Click to select,
Shift+Click to add,
Ctrl+Click to remove anchor.
Click End Editing Spline when done.

In the Scene View, use **Shift+Left Mouse** to add anchors. A segment will be created to connect the newest and the previous anchor.

Use **Ctrl+Left Mouse** on an anchor or segment to remove it.

Use **Left Mouse** on an anchor or segment to select it.

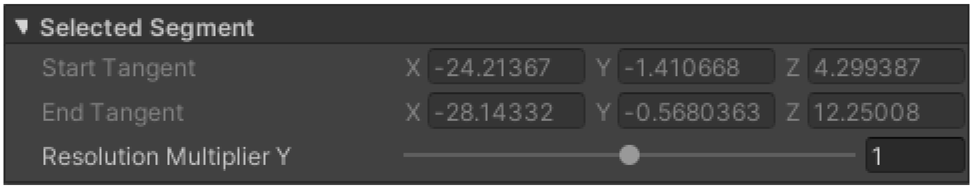
By selecting an anchor, you'll be able to use the builtin transform tool (W-E-R keys) to move, rotate or scale it. Its transformation is also shown in the Inspector. You can’t rotate an anchor when Auto Tangent is on.



▼ Selected Anchor

Position	X	0.8704529	Y	-1.623279	Z	-12.50149
Rotation	X	0.1910766	Y	329.1938	Z	1.000522e-0
Scale	X	0.912525	Y	0.912525	Z	0.912525

By selecting a segment, you'll be able to adjust it tangents using the gizmos, when Auto Tangent is NOT on. Its properties are also shown in the Inspector. The tiny arrow in the middle of the segment indicates its flow path, and will affect Auto Tangent functionality.



▼ Selected Segment

Start Tangent	X	-24.21367	Y	-1.410668	Z	4.299387
End Tangent	X	-28.14332	Y	-0.5680363	Z	12.25008
Resolution Multiplier Y						1

- Resolution Multiplier Y: Increase or decrease mesh resolution of a specific segment along its path.

You can add a branch by selecting an anchor, then Shift+Left Mouse on another location.

Similarly, you can connect 2 anchors manually by selecting an anchor, then Shift+Left Mouse on the other anchor.

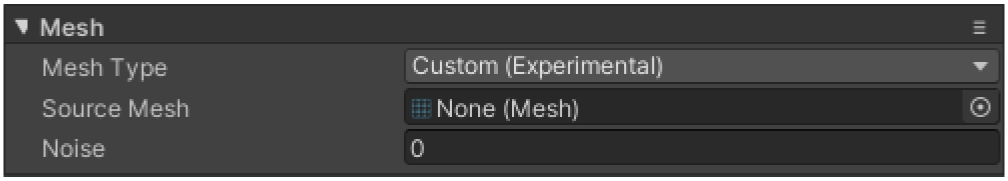
NOTE: Anchors and tangents position are in local space.

Click on **End Editing Spline** when done.

You can use the transform gizmos to move, rotate and scale the whole spline at once.

Custom (Experimental)

This mode allows you to render the water using custom mesh. Useful when you need the mesh to be carefully crafted. However, shader features are quite limited.



Mesh

Mesh Type	Custom (Experimental)
Source Mesh	None (Mesh)
Noise	0

- Source Mesh: The mesh to copy data from. Vertex position will be remapped to 0-1 range, so you need to scale it using the Transform component to fit in the scene.
- Noise: Adding some random noise to vertex position.

Rendering

Contains lighting and rendering settings.

- Material: The current material used to render water.
- Queue Index: Render order of the water.
- Light Model: Select light model, including Physical Based, Blinn Phong and Lambert.
- Flat Lighting: If turned on, light will be evaluated per-triangle instead of per-pixel, to create a crispy polygonal look.
- Render Back Face: Should it render water when the camera is under water level. Check this on when using underwater effect.

Time

Control the time parameter that used to animate the water.

- Time Mode: Select Auto to the water will animate itself. Select Manual if you want to set its time with custom script, useful when making a multiplayer game where the water animation need to be sync across clients.
- Time: The current time value. To set value for this in Manual mode, use ManualTimeSeconds property.

You can retrieve the current time value by calling water.GetTimeParam().

Colors

Control water color tinting and lighting model.

- Color: Shallow water color.
- Depth Color: Deep water color. This requires Light Absorption to be enabled.
- Specular Color: Specular reflection color.
- Smoothness: Control the shininess of the water surface.

Fresnel

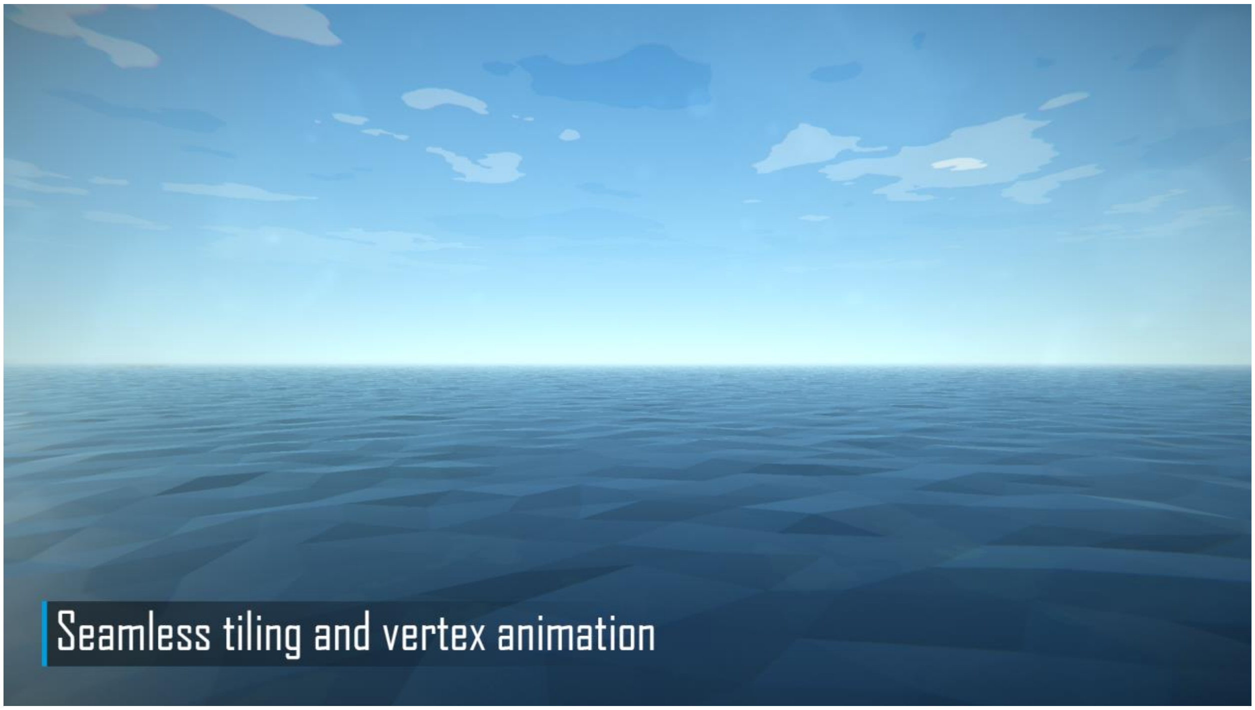
Control the fresnel factor, which is used to blend between reflection and refraction.

