R.A.M 2019 -River Auto Material & L.V.E Lava & Volcano Environment 2019 Tutorial

River Auto Material 2019

Lava & Volcano Environment 2019

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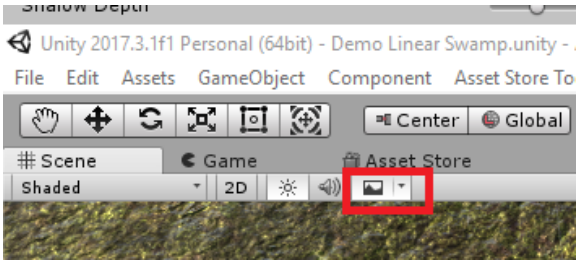
Important words at start about both assets

As we create many tools, shaders we try to share same technology between assets to avoid mess in your project. Tools and systems mentioned in this doc are shared between L.V.E and R.A.M. If you will be common with one of this pack for sure you will not have problems with other one or any other future packs. As we like to say – one spline to rule them all!

We made few demo scenes to show different setup and possibilities.

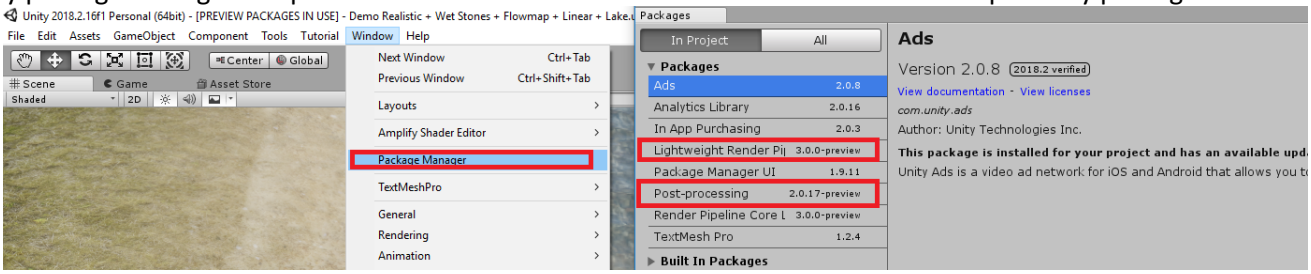
To see how surface moves and to notice lava emission in scene view you need to keep image effects turned on in scene window:



Lava shading need bloom image effect at the scene, emission show up and react with screen only when bloom is turned on. This is how engine works with emissive materials. Be sure then that you have bloom effect from post process stack or other source. Bloom power will also affect emission behave so you have to find balance bloom power and emission power. We suggest to setup emission on non- emissive area to reasonable values and then play with emission power at materials. We setup our materials to pretty standard values so there should be no or small adjustment in emission values.

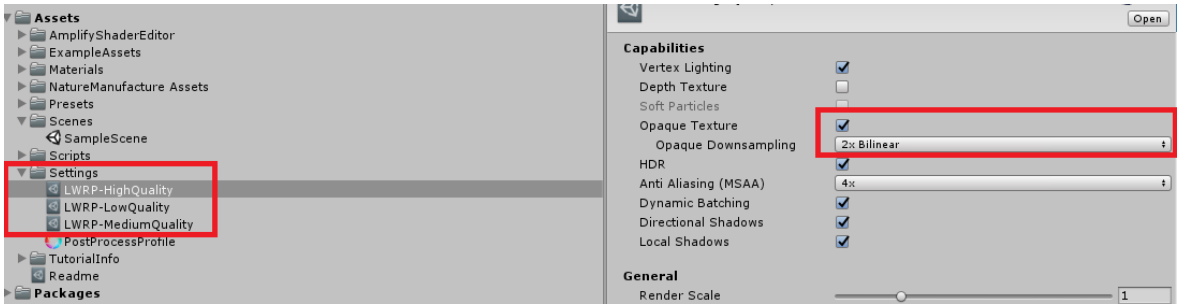
SRP (LW and HD)

If you use HD or LW SRP you need to setup project with hd or lw rp. Then import proper HD or LW RP versions are in unity package manager. Proper version which our asset use will be in name of the compatibility package.



Next step is import our compatibility pack called:
“HD SRP 4.9 Unity 2018.3 River Auto Material 2019 (Beta)”, “LW SRP 5.7 Unity 2019.1 River Auto Material 2019” or other HD RP Unity versions for HD RP. This packs will replace shaders, materials, prefabs, particles etc and force assets to work on chosen RP out of the box. Make note that tessellation is not supported by LW SR and HD RP yet. We export LW SRP in 2019.1 and LW SRP 5.x and HD RP in 4.9 for unity 2018.3 and 5.7 unity 2019.1

To use distortion in LW SRP at rivers , heated air & water particles in LW SRP please be sure that you have this option turned on:



River Setup

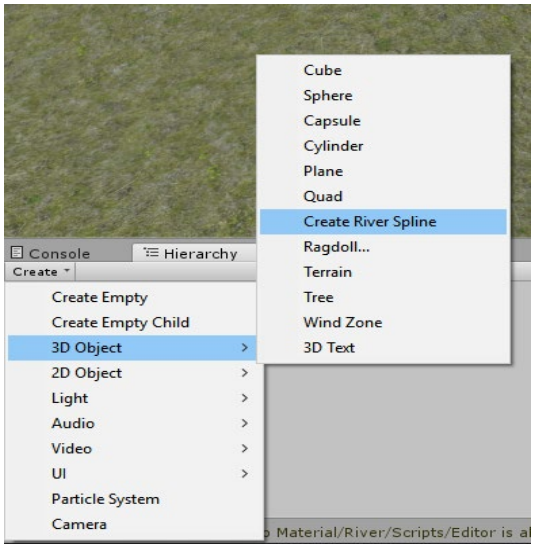
By our spline tool you could create very advanced mesh for your water/lava river or cliff and road or even lake. By our tools inside spline system you could manage a lot of features like flow map, water stage, simulations, terrain carve and foliage manage, import or export points and support vegetation studio pro and non pro versions.
Here are few steps that will give ability to create and understand simple mesh for your river:

Basic options:

1. Create river object at your scene:

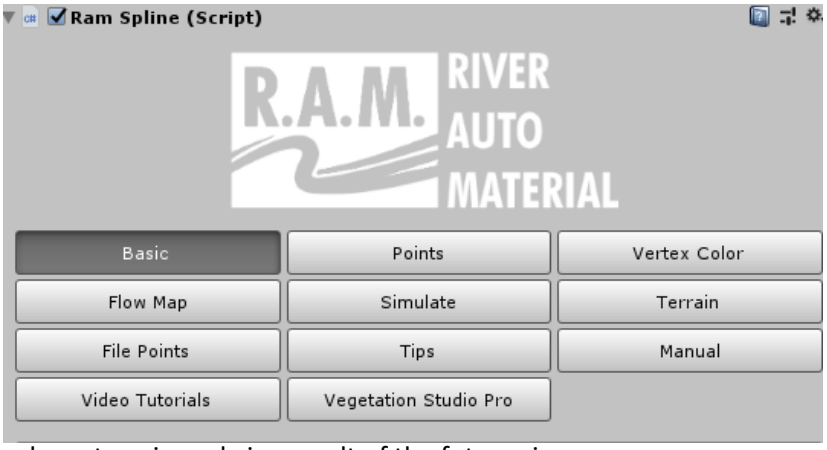
Make note that this option could not show if you got compiler errors in your project. It's because errors block editor script compilation.

Create -> 3D object -> Create River Spline.
This operation will create river object in your hierarchy.



2.River spline panel.

If you check spline in your hierarchy you will get such view:

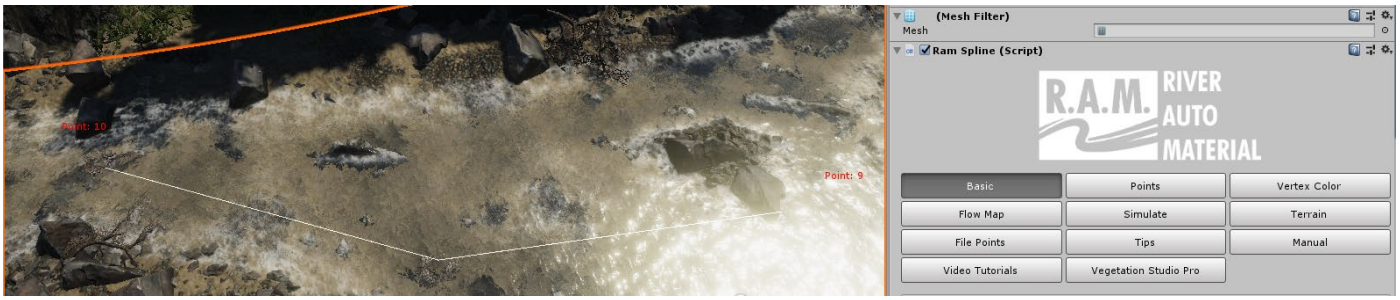


As you see there are few main pages:

- **"Basic"** - changes which are global for whole mesh or even few of them if rivers are connected. You could manage here uv, vertex density and shape, light setup etc.
- **"Points"** - local changes like rotation, position, scale, add, remove, select, snap.
- **"Vertex Color"** - modify mesh and customize locally by our vertex color tool
- **"Flow Map"** – modify flow map, manage automatic generated flow map values
- **"Simulate"** – this part allow you to simulate river/spline flow from specific point. System analyzes terrain and give result of the future river.
- **"Terrain"** – modify terrain under the spline like paint, carve and foliage manage.
- **"File Points"** – here you could import/export points from CSV file to create R.A.M spline.
- **"Tips"** - info about lighting and tricks.
- **"Manual"** - which drives you directly to this PDF
- **"Video Tutorials"** - which will open YT tutorials where we will explain R.A.M and L.V.E usage.
- **"Vegetation Studio Pro or Non pro"** – it shows only if vegetation studio is inside project and give ability to manage foliage in co-op with that system.

3. Add points / remove points (raycast from mouse)

- Add new points when you hold: CTRL + Left Mouse. Setup few points like that.
- Add point between existing points: Shift then Left Button Click (shows debug lines which fallow the pointer)



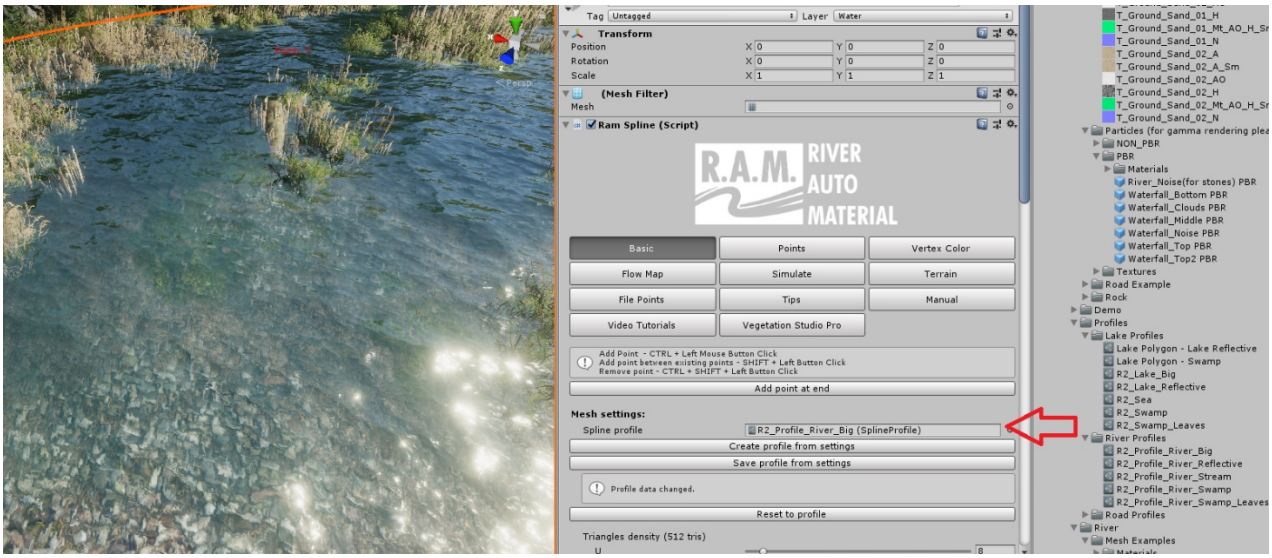
- Remove point: CTRL + Shift then Left Button Click to remove point. (shows debug which fallow the pointer)

4. Setup material or whole river features

There are 2 ways to setup material into spline.

