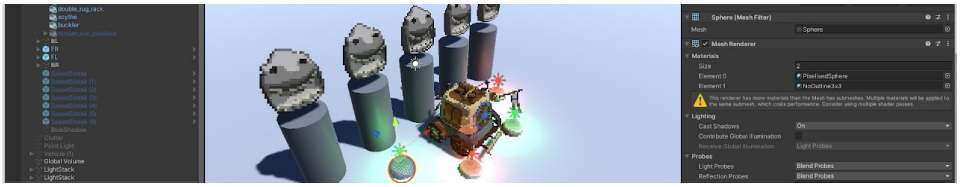
User Guide (v1.7)



Requirements

The package has the following minimum requirements*:

- Universal Render Pipeline 7.3.1

Please let me know if you find it working without these requirements, or not working with them!

I have tested using the following versions of Unity:

- ProPixelizer v1.6
  - 2019.4.33 LTS + URP 7.7.1
  - 2020.3.24 LTS + URP 10.7.0
  - 2021.2.5 + URP 12.1.2
- ProPixelizer v1.5
  - 2019.4.28 LTS + URP 7.6.0
  - 2020.3.13 LTS + URP 10.5.0
- ProPixelizer v1.4
  - 2019.4.23f1 (LTS) + URP 7.3.1
  - 2020.2.1f1 + URP 10.2.22
- ProPixelizer v1.3
  - 2019.3.0 + URP 7.4.x
  - 2020.1.2f1 + URP 8.2.0
  - 2020.2.1f1 + URP 10.2.22

Build Targets

I've tested:

- webGL ES 2.0 (firefox and chrome), running on a desktop.
- Windows PC, both Direct X and openGL.
- Android (works, but laggy on my low end phone, a Galaxy A10).

If you are interested in how ProPixelizer works, I give a brief description of the pixelization process in this article, under Attempt #3. I intend to write more technical articles in the future. Feel free to contact me on Discord or twitter with questions!

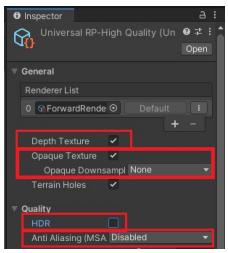
Getting started

First, make sure you have the Universal Render Pipeline package added to the project (you can add this using the Unity Package Manager).

Import ProPixelizer from the Unity Package Manager; it must be located at *Assets/ProPixelizer*, which is the default location.

If the Shader Variant Limit is set too low, ProPixelizer will raise a warning in the console. You can increase the setting (e.g. to 256) via *Edit > Preferences > Shader Graph*. After raising the limit, right click and reimport the ProPixelizer folder to recompile the shaders.

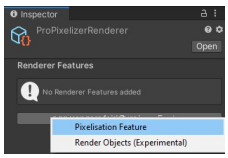
Setting up the render pipeline



In the Universal Render Pipeline Asset, enable *Depth Texture* and *Opaque Texture* without downsampling.

Disable *Anti Aliasing*.

For versions of ProPixelizer before v1.6, disable HDR.

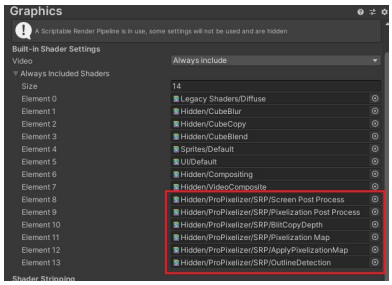


Select the Renderer asset (here - ForwardRenderer, in the RendererList). Below *Render Features* click *Add Render Feature*, and select *Pixelisation Feature* to add the render feature required for ProPixelizer.

Note that in recent versions of URP there are multiple RenderPipelineAssets by default, with one associated with each different quality setting.

In 2021 LTS, if the RenderPipelineAsset for your chosen Quality setting uses the SSAO render feature, change the 'source' property of the SSAO feature from DepthNormals to Depth.