- Strength: Higher value means more reflection, less refraction.
- Bias: Offset the fresnel value.

Ripple

Simulate small movements across the water surface.

- Height: Height of the ripple.
- Speed: Speed of the ripple.
- Scale: Scale of the ripple pattern.

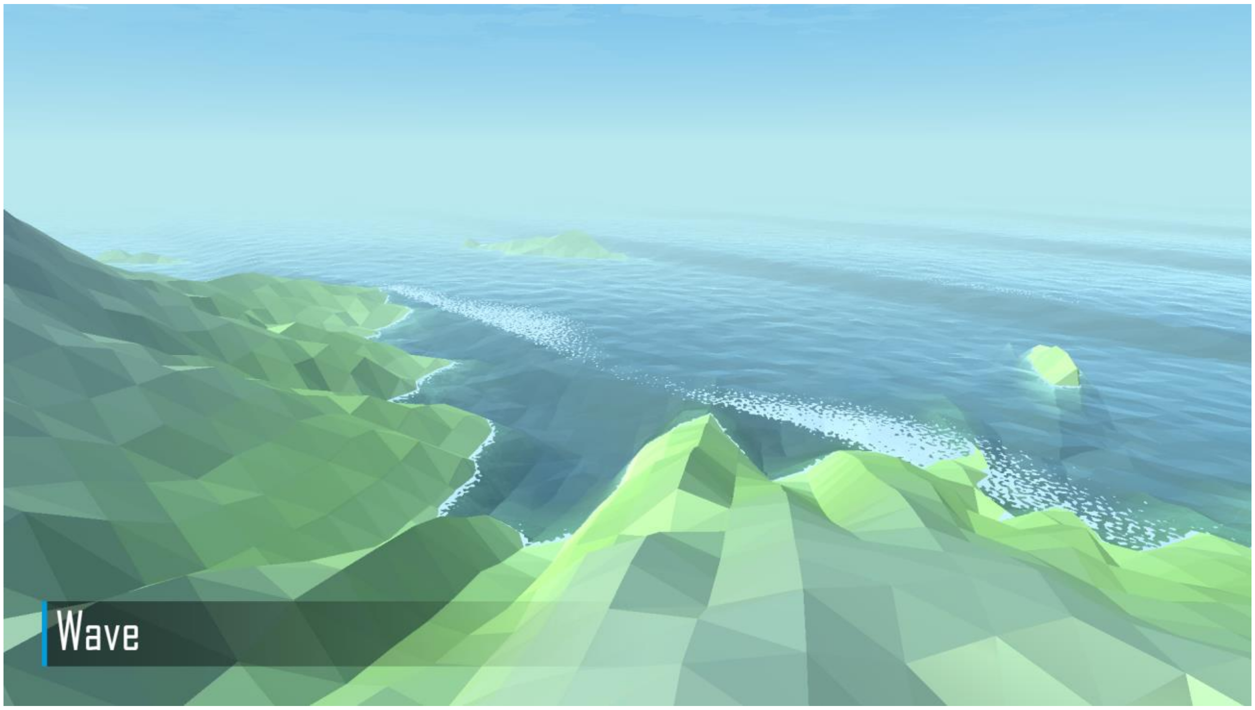


Wave

Simulate one direction wave effect.

- Enable: Enable the effect or not.

- Direction: Movement direction of the waves, in degree.
- Speed: Movement speed of the waves.
- Height: Height of the waves.
- Length: Distance between 2 waves.
- Steepness: Higher value will push the wave crests forward.
- Deform: Add some random deformation to the waves.
- Use Mask: Whether to use Wave Mask texture or not.
- Visualization: Visualize the mask in the scene view.
- Bounds: Define the region to apply the Wave Mask texture, in world space.
- Mask: The mask texture, RG reserved for later use, B is crest intensity, A is wave height.



Light Absorption

Simulate the effect that objects become darker when light travels through the deep surface of the water.

- Enable: Enable the effect or not.
- Depth Color: Color of the deep water.
- Max Depth: The depth where it becomes darkest color.

Foam

Simulate foam/shoreline effect where water intersects with other objects, on wave crest or when water flow from higher to lower place such as waterfall.

- Enable: Enable the effect or not.
- High Quality: Toggle high quality foam mode.
- Scale/Speed: Define the foam noise.
- Color: Foam color.