- You could drag and drop profiles which we prepared which contain info about:
  - material
  - mesh shape
  - uv directions and density
  - spline /mesh resolution
  - terrain carve
  - terrain painting
  - flow map
  - shape and flow map noises,
  - vegetation studio pro biomes
  - light setup

Basically whole river setup out of the box – drag and drop setup. Try our river and road profiles. It's very useful, you don't have to copy paste any values anymore to create similar effects. Make note that we mark our profiles for R.A.M 2019 as R2_Profile_"Name" to avoid problems with older system versions.



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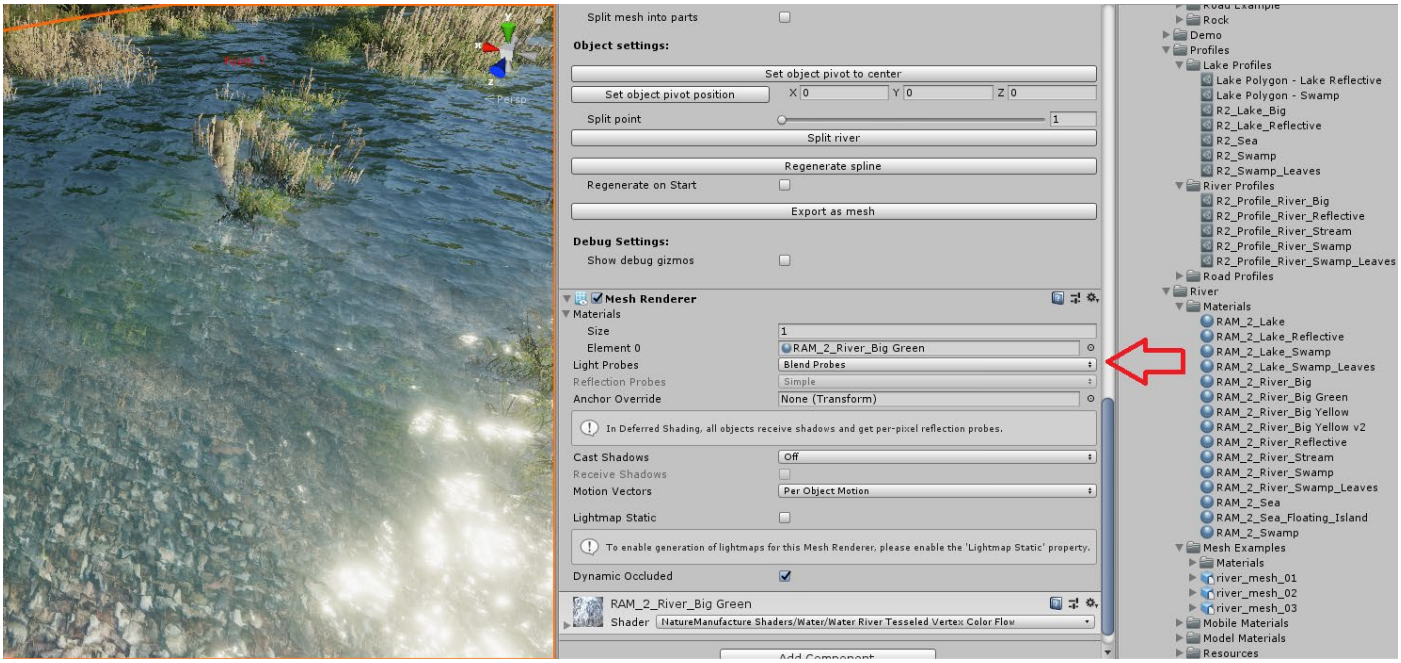
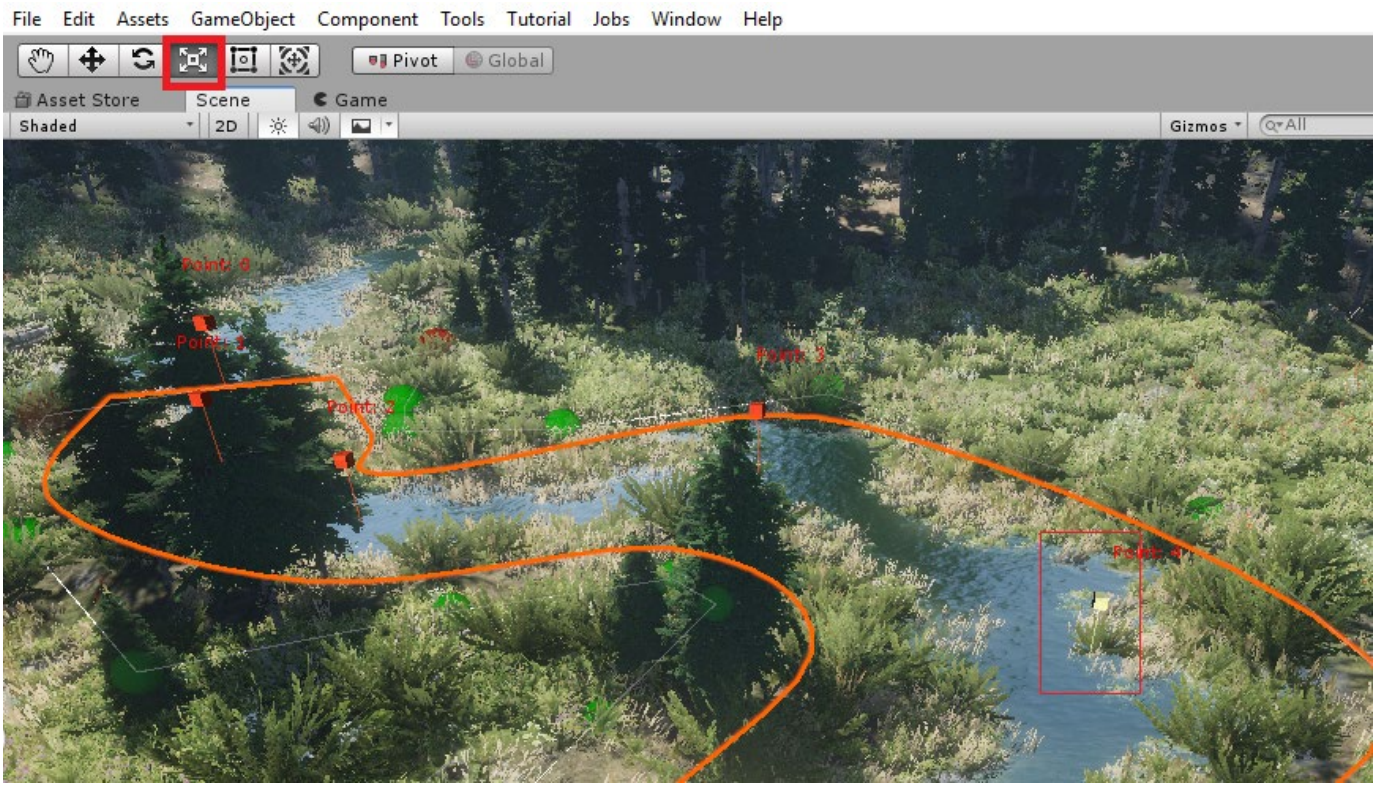
- You could drag and drop material from our library or create your own. Just drag and drop material from project into mesh renderer component at spline object

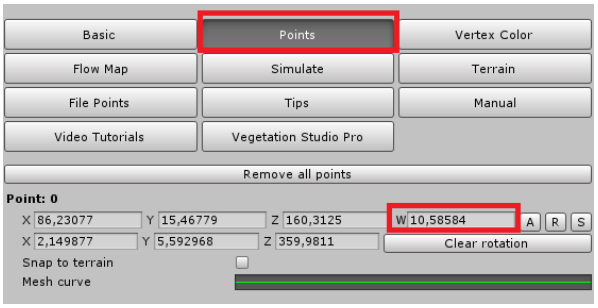


5. Scale mesh and change the size.

- You could start scaling your river in specific point by clicking "R" or by this marked button. During moving the box up or down at your screen, river will get different scale at selected point.



- You could also scale river in specific place in “Points” page – “W” value

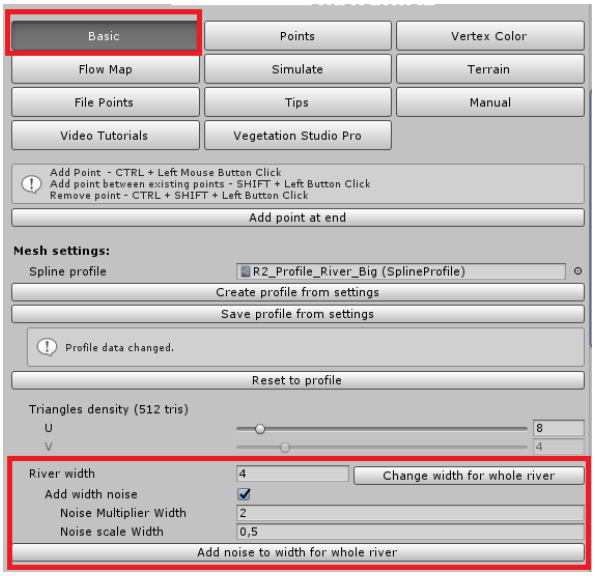


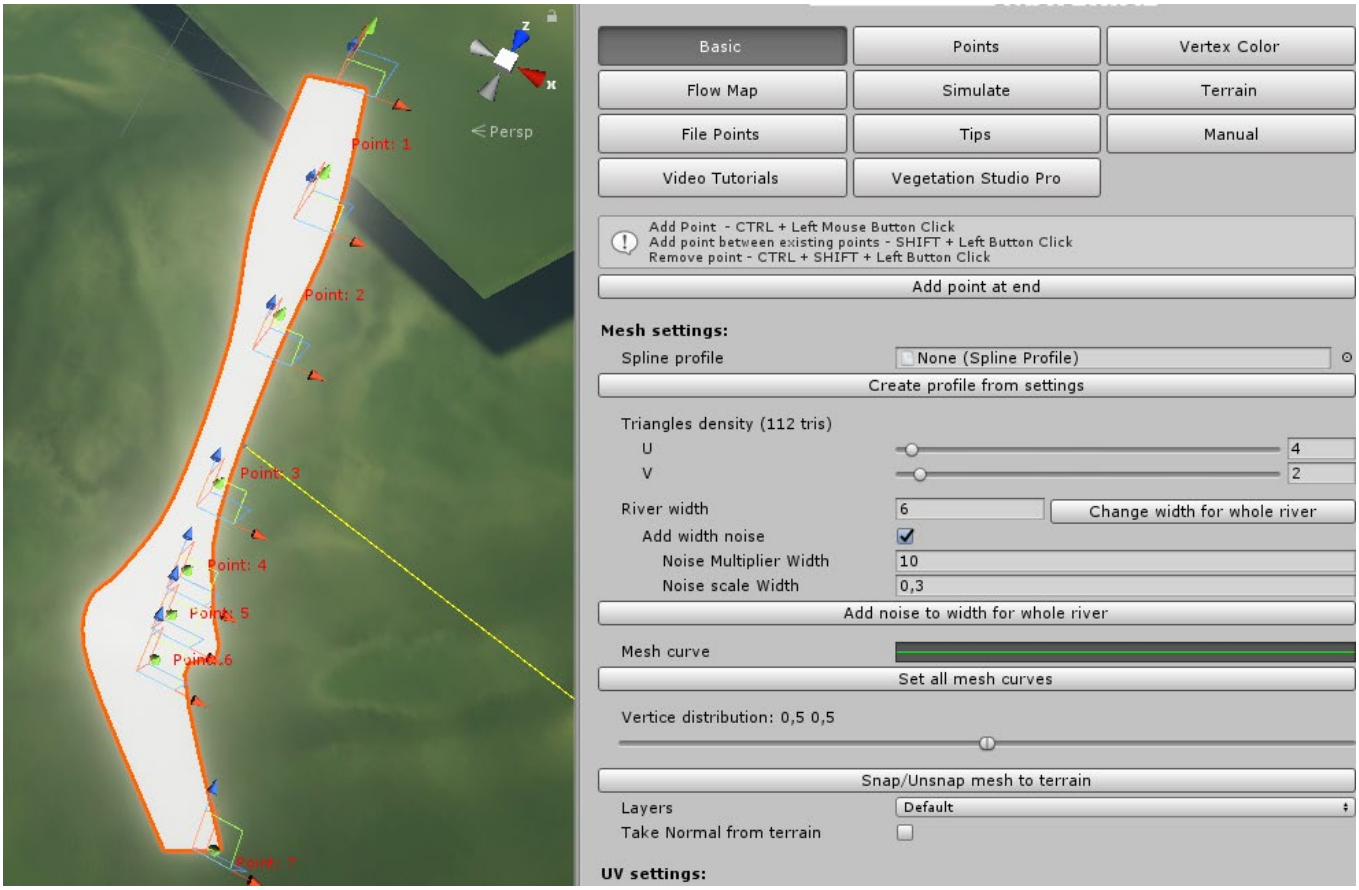
- If you want to scale whole river at once in “Basic” section change value “River width” and click the button.