Setting up the project



The following step is only required for ProPixelizer versions v1.0 to v1.6; **it is not required for v1.7:**

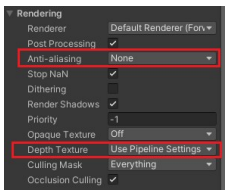
Under `Project Settings > Graphics`, add the following ProPixelizer shaders to the Project's *Always Included Shaders*:

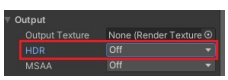
- Hidden/ProPixelizer/SRP/Screen Post Process
- Hidden/ProPixelizer/SRP/Pixelization Post Process
- Hidden/ProPixelizer/SRP/BlitCopyDepth
- **v1.3+:** Hidden/ProPixelizer/SRP/Pixelization Map
- **v1.3+:** Hidden/ProPixelizer/SRP/ApplyPixelizationMap
- **v1.6+:** Hidden/ProPixelizer/SRP/OutlineDetection

This step is required because Unity cannot determine that these shaders are used by the Project - because they are only referenced in the code (specifically, in the Pixelisation Feature*) - so Unity mistakenly omits them from the build. It's only required for building your project, and you can skip it for the moment if you are in a rush to get started.*

Note that your project may have multiple different Render Pipeline Assets for different quality settings. You will need to configure the Render Pipeline Assets in both *Project Settings > Graphics* and *Project Settings > Quality*. ProPixelizer v1.7+ will warn you if one of these is unset.

Setting up the camera





Configure the camera as follows:

- *Rendering/Anti-aliasing*: None
- *Rendering/Depth Texture*: Use Pipeline Settings
- *Output/HDR*: Off, if using a version before v1.6

Post processing can be used, e.g. *Bloom* and *Vignette*, and configured through a Volume as per the usual Unity workflow.

For best results, it is strongly recommended to **use orthographic rather than perspective** projection. This is because pixel creep can only be fully eradicated for cameras using orthographic projection; under orthographic projections the size of an object does not change as it moves within the camera's view.

Add the **Camera Snap SRP** MonoBehaviour to the camera game object. This behavior is used to snap pixelated objects and prevent 'swimming' artefacts. More information can be found in the section *Eradicating Pixel Creep* below.

Updating from previous versions

Updating to v1.4

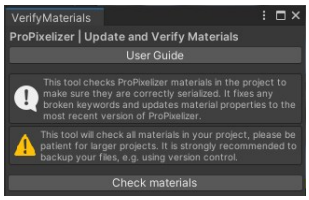
- I changed the name of some shader keywords to be consistent between outline and appearance materials. After you update, run the tool *Window/ProPixelizer/Verify Materials* to fix any broken materials in your project (this will update all materials to use the new keywords).

Updating to v1.6

- There are now some features of ProPixelizer which require the Outline pass to run. Use the Appearance+Outline material (which includes this pass), not the Appearance material. If you want to remove the outline, just set the outline alpha to zero.
- There is now another material to add to the *Always Include Shaders* under *Project Settings > Graphics*: Hidden/ProPixelizer/SRP/OutlineDetection. You can see the full list in the 'setting up the project' part of this guide.

Updating to v1.7

- You must now use the single *Appearance+Outline* material (PixelizedWithOutline) - *Appearance* will no longer work.
  - Source Buffer option has been removed - pixelization is now determined only using the ProPixelizer Metadata buffer for better support across the different platforms. The appearance material does not have the passes required to render to the ProPixelizer Metadata buffer (these are added by the PixelizedWithOutline shader).
- Some material properties have been named from randomized ShaderGraph strings into more meaningful names.
- An automatic material updater has been added to fix both of the above issues. If your materials need to be updated, an update button will appear in inspector which will migrate your materials and properties to the PixelizedWithOutline shader.
- You no longer need to add things to 'Always Included Shaders'.
- 2019 is no longer supported, but both 2020 and 2021 now have LTS versions you can use instead. There is early support for 2022, but please bear in mind the URP API for this version is currently still changing frequently.
- Many of the updates can be automatically applied to your materials using the tool at *Window/ProPixelizer/Update and Verify Materials*. Please back up your project before using it, it will search through all materials looking for ProPixelizer materials to update.



Check out the examples!

ProPixelizer includes a number of examples to show of various setups:

- *ProPixelizer/ExampleAssets/Example.unity*: a bare bones scene containing a few primitives with different materials.
- *ProPixelizer/ExampleAssets/Floating/Example_NoCreep.unity*: an example scene with many moving objects, which shows how to setup the camera snap behaviors to prevent swimming and pixel creep.
- *ProPixelizer/ExampleAssets/CameraStacking/CameraStacking.unity*: an example showing ProPixelizer working in a camera stack.