Shoreline Foam

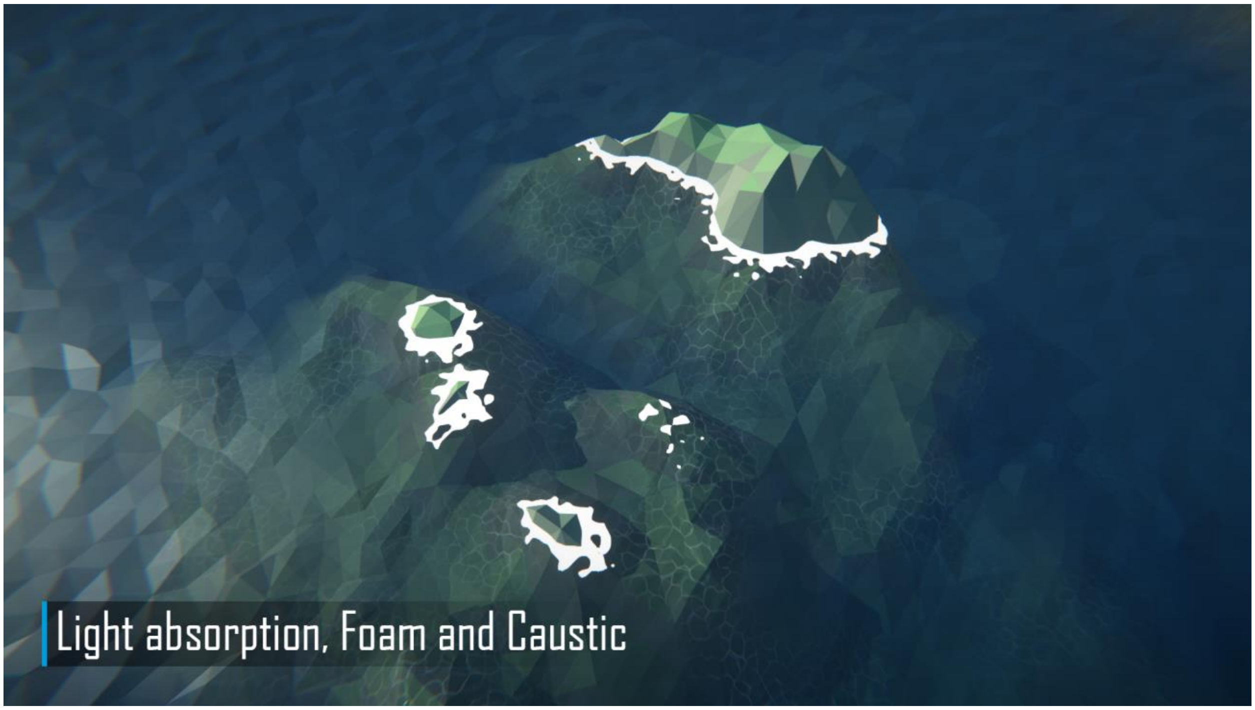
- Distance: Distance from the intersection point where foam is visible.
- Strength: Intensity of shoreline foam.

Crest Foam

- Max Depth: Maximum depth of the water body where crest foam is visible. (Crest usually appear near the shore, not on deep ocean)
- Strength: Intensity of crest foam.

Slope Foam

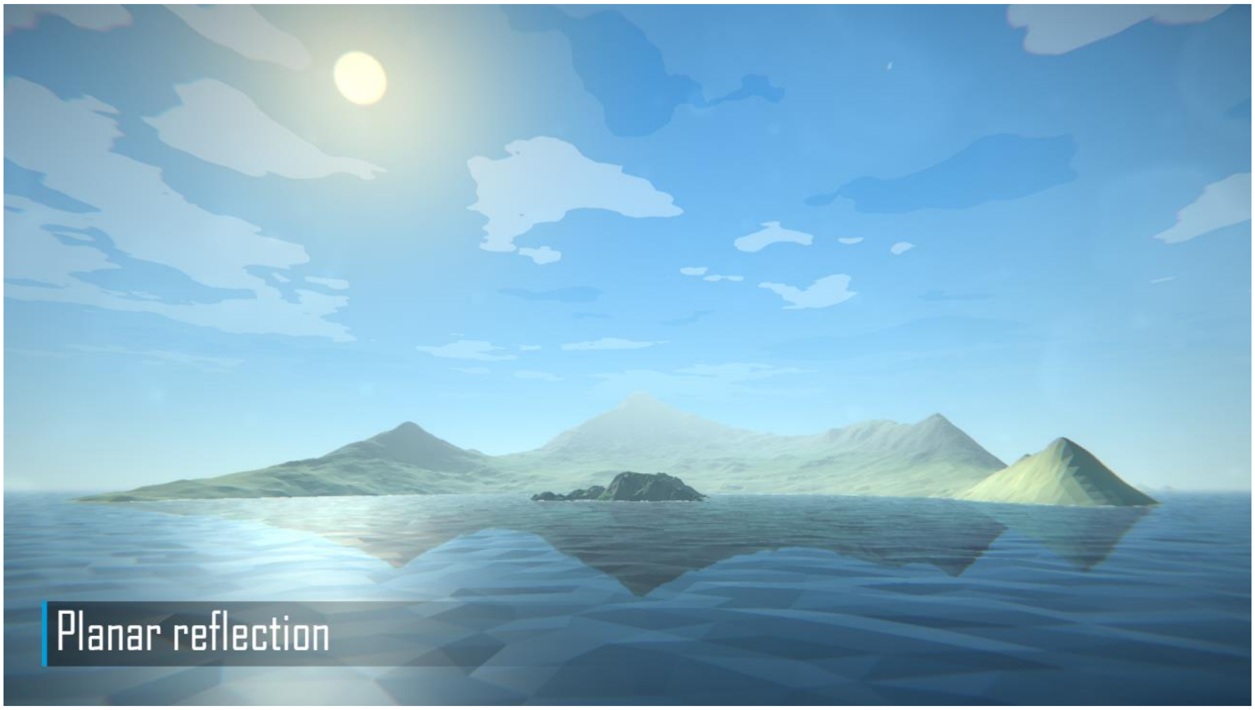
- Distance: Distance between 2 foam strips.
- Flow Speed: How fast the foam move..
- Strength: Intensity of slope foam.



Reflection

Simulate planar reflection effect.

- Enable: Enable the effect or not.
- Custom Skybox: Check to reflect custom skybox of the camera (Skybox component).
- Pixel Light: Should it render reflection texture with pixel light? Turn off to save performance.
- Blur: Adding a slight blur effect to reflection texture, for better quality when using a low resolution reflection.
- Clip Plane Offset: Offset the reflection camera to hide the “gap”.
- Reflection Layer: Objects in these layers will be reflected.
- Resolution: Resolution of the reflection texture.
- Distortion: Adding some distortion to the reflected image.