There is also automatic noise option “Add width noise” checkbox to avoid straight shape of the spline. This noise will make it look much more natural.

You could add noises few times and they will multiply themselves. To back to original value simply click change river width for whole river.

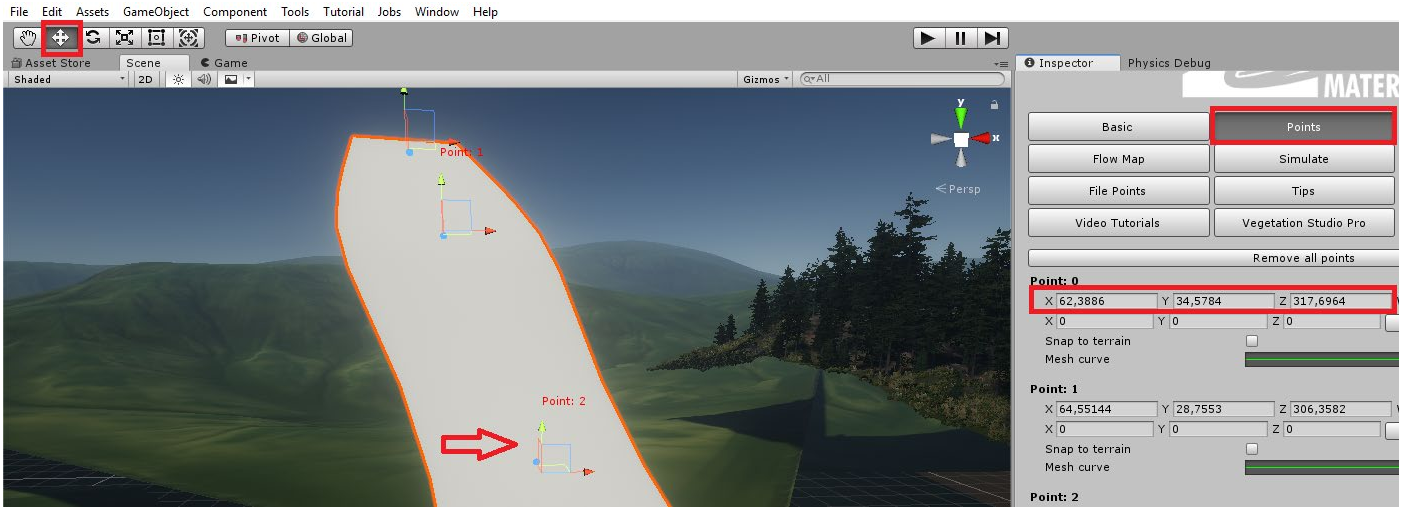
Result of such noise is visible below. System simply add value to the scale at every point.





6. Point movement.

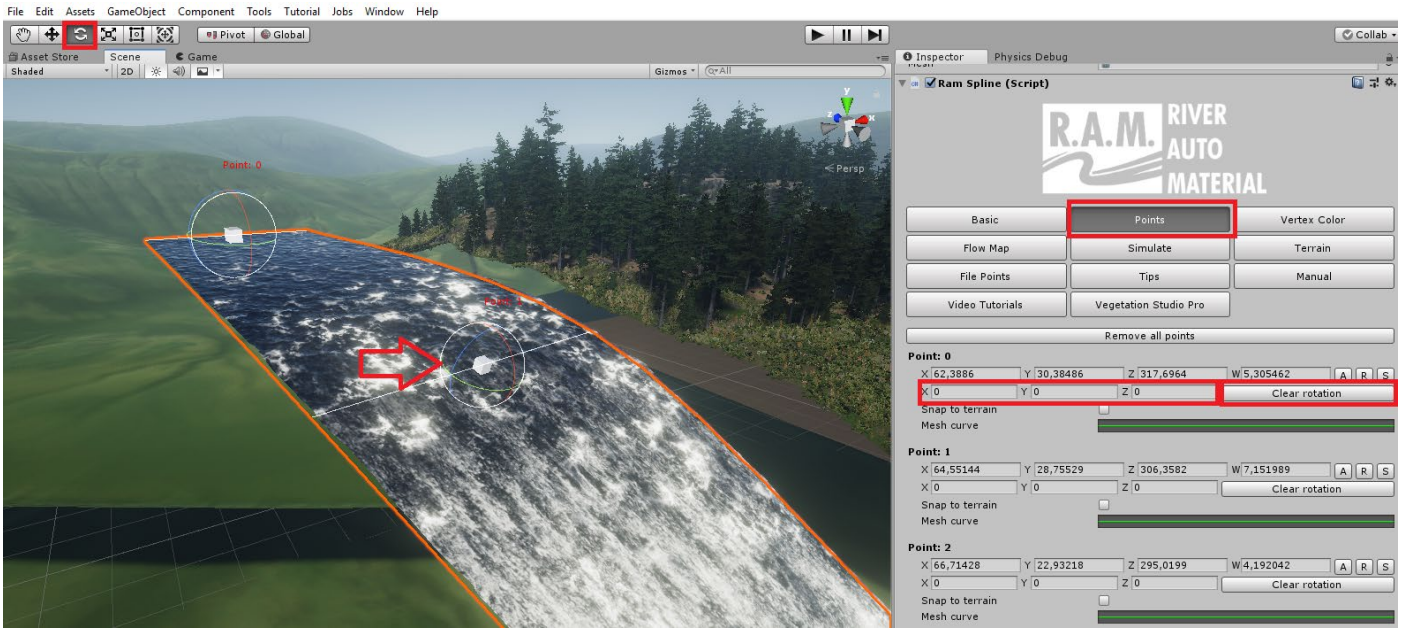
You could start to move your river specific points by clicking "W" or marked button in left top corner. By moving selected arrow at your screen river point will change point position.



You also could move point at “Points” page in point label. You can change XYZ values from that panel.

7. Rotation

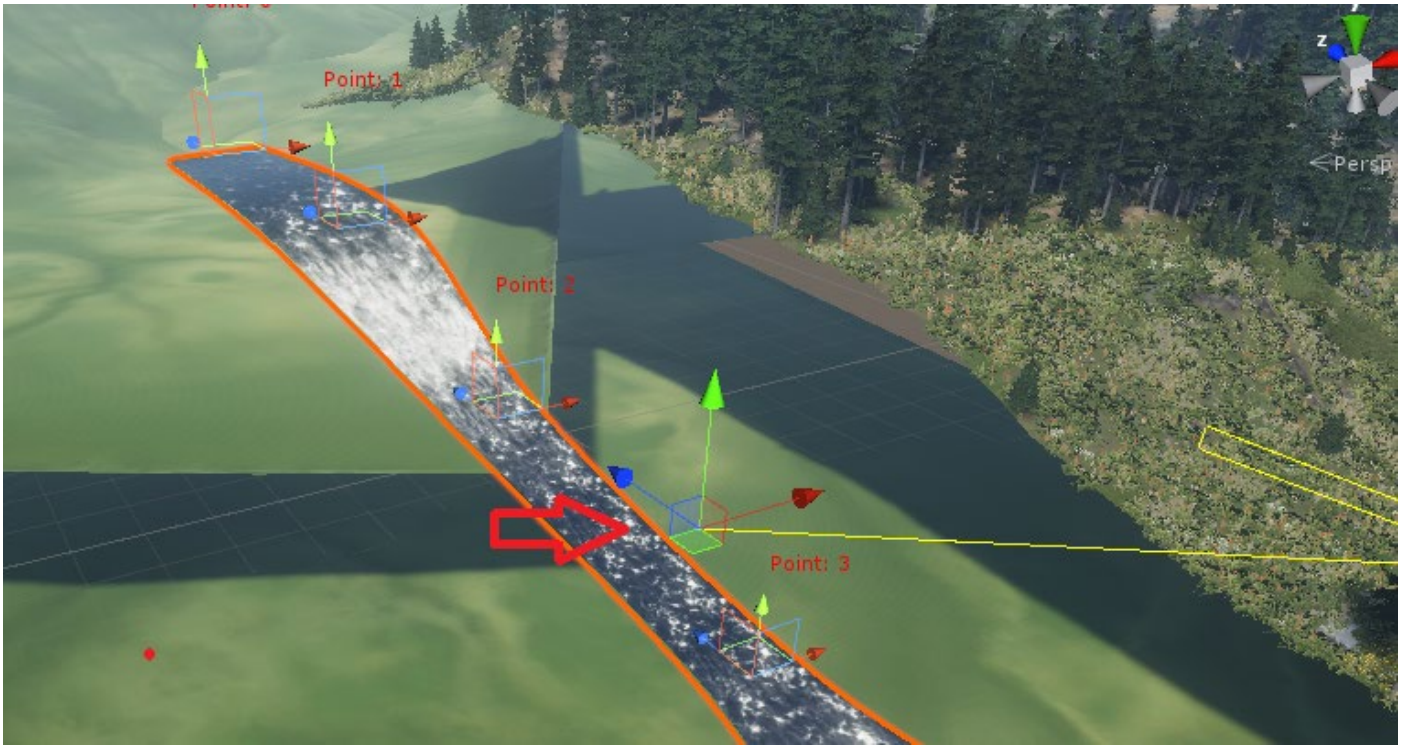
You could rotate points at river like normal objects in scene hierarchy. Click “E” or marked button in left top corner.
You could rotate point at “Basic” page in point label. You can change XYZ values from that panel.
Note that too big angle sometimes could invert normal but small changes could fix spline or add additional details.
By green and blue lines you could control shape, by red mesh normal direction. Via mesh normal direction you could create cascade or waterfall even at flat area or adjust water / lava speed before or after cascade. We advise to play with it a bit!



You could always clear rotation changes and reset to default values by “clear rotation button” in points page.

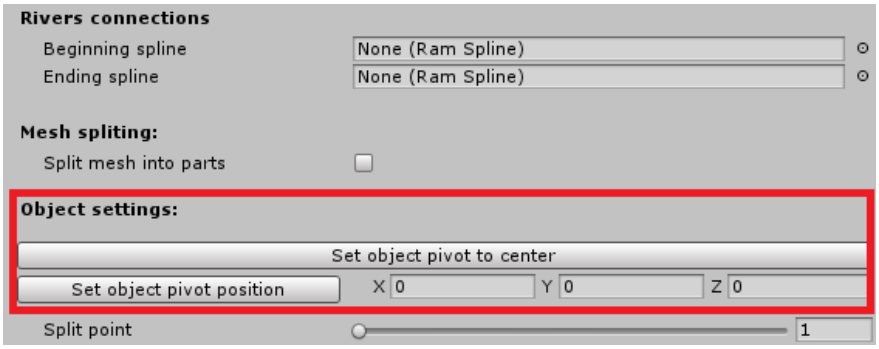
8. Global move and rotation

You could do this by selecting big arrow or circle.

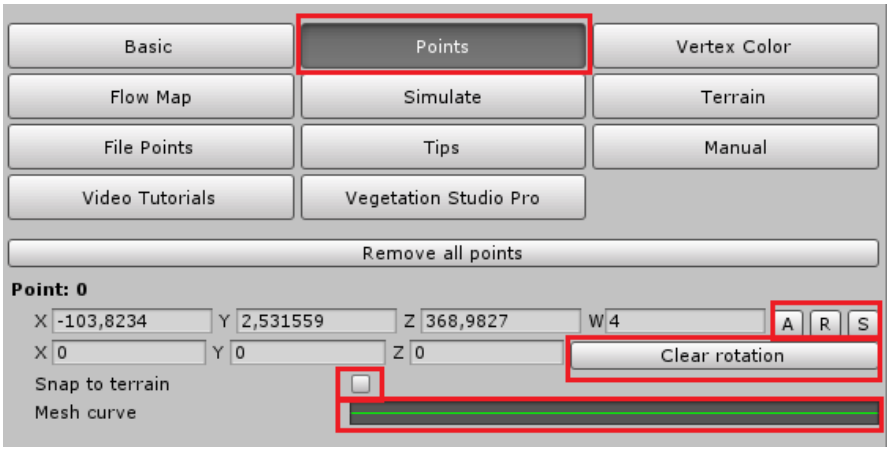


By default this marker is at 0, 0, 0 position. You can change it at “Basic” panel via click “Set object pivot position” button. You can change it to object center or specific point.

This will generate errors.