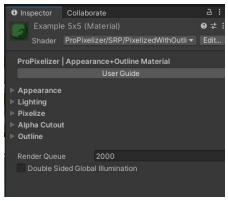
Pixelized objects: materials setup

Objects can be pixelized into *macropixels* of size 1x, 2x, 3x, 4x, and 5x screen pixels.

ProPixelizer draws pixelated objects by applying two passes:

- An **appearance pass**, which reduces the color, adds dither if required, and quantises the shading.
- An **outline pass**, which fills a buffer with information required to draw object outlines (outline color, object ID).

ProPixelizer provides a **PixelizedWithOutline** material shader, which adds all required passes to an object. The forward 'appearance' passes are generated by a Shader Graph shader called ProPixelizerBase, which are included in the PixelizedWithOutline shader using Unity's `UsePass` ShaderLab feature.



PixelizedWithOutline material

The PixelizedWithOutline material adds all passes required to draw and outline the object. It uses a custom editor inspector and categorizes the shader properties as follows:

- **Appearance:** Properties for albedo maps, normals maps, emission maps, and whether to color grade the object using a palette.
  - The **Palette** texture property is a texture look-up table (LUT) used for color grading when the 'Use Color Grading' option is enabled. A number of LUTs to emulate well-known devices (eg NES, PAL, GameBoy) are shipped with **ProPixelizer**.
  - You can create your own palettes by using a palette asset (Right Click -> Create -> ProPixelizer -> Palette) which is used to generate the LUTs. The LUT can also include dither patterns as demonstrated here. For more information, see the 'Color palettes and dither patterns' section of the user guide below.
- **Lighting:** Shadow and lighting ramp.
  - **Lighting Ramp** is a texture ramp used for cell shading, which helps give a pixel-art aesthetic. When rendering the object, the calculated color Value is used as to sample the lighting ramp.
  - **Ambient Light:** A background level of lighting. This can be helpful to tweak the appearance, in conjunction with the color grading. *ProPixelizer doesn't yet support ambient light probes, but I am working on adding this!*
- **Pixelize:** Properties to pixelate the object.
  - **Pixel size** in the range 1-5. This sets the size of one 'macropixel' in screen pixels.
- **Alpha Cutout**: Properties to enable cutout transparency.
- **Outline:** Outline related properties.
  - **ID:** A number. Outlines are drawn when pixels have an ID different to those around them. If two objects should have outlines when they meet, give them different IDs (eg, two enemies). If they should not have outlines (eg, a character and their equipment), give them the same ID. The value should be an integer in the range (0, 255).
  - **Outline Color:** The color to use for the outline. The alpha value controls blending with the scene color. Alpha values of 0 can be used for invisible outlines, 1.0 can be used for block color, and fractions to blend with the appearance material color.
  - **Edge Highlight:** This property is used to lighten or darken edges detected by inspection of scene normals. To use it, make sure that 'Use Normals For Edge Detection' is enabled on the Pixelisation Feature of your Forward Renderer Asset. Color values less than 0.5 will darken edges, color values above 0.5 will lighten edges, and values of 0.5 will make no difference.

Technical note for advanced users: If you are writing your own ShaderLab shaders, you can perform the pixelisation and outline within a single material shader. In the fragment shader, you should `clip()` the output of `PixelClipAlpha_float` in `PixelUtils.hlsl`, and also add a separate Pass with Tags `"LightMode" = "Outlines"`, which you can create by including `OutlinePass.hlsl`.

Eradicating pixel creep

Pixel creep is a problem that occurs frequently when rendering 3D objects as pixel art - the object appears to shimmer as it moves across the screen. An example can be seen in this video: https://www.youtube.com/watch?v=lO8O5tY-wZI . The creep occurs because the number of pixels that an object occludes changes as it moves across the screen.

Pixel creep can be removed by aligning objects to the pixels of the screen before rendering them. **Note that pixel creep can only ever be solved for orthographic projections**; in a perspective projection, the object's size will change as it moves on the screen.

For orthographic projections, ProPixelizer provides functionality to handle this for you, through two MonoBehaviours:

- A `CameraSnapSRP` MonoBehaviour, which should be attached to your camera. The `PixelSize` property determines the size of one camera pixel in world units.
- An `ObjectRenderSnapable` MonoBehaviour, which should be attached to meshes that you are rendering.