Refraction

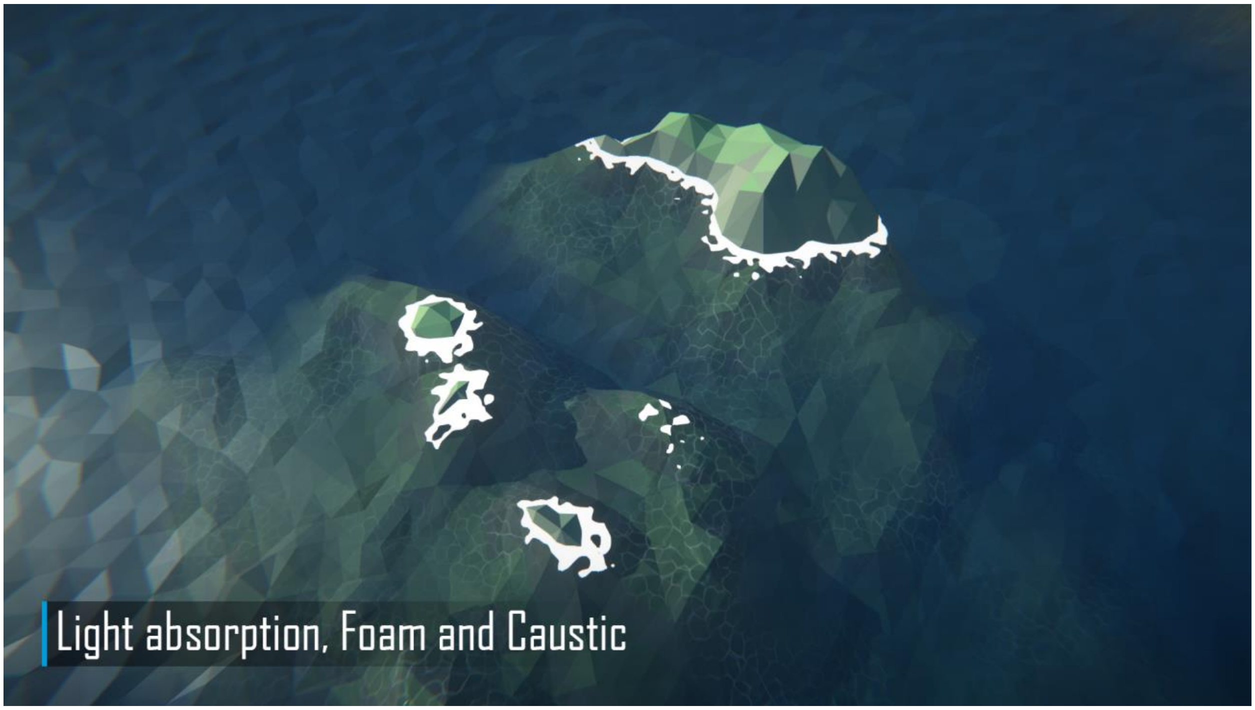
Simulate refraction effect where light ray gets bent when entering the water volume.

- Enable: Enable the effect or not.
- Distortion: Adding some distortion to the refracted image.

Caustic

Simulate the projection of light rays onto the underwater surface.

- Enable: Enable the effect or not.
- Texture: The caustic image. A seamless/tileable one is recommended.
- Size: Size of the caustic image in world space.
- Strength: Strength of the effect.
- Distortion: Add some distortion to the caustic image.



Aura 2 Integration

This section adds support for Aura 2 volumetric light and fog.

You need Aura 2 to be imported in your project. Only support Builtin RP (as Aura does).

- Apply Fog: Apply volumetric fog to the water plane.
- Apply Lighting: Apply volumetric lighting to the water plane.
- Lighting Factor: Intensity of the volumetric lighting.

ADDING WATER EFFECTS

Water Effect adds underwater fog and lens wetness to your camera. Note that these effects only apply in Play mode and built games.

Water Effect only works for the main camera.

Installing additional packages

To use water effects, you have to install the following packages using the Package Manager:

For Builtin Render Pipeline:

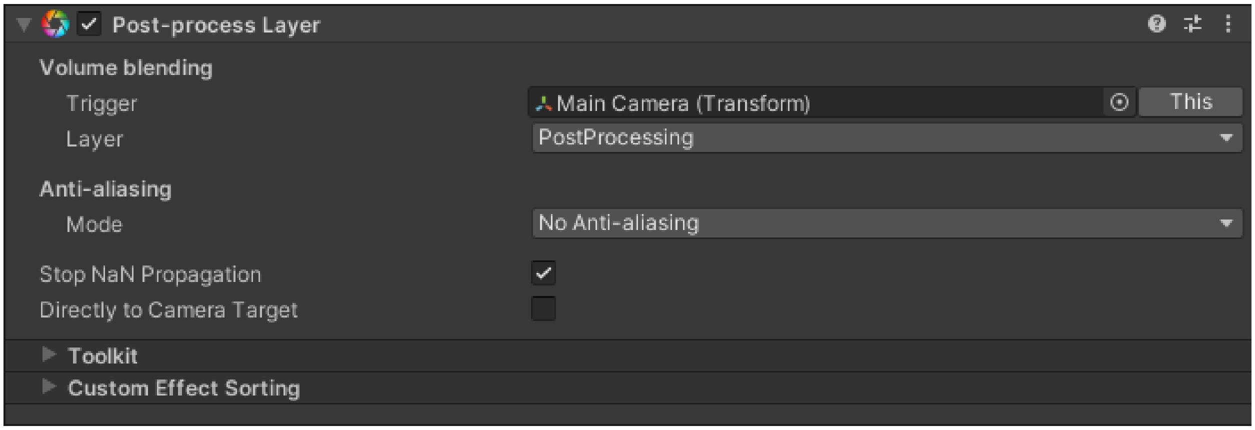
- Post Processing Stack V2 (**com.unity.postprocessing**)

For Universal Render Pipeline:

- Universal RP (**com.unity.render-pipelines.universal)**

Setup for Builtin RP

After installing the Post Processing Stack V2, select your main camera and add a Post-process Layer component:



☑ Post-process Layer

Volume blending

Trigger: Main Camera (Transform) — This

Layer: PostProcessing

Anti-aliasing

Mode: No Anti-aliasing

Stop NaN Propagation ☑

Directly to Camera Target □

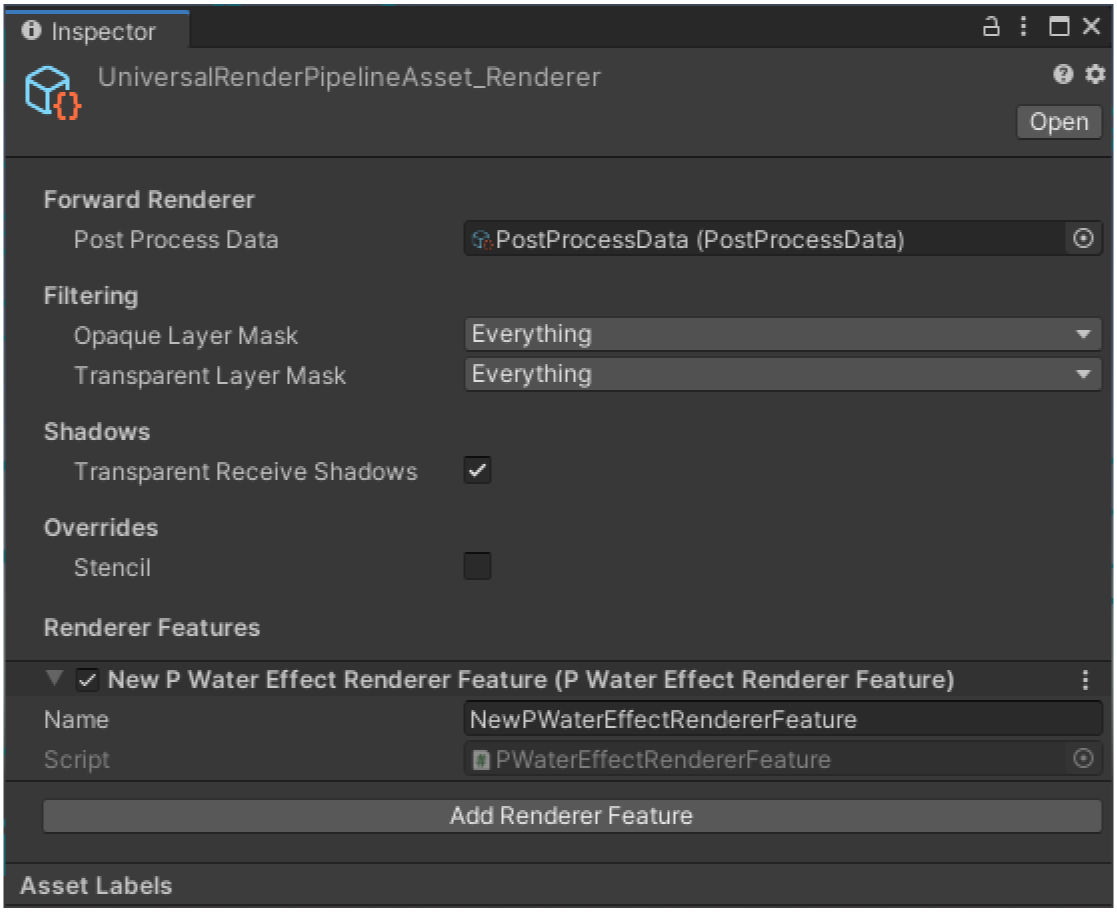
▶ Toolkit

▶ Custom Effect Sorting

Then, select a Layer for volume blending.

Setup for Universal RP

Select your Universal Render Pipeline Asset, then add a “Water Effect Renderer Feature” to its active renderer:



Inspector

UniversalRenderPipelineAsset_Renderer

Open

Forward Renderer

Post Process Data: PostProcessData (PostProcessData)

Filtering

Opaque Layer Mask: Everything

Transparent Layer Mask: Everything

Shadows

Transparent Receive Shadows: ☑

Overrides

Stencil: □

Renderer Features

☑ New P Water Effect Renderer Feature (P Water Effect Renderer Feature)

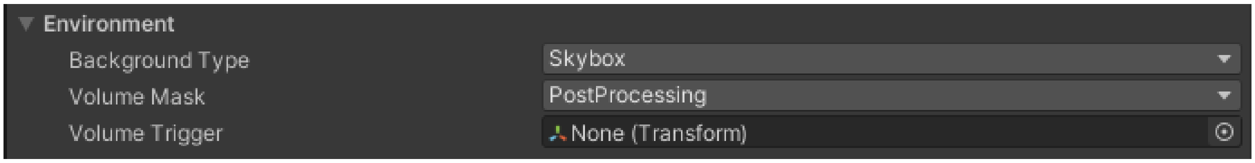
Name: NewPWaterEffectRendererFeature

Script: PWaterEffectRendererFeature

Add Renderer Feature

Asset Labels

Then, select your Main Camera and set Volume Mask to a desired value.



Environment

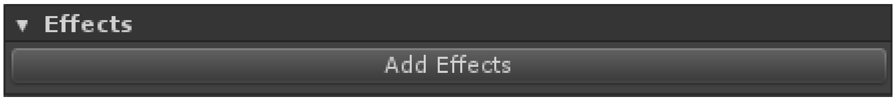
Background Type: Skybox

Volume Mask: PostProcessing

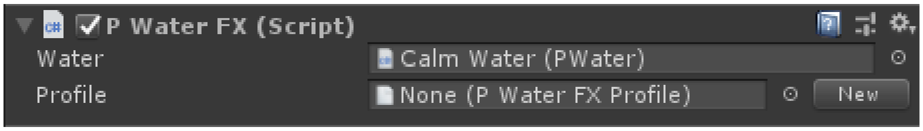
Volume Trigger: None (Transform)

Add Water Effect component

To add water effect controller, select the water game object, in the Inspector, under Effect foldout, click Add Effects:



A new component will be added to the game object:



P Water FX (Script)

Water: Calm Water (PWater)