9. Additional point options in points page:



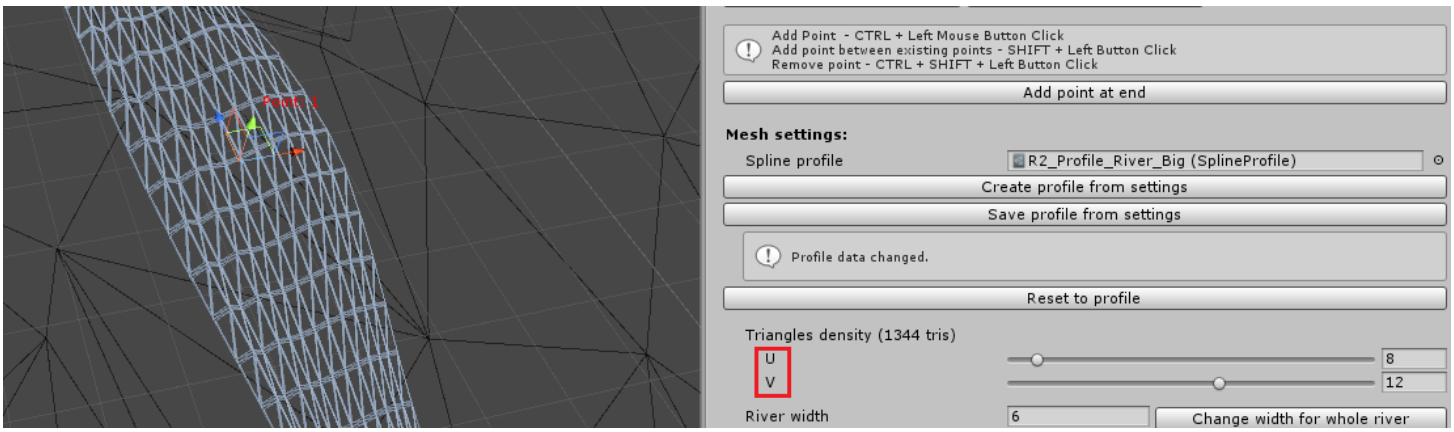
- "R" button to remove points from spline.
- "A" button to add point after this selected point.
- "S" button to select "mark" point at spline. Helpful before remove operation.
- “Clear Rotation” will reset rotation in current point to default values
- “Snap to terrain” your mesh (mesh will fallow the terrain in current spline point), useful for streams and in other objects then river, our tool is universal.
- “Mesh curve” allows you to change locally mesh shape in current point. Useful rather for roads or small streams in combination with “Snap to terrain”. Remember that shape is based on verts so if you have low vert density in “V”

direction at “Basic” panel you can have problems to get just specific shape. More information about shape and density of the mesh you will find below.

10. Mesh resolution and shape.

- Resolution

You could control it by changing triangle density number in U (along the spline) or V direction (perpendicularly). From our perspective 4-8 is pretty are good values. You could add more triangles in U direction in specific area by adding more control points instead of adding them globally by this slider

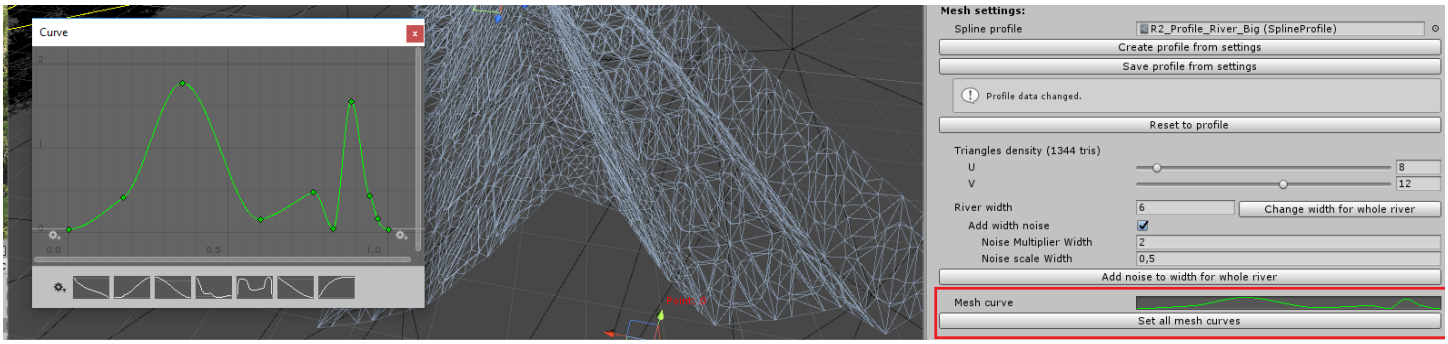


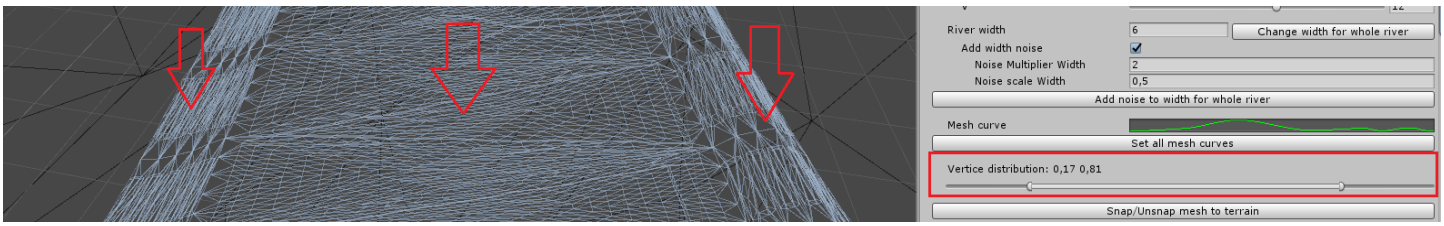
If you connect few rivers you also have to keep a bit more verts in “V” value to distribute them to other rivers. Note that if you have multiple rivers connected “V” option will be switched off for rivers which are connected with main river. More info you will find lower.

- Shape

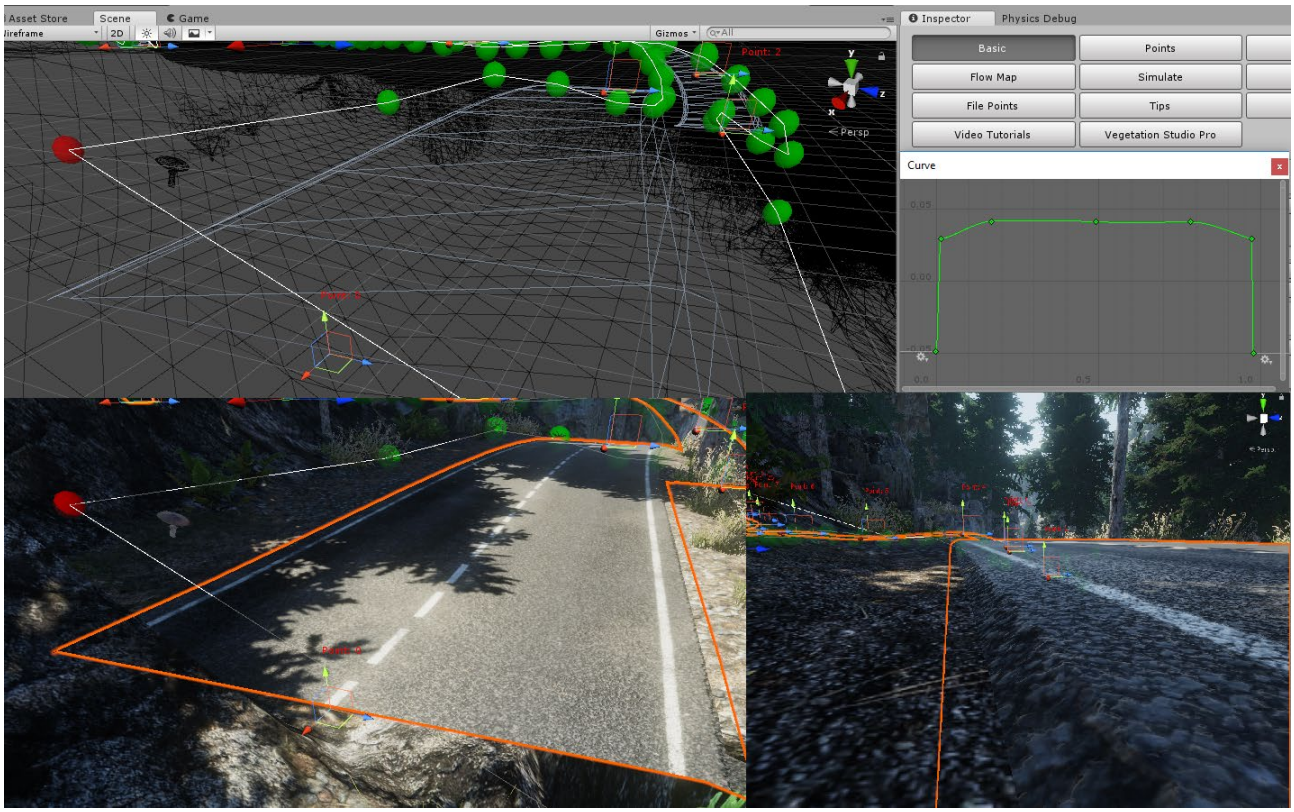
You could manage shape of the mesh in 2 ways. Position of verts and their distribution.

- Vert position could be modified by spline curves. After you setup spline click “Set all mesh curves” and it will set this profile to all points at the spline. You could do this locally for 1 point in realtime at “Points” label.





- Example – For asphalt roads or lava we would like to curve borders of the road without spent many verts on whole road shape. We get nice natural result with few verts.

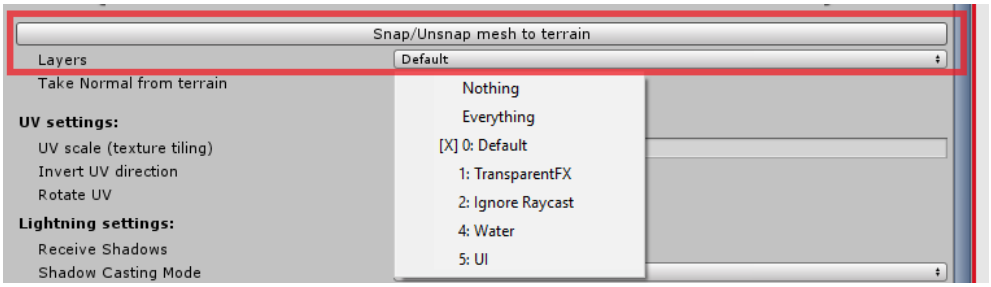


If you connect few rivers you have to remember that they should have the same vert distribution. Sometimes you have to adjust start/end connection points to get more natural result.

Note: For tessellated shader it's good to hold pretty square mesh because of equal triangles. Ofc do not add V density too much. Tessellation will handle non square mesh but when difference is too huge it could start to look weird. In close distance tessellation will handle and fix most mesh problems with river shape so there is no need to adding huge density in the mesh – trust tessellation 😊

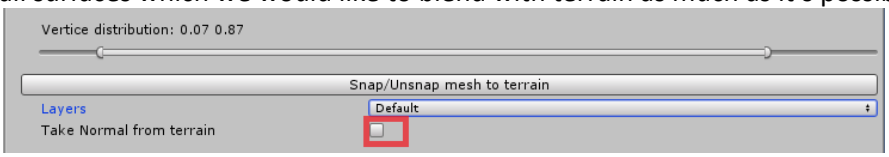
11. Mesh snapping to colliders and terrain.

Our spline system have ability to snap to any surface with collider. If you click this button it will snap all verts to colliders under the spline. It's global value and you could also modify it locally in "Points" section. We also give ability to snap by layers so for example to avoid small rocks or any other objects. Make note that if you want to snap spline to very dense and unregular surface spline will probably need a bit more verts/ dense to catch all changes.



12. Vertex normal from terrain.

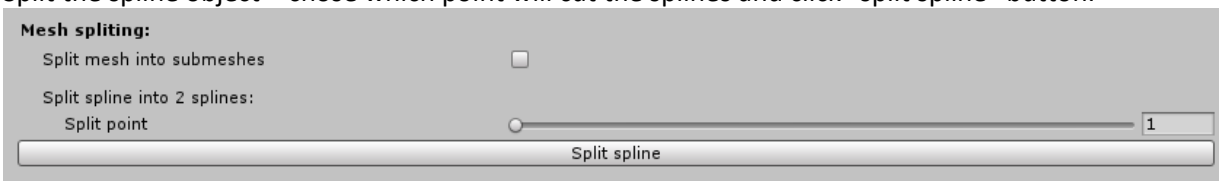
Spline have ability to take normal from surface under own mesh. It's useful for dirty roads and paths or frozen lava rivers. Probably with all surfaces which we would like to blend with terrain as much as it's possible.