These MonoBehaviours will snap object positions before rendering and restore them afterwards. The implementation respects transform hierarchies.

Snapping angles

The `ObjectRenderSnapable` MonoBehaviour can also snap the angles of objects being rendered. Set `ShouldSnapAngles` to true if object angles should also be snapped, by the desired `Angle Resolution`. If you have nested transformations (eg for equipment), I recommend you only do this on the root transform.

Aligning pixel grids

The `ObjectRenderSnapable` MonoBehaviour also provides a way to align the pixel grids of child objects to their root transform. This is useful for things like equipment - you have different meshes but want the complete object to look like one sprite. Set the property `Align Pixel Grid` to true to cause the object's pixel grid to be aligned with the `Pixel Grid Reference` transform, or the root transform of the heirachy if this property is none.

An example is given in the picture on the left, showing how the blue/green shield looks when it is and is not aligned to the pixels of the root transform. Look closely within the circles - on the unaligned you should be able to see the slightly 1 pixel misalignment of the two objects with 3x3 pixelsizes.

More control over object outlines

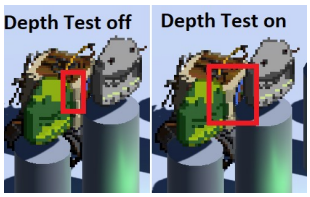
Exterior outlines are drawn whenever two adjacent pixels have a different `ID`, as determined from the `Outline/ID` material property.

The `OutlineControl` MonoBehaviour provides some extra ways to control the outlines of your objects:

- You can specify an `ID` to use, or set `Use Random ID` to true to generate a random ID at runtime.
- Set `UseRootID` to true if the outline material should use the ID of the root transform. This also requires an `OutlineControl` MonoBehaviour to be present on the root transform. Like with aligning the pixel grids, this is useful for child objects such as equipment attached to a player model - it ensures the outline is drawn around the entire player, and not around each individual piece of equipment. In the image on the left, I have set `UseRootID` to true on all attached equipment (eg the shield, crossbow, window, etc) but not around the wheels.
- The same is also true of color. You can specify the color to use for the outline with `Color`, and also whether to `UseRootColor`.

Note that many of these changes will only take place once you hit play mode (they require instancing the material).

Technical note for advanced users: The `ID` is rendered into the ProPixelizer metadata buffer with 8-bit precision, so only 256 different values of ID can be specified.



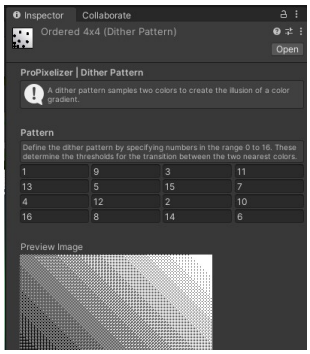
Depth Test outlines

This option was added in **v1.3** and can be found on the `PixelisationFeature` that you added to your `ForwardRenderer` Asset in the *Getting Started* section. When enabled, outlines will only be drawn for edge pixels that are in front of their neighbors. This helps achieve the feel of a hand-drawn sprite, for which the outline would not change depending on the geometry in front of it. A comparison of the two settings is shown in the image here.

Color palettes and dither pattern tools

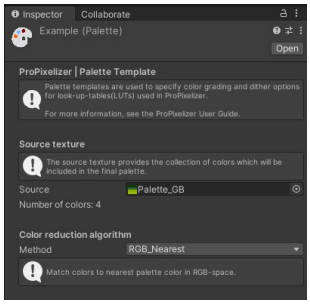
Many old games used reduced color palettes, often due to hardware limitations! For example, the original GameBoy could only display 4 different brightness values, and the SNES could only display 256 colors at once. Games sometimes employed dithering to emulate an increased color depth.

ProPixelizer gives you a set of tools to create reduced color palettes and dither patterns. Both are combined into a texture Look-Up Table (LUT) which is sampled when rendering the object to color grade with minimal overhead.



Dither patterns

ProPixelizer supports 4x4 dither patterns. You can design your own dither pattern by creating a dither pattern asset (Create -> ProPixelizer -> Dither Pattern). The editor will display a 4x4 grid of values, and a preview of how the dither pattern will appear for a smooth monochrome gradient. Each 'value' in the grid ranges from 0 to 16, and shows the 'threshold' at which this pixel in the 4x4 pattern will be enabled. Some example patterns are included (ProPixelizer/Palettes/DitherPatterns).