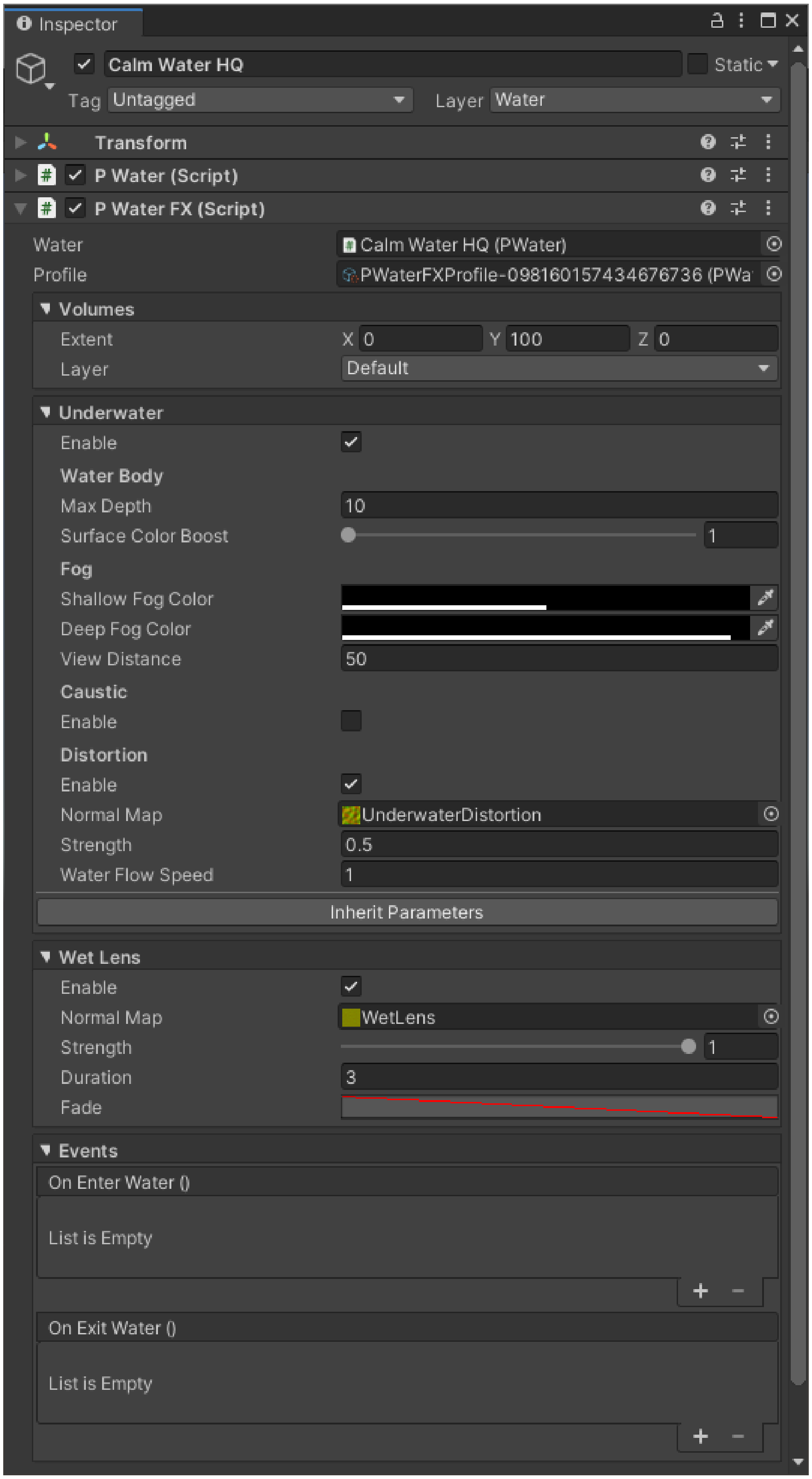
Profile: None (P Water FX Profile)

Water FX Profile is an asset type containing effect configs to share across your project. You can create one by right click on the Project window, go to Create>Poseidon>Water FX Profile.

Drop your FX Profile into the Profile slot if you already have one, or simply click on New button to create a new one.

You should store the FX Profile in an appropriate directory for reusing later.

After that, the Inspector should look like this:



Inspector

☑ Calm Water HQ □ Static

Tag Untagged Layer Water

Transform

☑ P Water (Script)

☑ P Water FX (Script)

Water: Calm Water HQ (PWater)

Profile: PWaterFXProfile-098160157434676736 (PWa

Volumes

Extent: X 0 Y 100 Z 0

Layer: Default

Underwater

Enable: ☑

Water Body

Max Depth: 10

Surface Color Boost: 1

Fog

Shallow Fog Color

Deep Fog Color

View Distance: 50

Caustic

Enable: □

Distortion

Enable: ☑

Normal Map: UnderwaterDistortion

Strength: 0.5

Water Flow Speed: 1

Inherit Parameters

Wet Lens

Enable: ☑

Normal Map: WetLens

Strength: 1

Duration: 3

Fade

Events

On Enter Water ()

List is Empty

On Exit Water ()

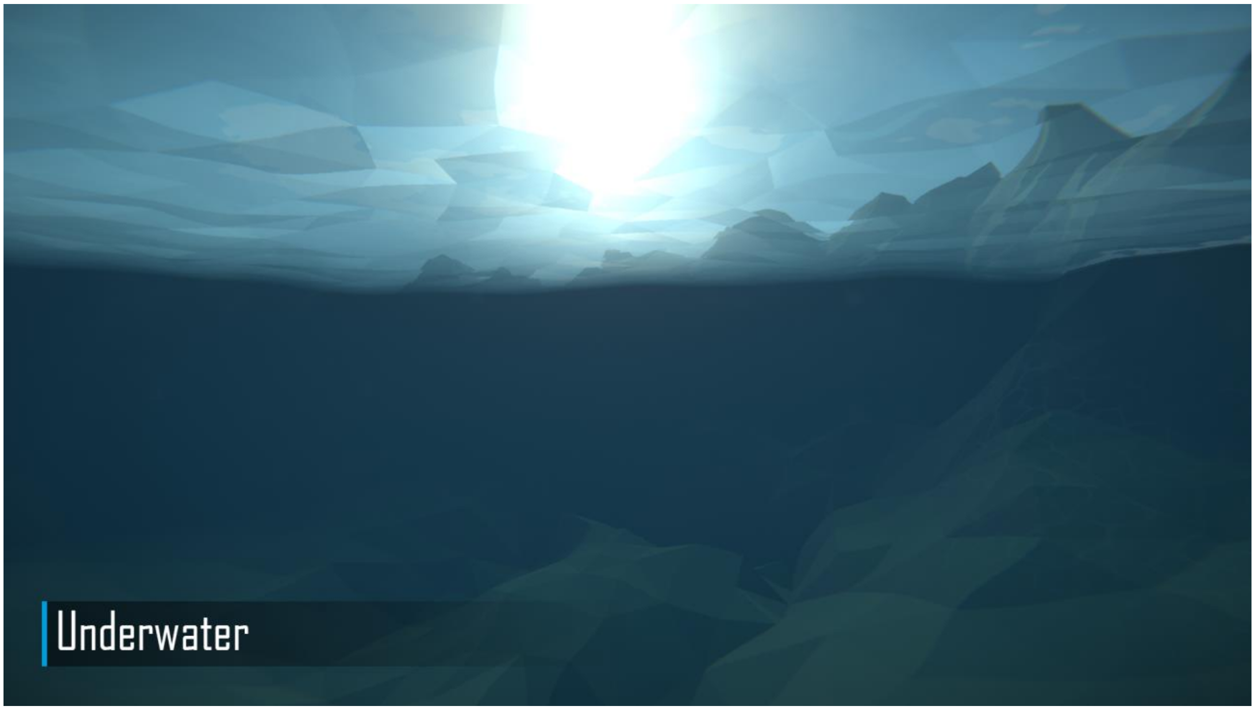
List is Empty

Volumes

Contains configurations for spawning post processing volumes

- Extent: Define size of the volume box by extent its water bounding box. This value will be added to the bounding box size. Too small value will cause glitch or unexpected behaviours because the camera goes outside of the volume too soon. Use the Scene view to see where your volume will be.
- Layer: Layer of the volume. **Make sure it matches with the Layer value set on your Post-process Layer or your camera volume mask**.

Underwater



Adding underwater fog, caustic and distortion.