13. Mesh and spline split

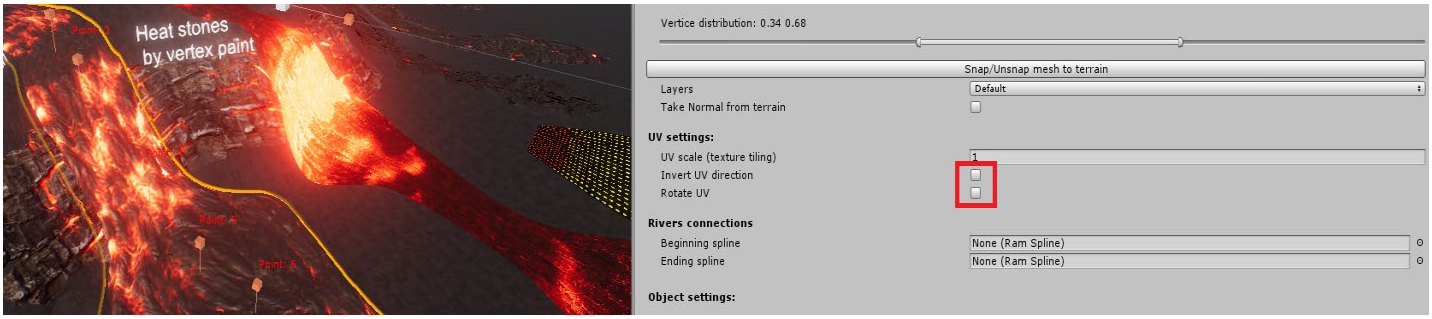
You could split river into many submeshes or splines. It's useful for streaming, also long rivers in parts are more friendly for camera culling and reflections.

- Split the spline object – chose which point will cut the splines and click "split spline" button.



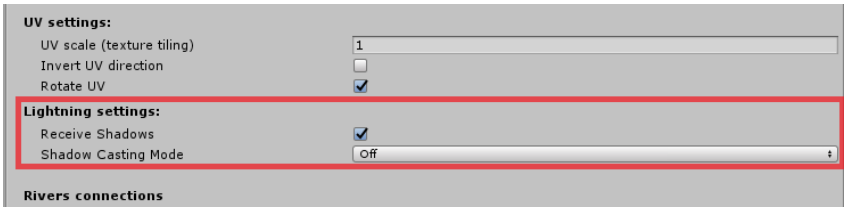
14. UV settings.

UV control gives ability to change tiling of the river or rotate whole UV by 90 degrees. This option was added to support textures with different directions. UV scale could be switched off if river depend from other rivers (multiple river connections) . You could also invert river direction.



15. Lightning settings.

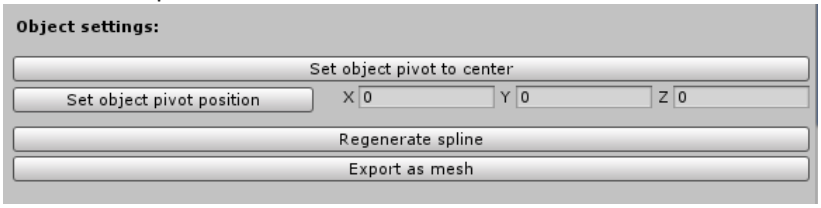
For all kind of roads and paths we would like to receive shadows and sometimes cast too. If road or lava surface is flat we don't need to cast shadows from it. It's just waste of gpu time.



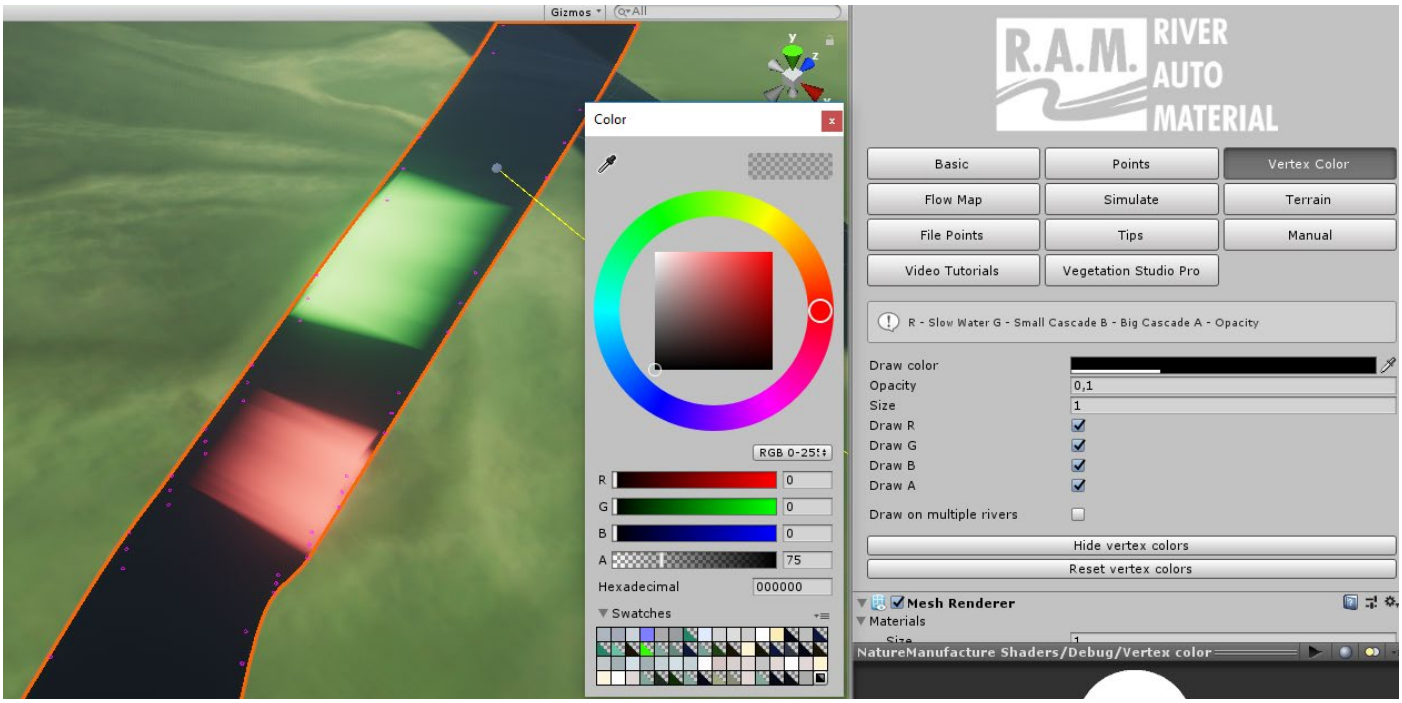
16. Object settings.

- change river object pivot position to its center or specific position.

- regenerate mesh object if you need. For example after copy/paste into other scene or multiple rivers changes/refreshing. It sometimes helps.



Vertex color customisation:

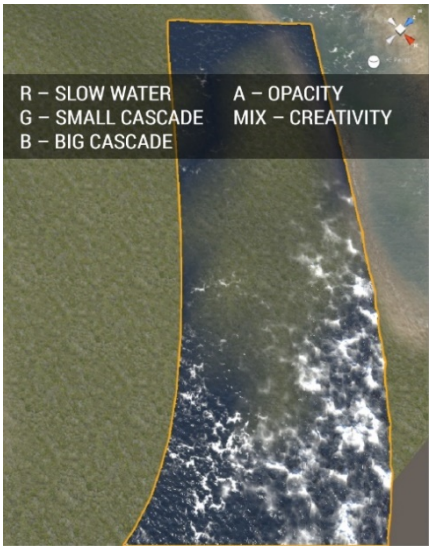


- When you start playing with vertex color you have to choose shader which support this feature. R.A.M 2019 all shaders support it. In L.V.E simply use this with vertex color in name.

- You can chose which color you will use in painting – for example only R,G or A. This will help to work with only 1 shader feature connected to chosen color and avoid to modify others.
- Different surface react on their own way on vertex paint:

Lava:

- ❖ R - Pretty cold lava/small slope
- ❖ G - Hot lava/bigger slope
- ❖ B - Very hot/waterfall
- ❖ A - Frozen lava
- ❖ Black – Automatic



Lava Frozen:

- ❖ R – Heat your lava
- ❖ G – Cover your lava by ground texture or any other
- ❖ B – maybe we will add another 2nd ground texture
- ❖ A – we will see 😊

Water:

- ❖ R – Slow water
- ❖ G –Small cascade
- ❖ B – Waterfall
- ❖ A – Alpha color It's useful to blend with other water systems or paint specific behave in specific place.
- ❖ Black – Automatic

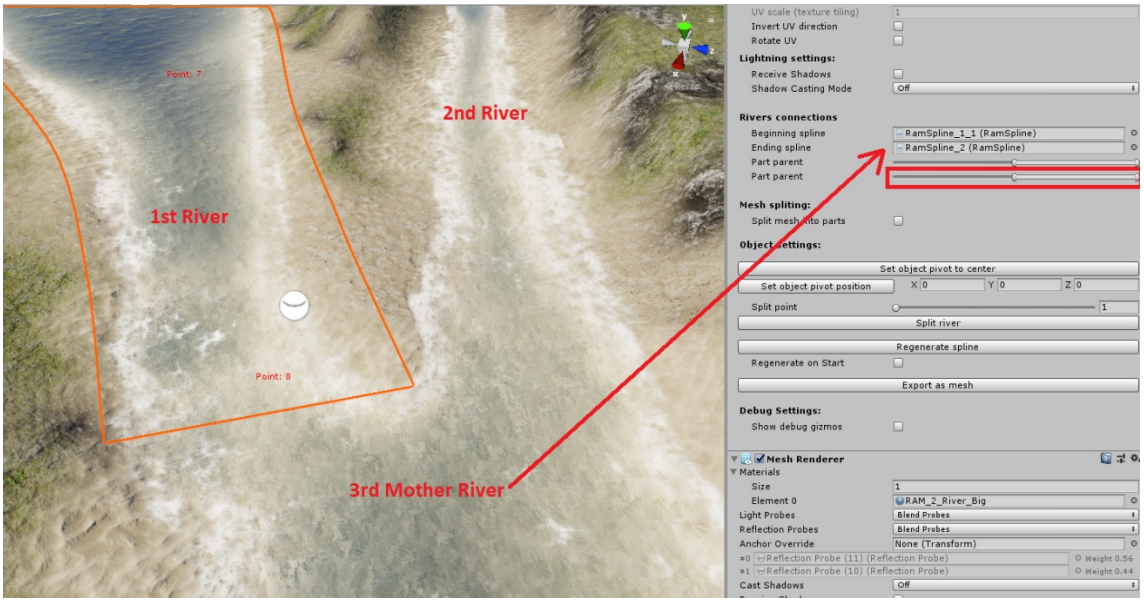
Swamp:

- ❖ R – Green duckweed or Albedo 1
- ❖ G –Roots or Albedo 2
- ❖ B – Clean Water
- ❖ A – Alpha color It's useful to blend with other
- ❖ Black – Automatic

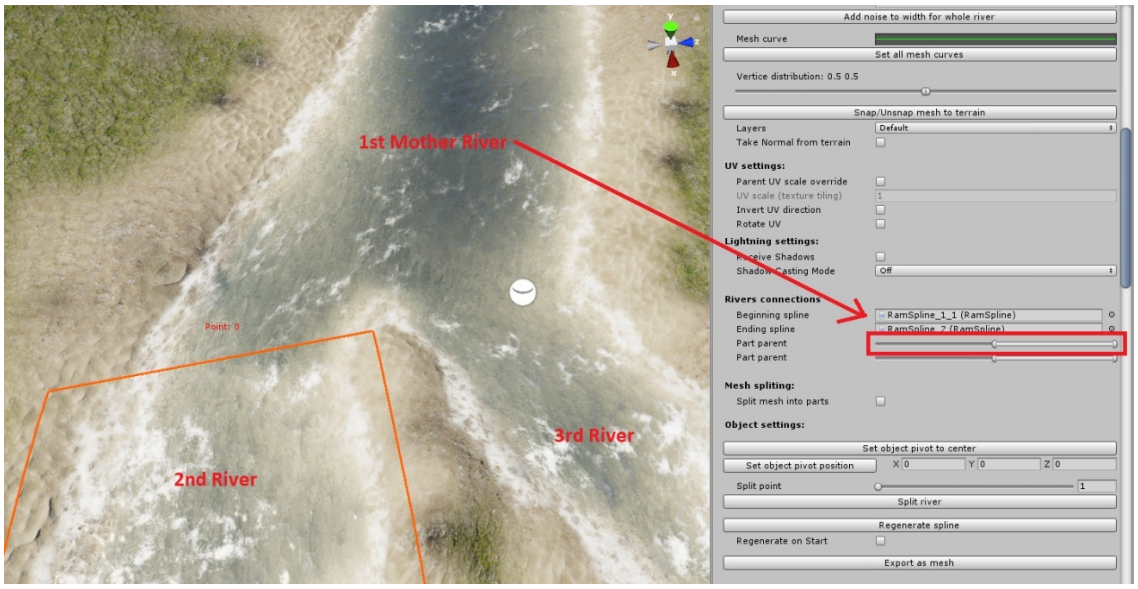
Multiple river / surfaces connections

Best practice is to watch our video tutorial with our demo scene then try to do it yourself. Basically you have to prepare yourself for this operation. Because there is few rules which have to be hold to get good synced mesh and also there are 2 ways to do it. For non-tesselled shaders you don't have to keep all rules because vertex offset will not desync and destroy mesh at connections.