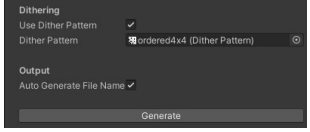


Color palettes

You can configure your own palettes using a palette asset (Create -> ProPixelizer -> Palette). After configuring the palette, use the 'Generate' button to create a texture LUT that you can use in your ProPixelizer materials.

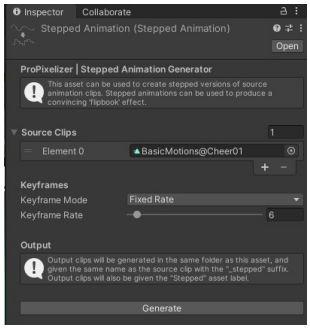
A number of properties can be configured:

- **Source Texture:** The texture to sample the set of colors from. The text below will tell you how many colors were identified in the source - these are used for color matching when generating the look up table.
- **Color reduction algorithm:** The method to use when deciding which colors are most similar. The comparison can be made in RGB-space, HSV-space, or just using the 'value' of the HSV space (which can work well for monochrome palettes in which hue does not matter).
- **Dithering:** Whether to use a dither pattern.



- **Output:** Options for generated LUT file name.

Stepped animation tools



Traditional pixel-art games used hand-drawn sprite sheets, and characters were animated by changing which sprite was displayed - the result was like a 'flipbook', with a few well defined poses. For instance, the cycle for a run animation could be ~5 frames long. 3D animations, on the other hand, commonly interpolate between key frames to produce smooth movement.

To help users achieve a flipbook effect, ProPixelizer provides a utility for automatically converting animation clips into stepped versions. A copy of the animation clip is created, keyframes are decimated, and the interpolation is set to None. This utility allows you to use many standard animations (e.g. from the Asset Store) in a way that keeps the pixel art aesthetic.

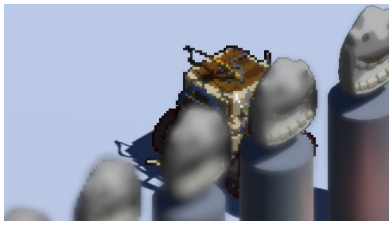
To use these tools, create a Stepped Animation asset (Create -> ProPixelizer -> Stepped Animation). After configuring, click 'generate' to create copies of the source clips.

Lastly, if you are using clips with anim trees, you may also wish to turn off the blending for the anim tree - otherwise changes of state will interpolate between frames, and break the flipbook feel.

Other tips for achieving a good pixel-art feel

Below are a collection of tips to bear in mind when using ProPixelizer:

- Try to avoid small features in geometry that are less than a pixel in size - otherwise they can flicker in and out of visibility.
- Old school sprite art typically only has a few different viewing angles - snap the angles of your objects to achieve the same feel.
- Reduce the number of keyframes in animation and use 'constant' interpolation to give it a stepped feel, as if flicking through pages of a sprite sheet.
- When using Color Grading, it helps to create your assets while targeting a particular color palette. There are significant differences between the various old-school color palettes. GameBoy is monochrome, for instance, while PAL is dark and grungy.



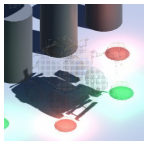
Note that you can also do neat things not normally seen in pixel art games, such as depth-of-field post processing.

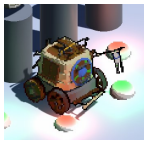
I hope you enjoy using ProPixelizer. Please do message me if you have any questions or problems. I'd also be very pleased to hear what you make with it.

Cheers!

Elliot

FAQ





My object looks like a bunch of dots?

The problem: Pixelated objects appear as a bunch of dots when rendered, as if dithered.

The solution: The Pixelisation Feature needs to be added to the Render Features of the Scriptable Render Pipeline - see 'Setting Up The Render Pipeline' under 'Getting Started', above.

If you are interested in *why* it looks like this, you can find the answer in this Medium article which describes how ProPixelizer works. The method used for ProPixelizer is described under Attempt #3; objects are first drawn as a dithered matrix of dots, then the post process fills the surrounding screen pixels to produce the final pixelated image.