- Enable: Enable the effect or not.

Water Body:

- Max Depth: Maximum depth where it becomes darkest.
- Surface Color Boost: Increase the intensity of water plane color (backface).

Fog:

- Shallow Fog Color: Fog color near the water plane.
- Deep Color Fog: Fog color when going deeper.
- View Distance: Maximum distance which object can be seen.

Caustic:

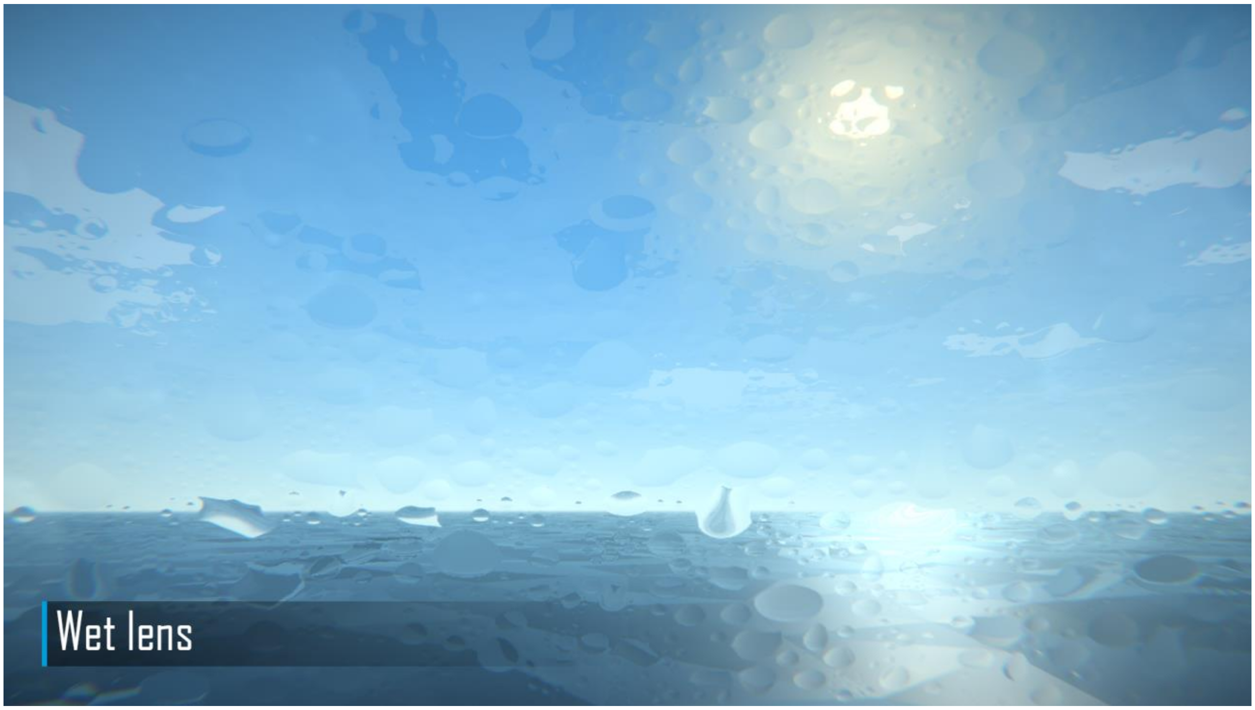
- Enable: Enable caustic or not.
- Texture: Caustic texture.
- Size: Size of caustic pattern in world space.
- Strength: Control caustic intensity.

Distortion:

- Enable: Enable distortion or not.
- Normal Map: Distortion texture, where distort vectors are stored in RG channel, which will be remapped from [0,1] to [-1,1] in shader code.
- Strength: How much the object is distorted.
- Water Flow Speed: How fast the water flows. This will make objects to be distorted faster.

You can click on Inherit Parameters to fetch value from the Water component.

Wet Lens



Adding distortion caused by a small droplet on the camera when getting out of water.

- Enable: Enable the effect or not.
- Normal Map: Distortion texture, where distort vectors are stored in RG channel, which will be remapped from [0,1] to [-1,1] in shader code.
- Strength: Intensity of the effect.
- Duration: Fade out duration.
- Fade: How to fade out over time.

Events

Some useful events when getting in or out of water. You can add more stuff such as bubble or splash sound here:

- OnEnterWater: Raise when the main camera get into water (above to below water plane)
- OnExitWater: Raise when the main camera get out of water (below to above water plane)

BUOYANCY

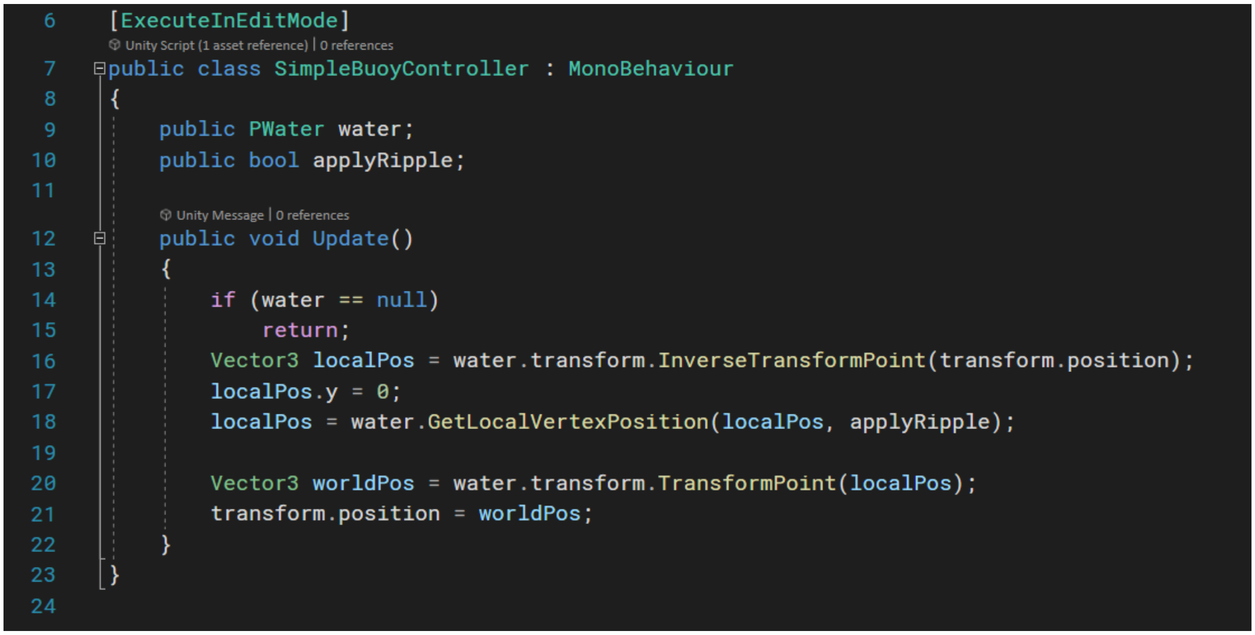
Since the mechanism of each game is different, there is no universal buoyancy solution packed in Poseidon.