1. **Mesh connection** – works with splines that use same materials.
   - If you create 2 rivers connections and they will merge into 3rd you have to drag and drop 3rd river as end of 1st and 2nd **"Ending Spline"** and adjust how big part of new river is 1st and 2nd river by "Part parent" slider.

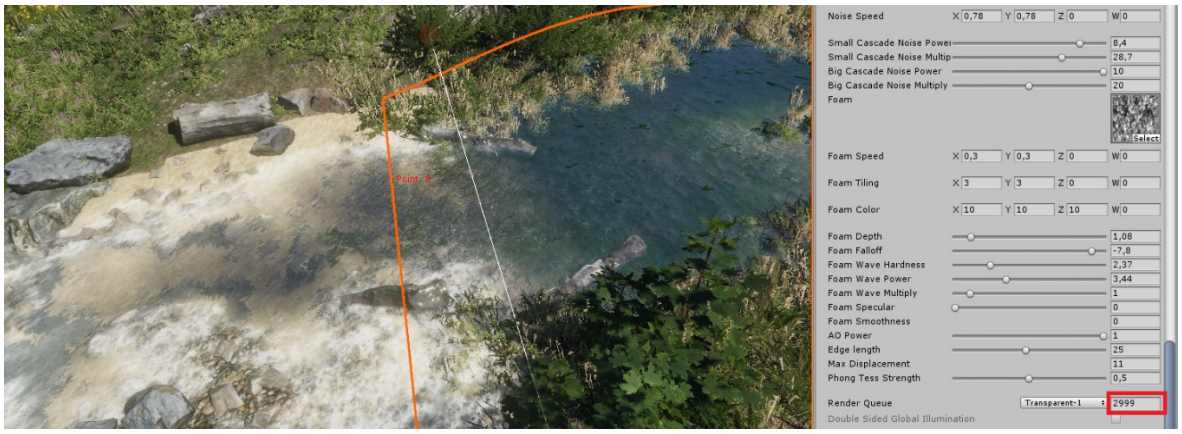


This 3rd river will now control "V" mesh density of your 1st and 2nd river and UV tiling. We did this to create seamless connection between rivers even with tesselled shader. Look at V and UV settings at 1st river. They were grayed.

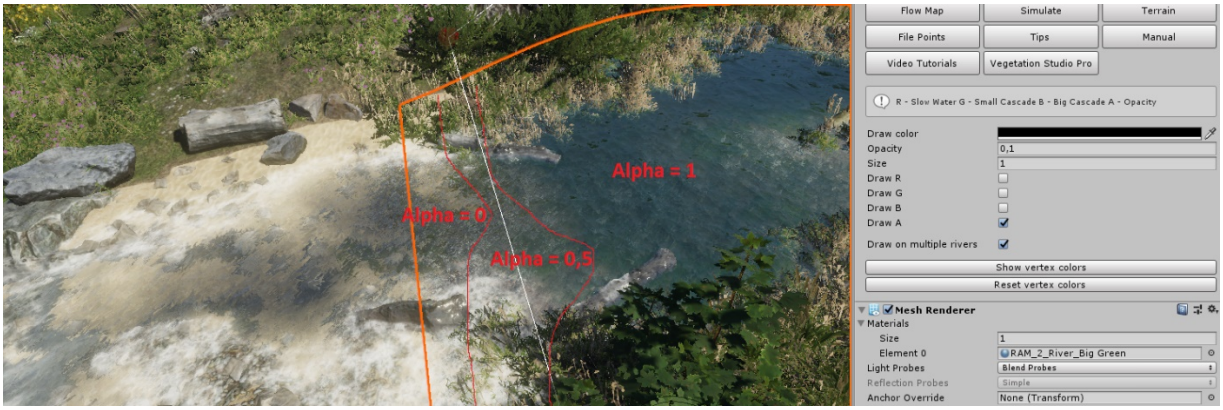


In such case you could create connection of 2,3,4,5 rivers at the same place but… each river take 1 or more“V” resolution. If mother river have v resolution = 4 you could create 2 rivers with V=2 and V=2 like at the image or V=3 and V=1 or 4 rivers with V =1. Play with it and check our setup at scenes. Make note this solution is suitable for water meshes that share same materials. Connection angles between rivers also cannot be to big. For standard rendering where reflections for transparent surfaces are per object this could generate reflections hard blend

2. **Alpha connections** – works with any water and transparent surface, you can even connect lava with water, swamp with sea etc. This allows you to connect our system with any other water system from store.
   - River mesh must be above second river mesh, not much just a bit
   - 1st river mesh must have higher render queue in material then 2nd .
     For example 1st river = 2999, 2nd river = 2998. This will avoid “Z fighting” between transparent surfaces at low angles or far distance.



   - 1st river must be blended with 2nd river via vertex alpha in spline vertex painter. This will generate smooth transition.
     Here we connect swamp water with mountain river. Without vertex alpha color connection there would be hard separate lines between this 2 surfaces.

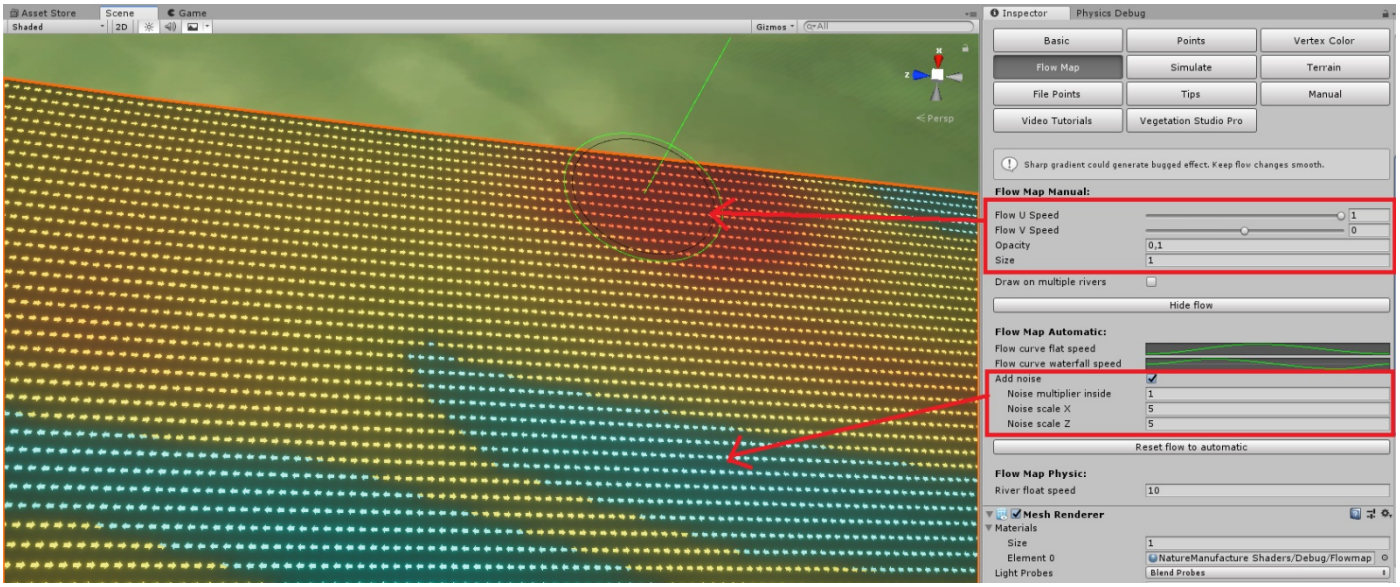


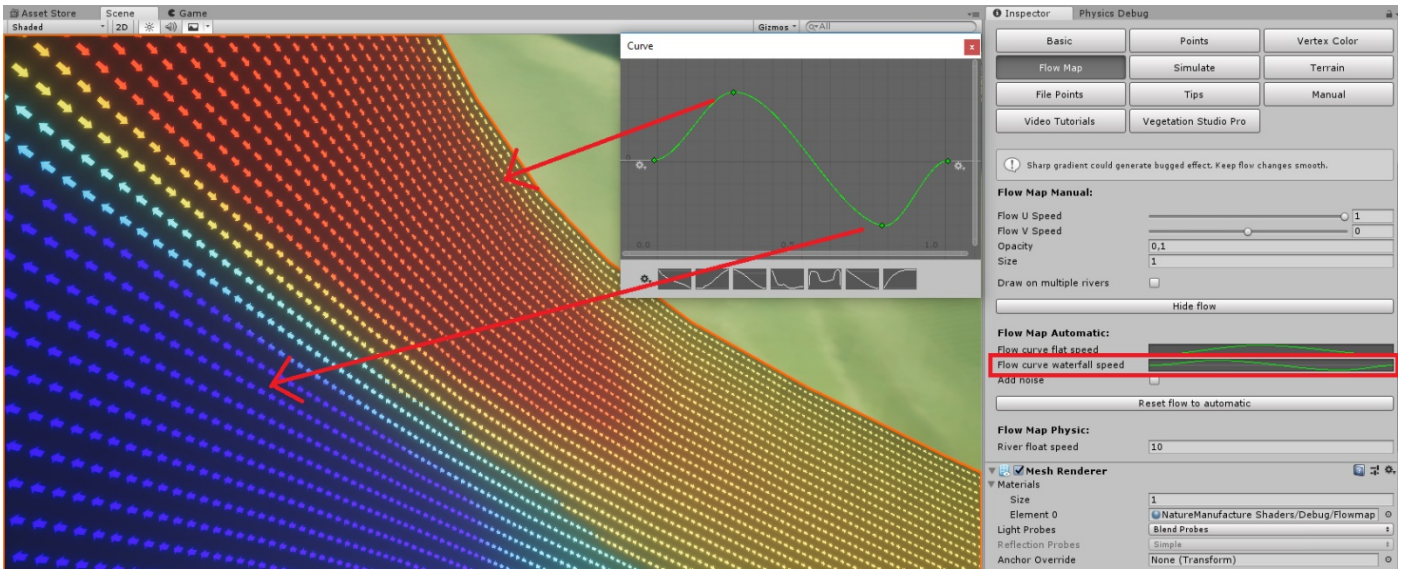
In such way you could connect waterfall which drop water into lake or river even if this 2 surfaces have different direction that cannot be handled by splines.

Flow Map

Flow mapped shaders are very sensitive. Gradient between direction must be smooth, mostly in tesselation shaders where verts must smoothly change UV and direction. We gives debug view to control this aspect. There are 2 ways to work with flowmap:

- **Manual** – gives ability to set any flow map value/speed on river spline via marker. You simply set U and V speed on slider, opacity and size of the brush.
- **Automatic** – its based on curves for waterfall and flat area. With noises it gives much nicer result but only if they are not so strong. Strong noises could even reverse river like we show in image below. With curves you could set faster water in the middle of the spline and slow it down at the broders. While waterfalls are separated from flat water as they have own curves you could separate waterfall behave from slow river. Make note that to big speed or to hard blend between this 2 stages will generate issues at uv.