If you see a shader error in the console when compiling the ScreenPostProcessing shader, please email me with details! The dots will also appear when the post process is not working, which is a bug.

Help, I see a black screen in builds/nothing shows in my build!

Make sure that Unity is correctly **adding the ProPixelizer post-process shaders to your build** - in some configurations, Unity mistakenly assumes these shaders are not required and strips them. See 'Setting up the Project' in this guide for the configuration of 'Always Included Shaders' to use.

If you have multiple quality configurations (eg, different assets for low and high quality targets), make sure each Universal Render Pipeline Asset is also set up correctly as in the first section of this guide.

I have a mesh with multiple materials - how should I apply the appearance+outline materials?

- From **ProPixelizer v1.4+**, you can now apply a combined Pixelized+Outline material using the *ProPixelizer/SRP/PixelizedWithOutline* shader.

The shaders are coming up pink!

This means that the ProPixelizer shaders have not been correctly compiled by Unity. There are typically two possible reasons this occurs:

- In some cases, Unity Package Manager will add the files to the project but not import them correctly.
  - **Solution:** Right-click the ProPixelizer folder in your project Assets and click 'Reimport'
- In some versions of unity, the shader graph fails to compile because it is generating too many variants. The below error may be seen:
  - `Error in Graph at Assets/ProPixelizer/ShaderGraph/Pixelised.shadergraph at node PBR Master: Graph is generating too many variants. Either delete Keywords, reduce Keyword variants or increase the Shader Variant Limit in Preferences > Shader Graph.`
  - **Solution:** This can be fixed by increasing the Shader Variant Limit using *Edit > Preferences > Shader Graph*, e.g. changing from the default 128 to 256. Afterwards, right click the ProPixelizer folder and reimport, then all should be fine.

Objects became invisible!

Sometimes Unity's library seems to incorrectly compile the PixelizedWithOutline shader. You can fix it by just right-clicking and reimporting the ProPixelizer/SRP/PixelizerWithOutline shader. In v1.7 I have added some tools to do this automatically, e.g. when the editor starts up.

Update history

Version 1.7 (*under development*)

- **Added** [MainColor] property attribute for PixelizedWithOutline shader.
- **Added** option to snap object angles in camera space, to help create a 'billboard' effect.
- **Added** Alpha support for Edge Highlight Color - set alpha to zero to disable edge highlights.
- **Added** an example showing camera stacking setup, and how to avoid creep on moving cameras.
- **Added** tool to the shader GUI to detect if materials need to be upgraded, and to handle upgrade.
- **Added** _EmissionColor property. _EmissionColor is multiplied by the emission texture to determine unlit appearance. It's great for damage flashes!
- **Added** additional messages to warn users when they haven't set the RenderPipelineAsset in the Graphics or Quality settings.
- **Added** Palette option HSV_Weighted_SquareDistance.
- **Added** Larger selection of preset dither patterns.
- **Fixed** Mac M1 soft crash bug (caused by index out of bounds exception when sampling the 4x4 dithered order array for transparency).
- **Fixed** no longer required to add shaders to the *always included* list when setting up the project.
- **Fixed** support for vertex colors, so that particles are now colored.
- **Fixed** Incorrect blending with transparent materials on some platforms/engine versions.
- **Fixed** Some bugs in the RenderSnapable system, added new features.
- **Fixed** annoying console error messages from incorrect PostProcessPass format.
- **Fixed** unpixelized objects appear pixelated when occluding a pixelated object.
- **Fixed** objects dithered using _BaseColor.alpha < 1 will now no longer prevent objects behind them from being seen.
- **Fixed** Null reference exception if user has render pipeline set in GraphicsSettings but not in QualitySettings.
- **Fixed** material properties have been given more sensible names (e.g. _Albedo instead of Texture2D_FBC26130). Examples have been tidied, with example separate appearance and outline materials removed. I've added migration tools to enable material properties to be automatically upgraded through the inspector.
- **Fixed** Saturation/Value weights in Palette.
- **Fixed** Disappearing materials when opening Unity (caused by UsePass in PixelizedWithOutline failing to import forward rendered passes from the shader graph if imported before the shader graph).
- **Fixed** `RTHandle` support required for 2022b (URP 13.1 and higher).
- **Removed** the Object outline shader, added OutlinePass.hlsl.
- **Removed** Option to choose source buffer used for pixelisation. ProPixelizer now always uses the ProPixelizer buffer.
- **Renamed** Pixelized to ProPixelizerBase and changed the shader GUI to redirect users to use the PixelizedWithOutline material instead.
- Dropped support for 2019 LTS, remade all example assets (e.g. Render pipeline, post process data, shadergraph) in 2020 LTS.