However, the key to develop your own buoyancy physics is to know the water level at a specific point. Poseidon provides a function to do that, defined in the **PWaterExtension** class:

public static Vector3 GetLocalVertexPosition(this PWater water, Vector3 localPos, bool applyRipple = false)

The function expects a local position and will return a local position with correct height level (y).

You can find example code in the SimpleBuoyController.cs file:



```
[ExecuteInEditMode]
Unity Script (1 asset reference) | 0 references
public class SimpleBuoyController : MonoBehaviour
{
    public PWater water;
    public bool applyRipple;

    Unity Message | 0 references
    public void Update()
    {
        if (water == null)
            return;
        Vector3 localPos = water.transform.InverseTransformPoint(transform.position);
        localPos.y = 0;
        localPos = water.GetLocalVertexPosition(localPos, applyRipple);

        Vector3 worldPos = water.transform.TransformPoint(localPos);
        transform.position = worldPos;
    }
}
```

VR CHECKLIST

Poseidon supports VR, with a reduced features set. Below are details for each render pipeline.

	Builtin RP	**Universal RP**
Stereo Render Mode	Single Pass Instanced.	
Basic shader features (Lighting, color, specular, smoothness, etc.)	Yes	Yes
Fresnel	Yes	Yes
Ripple	Yes	Yes
Light Absorption	Yes	Yes
Foam	Yes	Yes
Planar Reflection	No	No
Refraction	No	Yes
Caustic	Yes	Yes
Post Processing (Underwater, wet lens, etc.)	No	No

PERFORMANCE TIPS

Poseidon is highly optimized. However, it's necessary to achieve higher performance on lower end devices. Here are some tip:

- Disable things you don't really need.
- Use URP since these shaders run a bit faster.
- For Mobile, use simpler light models such as Blinn Phong and Lambert.
- Lower mesh resolution, vertex animation takes time!
- Set Mesh Noise to 0 to disable it.
- Disable High Quality Foam
- Don't use Pixel Light for Reflection.
- Lower reflection & refraction texture size.
- Filter out objects which will be rendered to reflection texture using Layers.
- Refraction runs faster in URP since it has downsample options.
- Increase Tile Size and reduce number of tiles, which will reduce draw calls.
- Water FX is not suitable for mobile.

UNIVERSAL RENDER PIPELINE UPGRADE GUIDE

Poseidon also supports the Unity Universal Render Pipeline. Note that render pipeline other than the built-in and URP is not supported. After install and setup URP, the water material will be automatically upgraded, if not, disable and then re-enable the Water component.

Minimum version for URP support: **Unity 2019.3**

RESOLVING PACKAGE DEPENDENCIES

Sometimes compilation errors may occur during the development process due to mis-configuring package dependencies. There are some ways to resolve them:

1. “failed to open source file: Packages/com.unity.render-pipelines.universal/…”: This error is from URP water shader, installing the render pipeline will solve it. You can ignore this error.
2. “The type PostProcessProfile does not exist”: Usually happens when you uninstall the Post Processing Stack V2, or uninstall LWRP/URP. Go to Player Settings, in the Scripting Defined Symbol, remove UNITY_POST_PROCESSING_STACK_V2 symbol.
3. “Namespace UnityEngine.Rendering.LWRP not exist”: Go to Window>Poseidon>Project>Update Dependencies to solve this.

TUTORIALS

Creating ocean/open water

For battleship-like games, it’s not wise to pin a large number of water tiles to create an ocean, because each tile is considered as an object to render, thus it will take time to cull and render them.

Instead, you can use the Follow Main Camera option combined with Unity fog to fake this sense of open area.

1. Set Mesh Type to Tileable Plane.
2. Set Tile Size to be large enough, 100x100 for example.
3. Turn on Follow Main Camera.
4. Click on Edit Tiles.
5. Hover the mouse in the Scene View, use Shift+Left Mouse to pin some tile **around the water object position**. A grid of 3x3 to 5x5 tiles is enough (that costs 9 to 25 draw calls already, don’t pin too much).
6. Open Lighting window and turn on Fog.
7. Adjust the fog so it can cover the water boundary and blend well with the sky horizon.
8. Enter Play mode, then try moving the Main Camera to see it work.

See this video.

RELEASE LOG

V1.8.2

FIXES

- Fix reflection camera not deleted after exiting game mode.

===

V1.8.1

FIXES

- Fix Water FX issue on Unity 2022.1+

- Fix "Loaded object state change..." error when entering playmode

===

V1.8.0

IMPROVEMENTS

- Show and error and fix suggestion when water features are toggled at runtime using script.

FIXES

- Fix null reference on material validation in some cases.

DEPRECATED

- Remove Aura 2 support. Other reliable integration comes later.

===

V1.7.9

FIXES

- Fix foam artifact when MSAA is enabled.

- Minor fix for WaterFX URP on Unity 2021.2+.

===

V1.7.8

FIXES

- Minor shader fix for Builtin RP (undeclared identifier 'i').

===

V1.7.7

FIXES

- Fix wrong water mesh when instantiate as prefab instance.

===

V1.7.6

FIXES

- Fix Underwater Caustic/Distortion not visible in build.

===

V1.7.5

FIXES

- Fix water inspector issue in URP

===

V1.7.4

FIXES

- Fix a prefab issue.

===

V1.7.3

IMPROVEMENTS

- Doubling water mesh bounds for better culling.

===

V1.7.2

IMPROVEMENTS

- Wave now takes into account Water FX.

FIXES

- Fix wet lens bug on game start.

- Fix water planes get rendered in a prefab scene.

- Change Manual Time to double.

===

V1.7.1

IMPROVEMENTS

- Adding automatic Water Level for WaterFX.

FIXES

- Fix GetLocalVertexPosition() bug with Wave Deform parameter (simply set the PerlinNoise.png to non-sRGB).

- Fix WaterFX trigger bug when player stands still but the water raises/lowers.

===

V1.7.0

NEW FEATURES

- Adding support for Aura 2 volumetric light & fog.