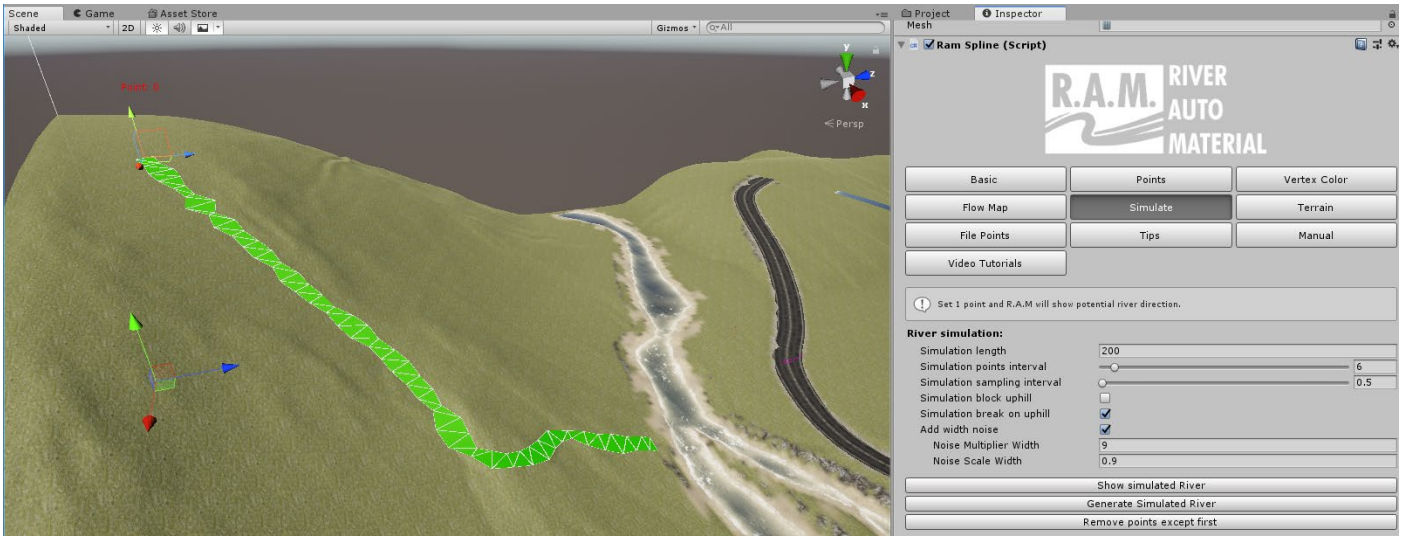


Options available at flow map panel:

- **“Show/Hide flow directions”** – It will show/hide arrows with colors which shows direction and speed of water. Deep red or blue mean big speed. Be careful and blend speed, don’t create hard gradient.
- **“Flow U, V speeds, opacity and size”** - They are used to control direction, speed, size and hardness of brush which will paint flow map on spline surface.
- **“Draw on multiple rivers”** – It gives ability to paint on river connections and many rivers at the same time. It help to keep proper blend and correct flow map on river connections.
- **“Flow curve flat and waterfall speed”** – By this 2 curves you could control automatic flow speed profile on flat and high slope surfaces (waterfalls). Everything between this curves will be interpolated. They give ability to move
- **“Add Noise”** – add noise at the river. Scale X and Y control size of noise in space. Noise multiplier inside controls how strong noise values will be. We multiply values at curves and add or subtract speed via noise. It’s nice tool to add small local water speed up or slowdown, just out of the box. Please use it carefully and avoid hard changes.+

Simulation

This options is useful to simulate river behave. User **setup only one** point, chose river length, density of points. Click "Show simulated river" to check how river will behave and which direction will chose. R.A.M will analise shapes around and show potential river position. It's useful for natural river generation. If shape of spline and it's position fit you, simply click generate. If you want to repeat, operation click remove points except first to start simulation again from 0.

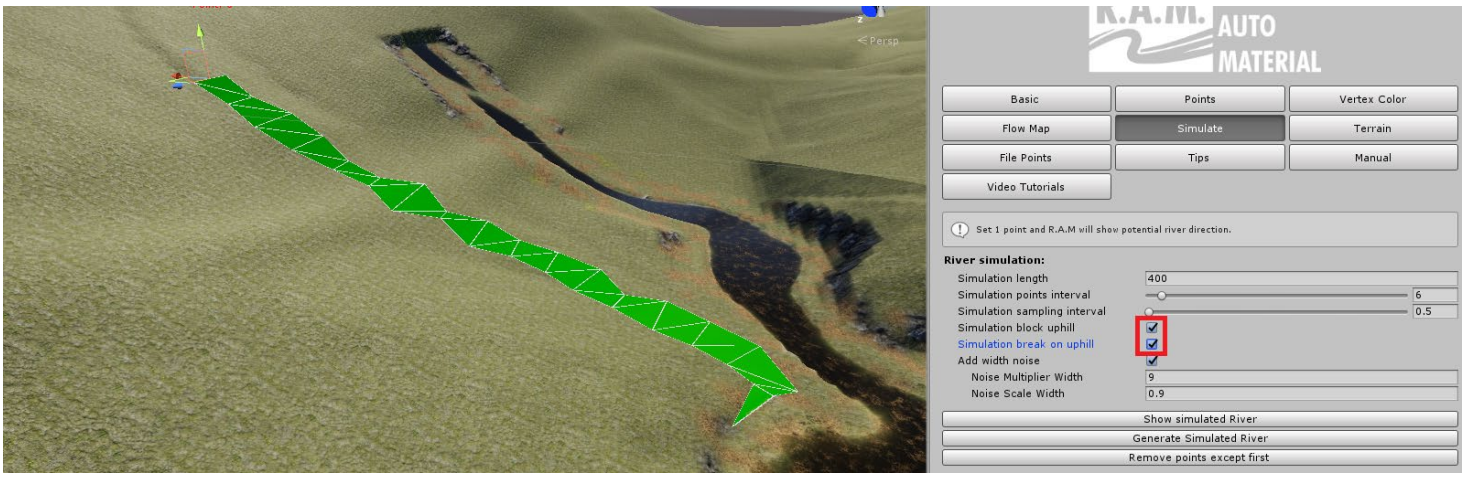


- **"Simulation River Length"** – It setup how long river will be generated.
- **"Simulation River Points"** – It setup number of points that will be between start and end of the spline. Too dense point setup could generate problems at spline shape, try to keep reasonable value.

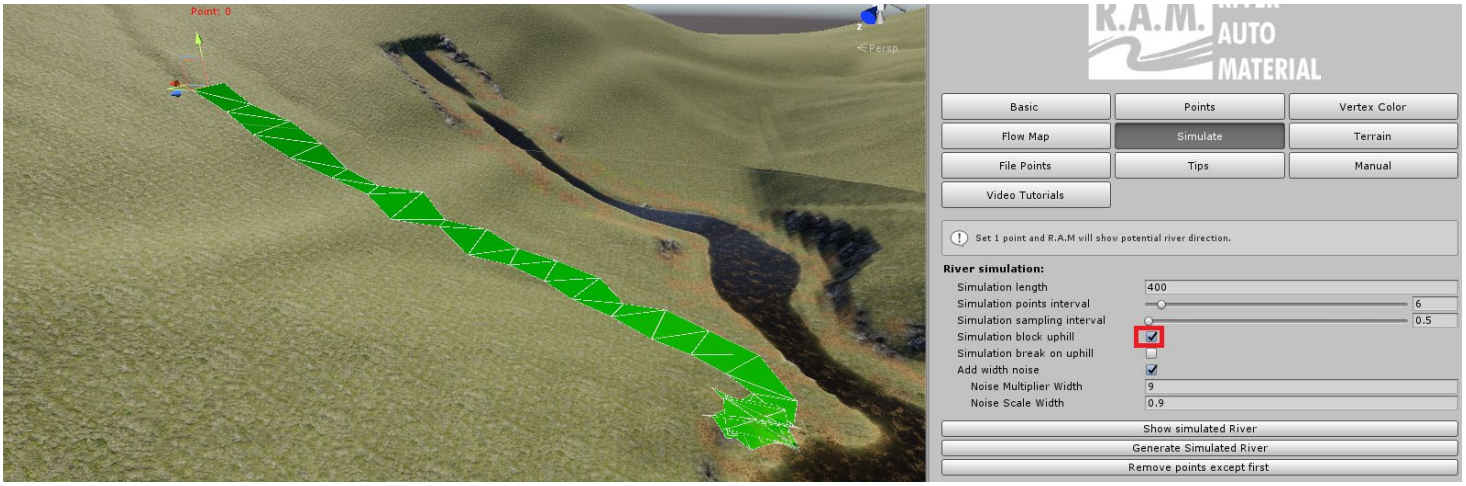
- **"Simulation Block Uphill"** – it will force simulation to create next points lower then last one. It could give poor results without "break" options.
- **"Simulation Break Uphill"** – it will break simulation when all next points would be higher then actual last point.
- **"Add width noise"** – will scale river and add noise our of the box, so it will look more natural. You can set noise density and power.

Examples with all this options you will find below. It's good to have knowledge how simulation will handle different situations.

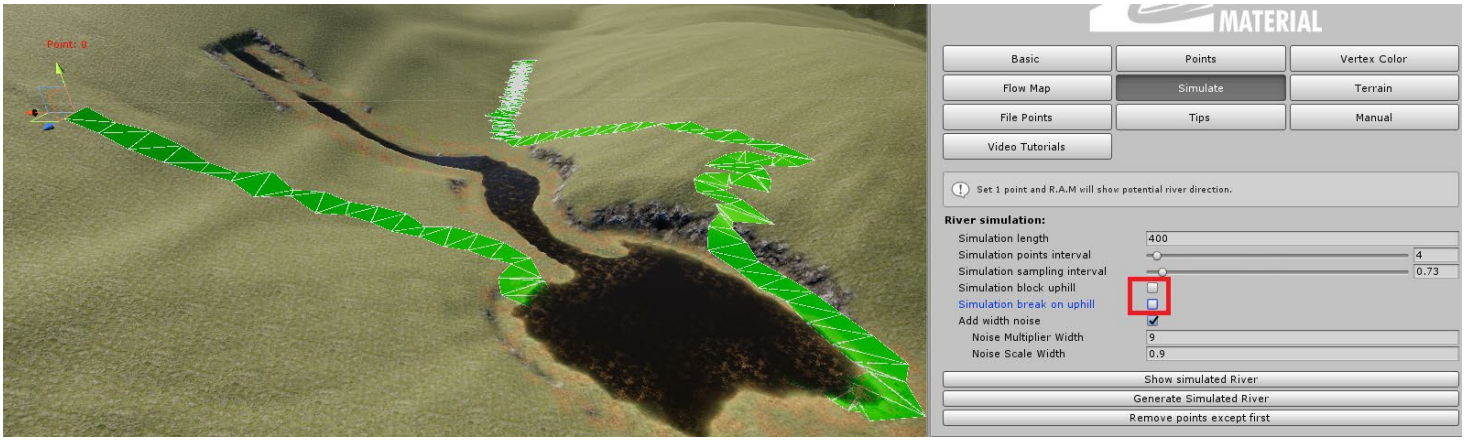
With this setup we block spline to create points up hill and we break spline when this situation will appear - most accurate setup.



With this setup we only block spline to create points uphill so it create bugged points where it can until simulation length will end the spline.

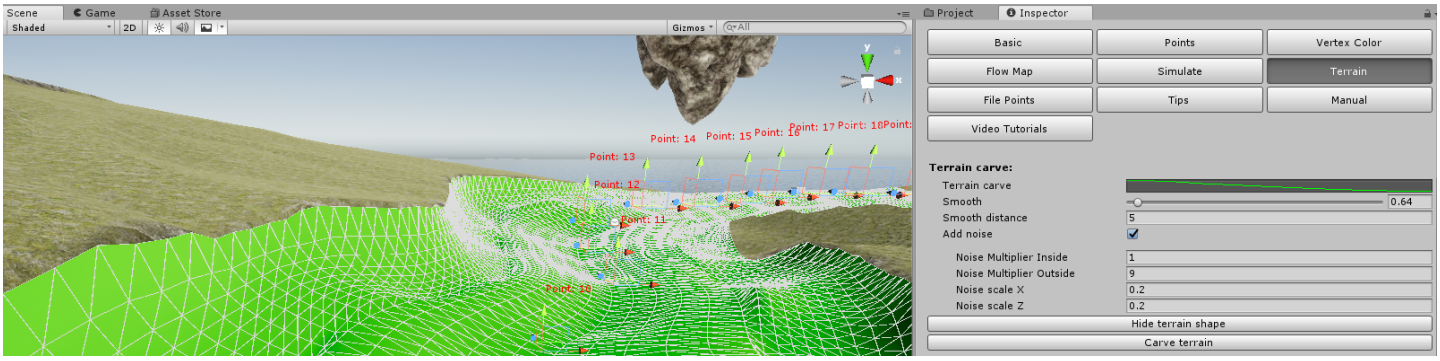


With this setup we allow spline to do everything. Sometimes it could be useful.