Version 1.6

*v1.6 adds significant new functionality to outlining. You are **strongly** recommended to use the Appearance+Outline material.*

- **Added** outlines now respect color palette, per-object control.
- **Added** outline appearance now controlled via shadergraph (add your own dashed patterns, blinking outlines, etc!).
- **Added** interior outlines using normal/depth post processing, per-object control.
- **Added** color property to the ProPixelizer shader.
- **Added** ability to define curve for mapping when using palette style V_Nearest (for monochrome palettes).
- **Added** Support for HDR.
- **Added** Fixed time delay mode to stepped animation tool.
- **Added** Ordered-dither transparency (e.g. for fading objects in/out)
- **Added** Option for camera snap to use orthographic size defined on camera, rather than just pixel size in world space units.
- **Fixed** Post-process does not flatten depth buffer, works with transparent again.
- **Fixed** Specular highlights no longer appear for very bright light sources.
- **Fixed** Shadows work for multiple cascades.
- **Fixed** Stepped animation tool doesn't create a new UUID when regenerating clips.
- **Fixed** SRPBatcher now works properly with ProPixelizer Appearance+Outline material. You should see a performance improvement!
- **Fixed** Additional light shadows (for URP 11+, thanks to Cyanilux's excellent repo.)
- **Fixed** Incorrect color grading on linear color space.
- **Fixed** Color grading bug, color grading is now 1-1 and limited only by 16-color/channel bit depth.
- **Fixed** Pixelization post-process for overlay cameras (requires Pixelisation source to be set to 'ProPixelizer Metadata', URP 10.5+).
- **Fixed** Camera snap supported for multiple cameras.
- **Fixed** Camera snap for moving cameras.
- Tidied up the example ShaderGraph, added more useful subgraphs.

Version 1.5

- **Added** improved workflow for palettes. Individual palettes are now assets, so the values used for generating LUTs are saved.
- **Added** editor tool for user-defined 4x4 dither patterns.
- **Added** editor tool for creating stepped animations, to help replicate a flipbook/spritesheet feel.
- **Fixed** Bug for game view on Metal.
- **Fixed** Bug when RenderScale != 1.
- **Fixed** Correct pixelation for material preview, material icons and shader graph preview (fix for 2020+ only, URP on 2019 LTS doesn't expose required properties).
- **Fixed** editor warning when selecting in inspector (fix for 2020+ only, URP on 2019 LTS doesn't expose required properties).

Version 1.4

- **Added** dither pattern support.
- **Added** single material to produce both outlines and appearance.
- **Added** example scene (*Floating*) to show new shader and a no-creep setup.
- **Fixed** occasional 'tearing' due to numerical precision error.
- **Fixed** creep in rare cases.
- **Improved** Palette Builder tool.
- Made shader keywords consistent - run *Window/ProPixelizer/Verify Materials* to fix broken materials.

Version 1.3

- **Added** option for depth-tested outlines, to prevent outlines when objects overlap (see option in render feature).
- **Added** alpha cutout support.
- **Added** custom GUI for Appearance materials (for ShaderGraph versions that support it, 2020+).
- **Fixed** Object flashing bug for Orthographic projections when near plane was negative.
- **Fixed** gaps at screen edge.
- **Fixed** various truncation warnings.
- **Fixed** support for Unity 2020.2 and URP 10.2
- **Performance improvement:** Large performance improvement on all platforms (3 pixelation passes for color/outline/depth now reduced to a single 'Pixelization Map' pass).

Version 1.2

- **Fixed** creep/malformation at some resolutions.
- **Fixed** tearing in perspective projection.
- **Fixed** 3x3 pixelation on AMD+openGL targets.
- **Quality of life:** the '_ID' property in the ObjectOutline shader is now specified as integer in the range (0,255). No change is required if using the OutlineControl MonoBehaviour.

Feel free to email with feature requests and suggestions!