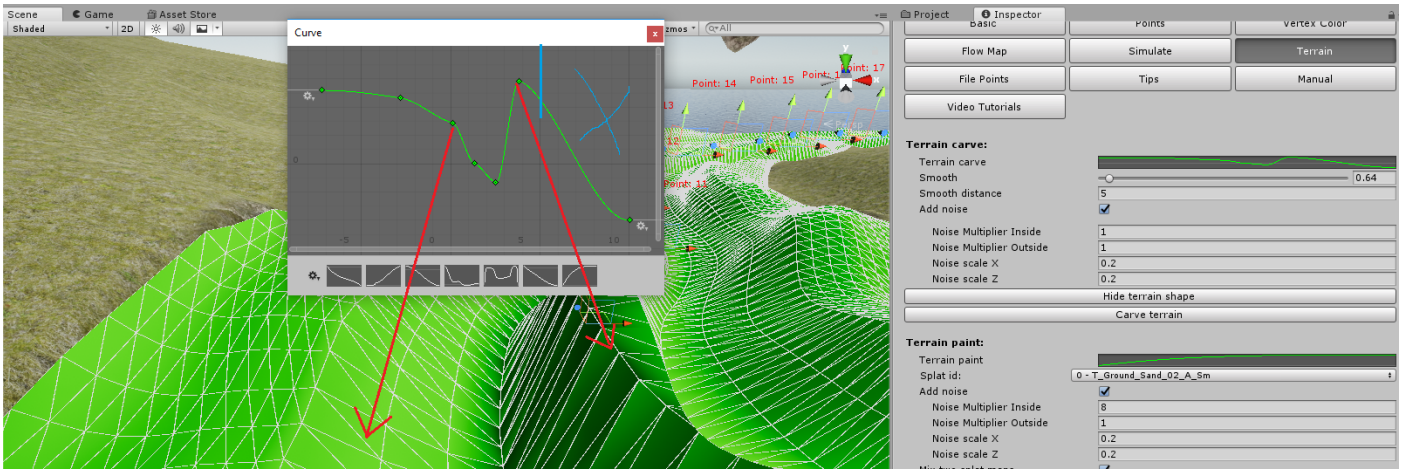
Terrain shape

- **"Single Terrain Select"** - You may chose source of splatmaps/layers for your terrain painting. R.A.M detect all terrains under the spline and add them to the list. This option is also responsible for chosen terrain if you chose to carve only at single terrain.
- This is tool is used to shape, paint terrain splat maps and manage foliage around and inside the spline. It works on multiple terrains. Debug "Show hide terrain shape" will show you future terrain shape in real time. System carve terrain also outside the spline and depends on your setup create hard or smooth blend between original terrain shape and river/road bed.
  - **"Terrain Carve"** – This curve will manage terrain inside and outside the spline. From left of the 0 point it will carve terrain outside the spline, from right inside.
  - **"Carve single terrain" -** R.A.M will carve only single terrain chosen from "single terrain select list"
  - **"Smooth"** – You can adjust smooth power for terrain shaping outside the spline. It's blending power function between terrain shape and shape which was setup by spline.
  - **"Smooth distance"** – You can adjust river terrain influence distance. Higher values will modify terrain verts far from river edge.
  - **"Add noise"** – This function add noise to river inside and outside it bed. It gives more natural result. We separate outside and inside noises as asphalt road we rather avoid inside noise while outside could be pretty high.
  - **"Show and Hide" terrain shape** – It turn on or off debug for future terrain shape. Values are refresh debug surface in realtime.



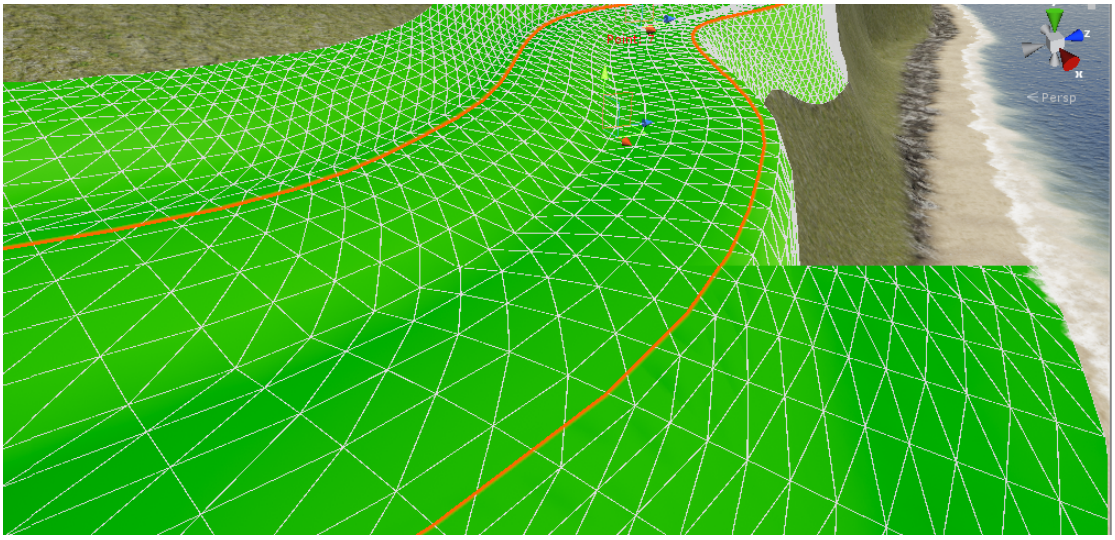
Let's check interesting setups:

Example 1: Area in right direction from blue line will be ignored because it can be used only if river would be much wider. With river which have 10m width, system will set height for 5m from left and 5 m from right river border. This gives ability to generate a bit different shape when river have different width.



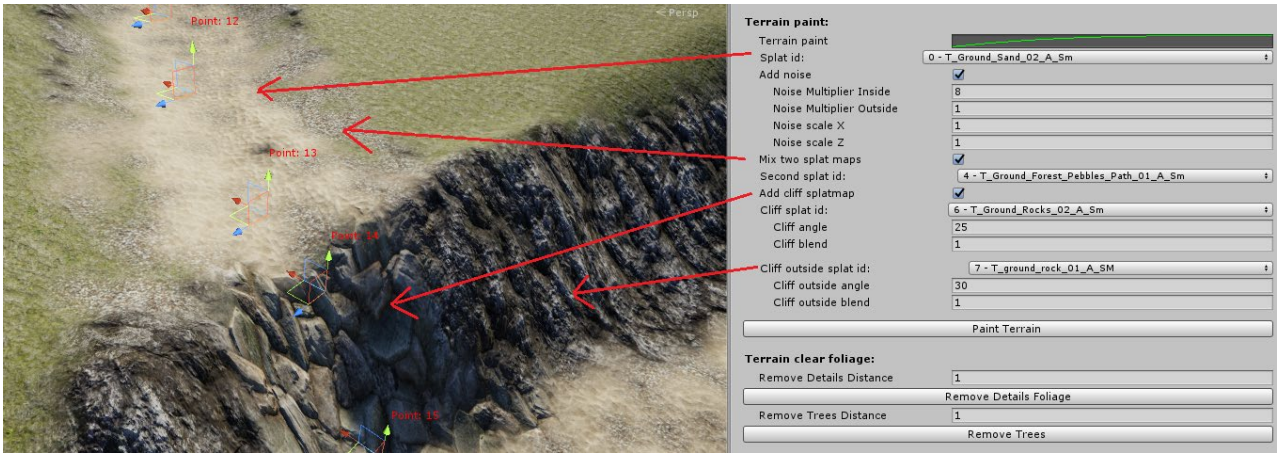
Example 2: With road hill we will show smooth power difference.

- Top part of the image have smooth power = 5 which means it smoothly blend terrain and shape from spline
- Bottom part of the image have smooth power = 0 which means it force hard shape directly from spline



Terrain painting

R.A.M is able to paint terrain inside and outside the spline using multiple layers and different textures directly for river bed and outside of it. Basically you can paint terrain via noises and slopes. We will definitely build more features in this direction for sure.



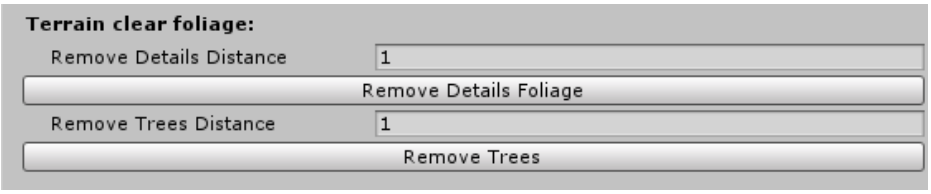
- **"Terrain paint curve"** is very useful when you use textures height-blending and you interest in specific sand or river bed texture show/pop up.
- **"Spat ID"** – chose splat map which you want to use to cover river area

- **"Mix two splat maps"** – You can use more then one splat to cover river bed like second sand layer or small pebbles like we did in that screen.
- **"Add cliff splatmap"** – you can add cliff/rock layer inside river bed.
    - **Angle** – slope that rocks /cliff show up
    - **Blend** – blend angle values, we rather like to have smooth transition from sand into cliff specially when we use height-blend texture terrain shaders

- **“Cliff outside”** – This allows us to use different cliff/rock texture outside the spline then inside. For example inside river we could use big river rocks and outside dirty ground or cliff textures.
  All this options will help to create naturally painted river area (not only bed)

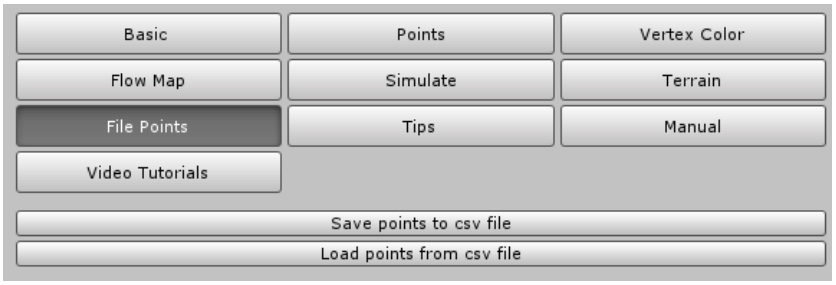
Terrain foliage manage

This option allows to remove trees and grass from unity terrain foliage under the spline



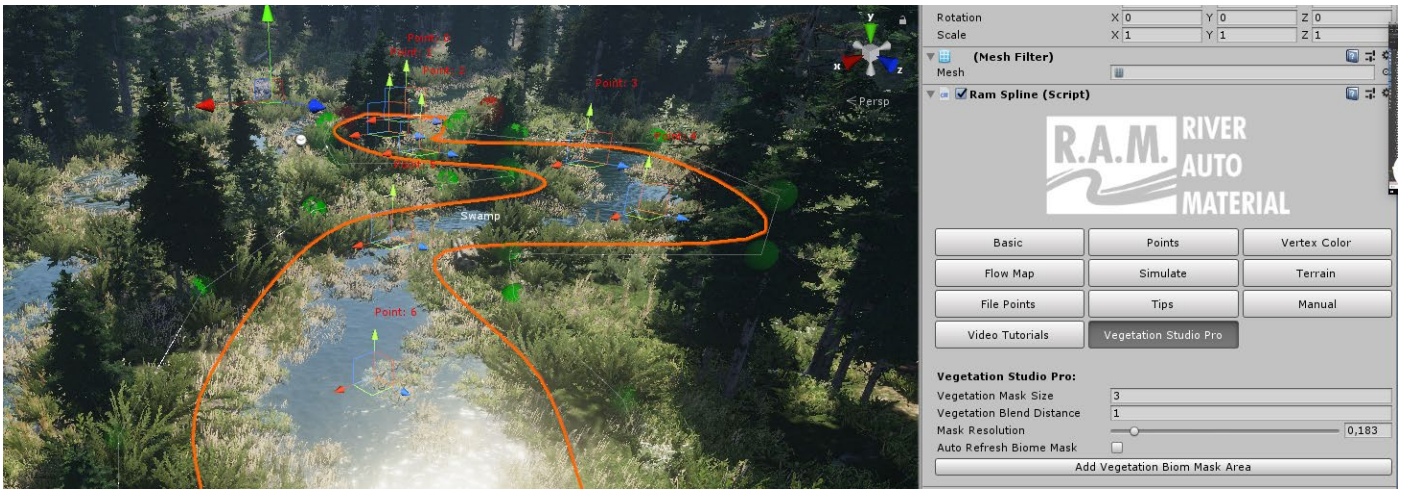
CSV File Points

This option allows you to import and create splines from CSV file format. Useful if you want to import data from GIS, and other 3d programs then unity. If spline is broken in anyway you always could export csv file and import it again. This should fix any issues. You could always export spline from unity into file in CSV format.

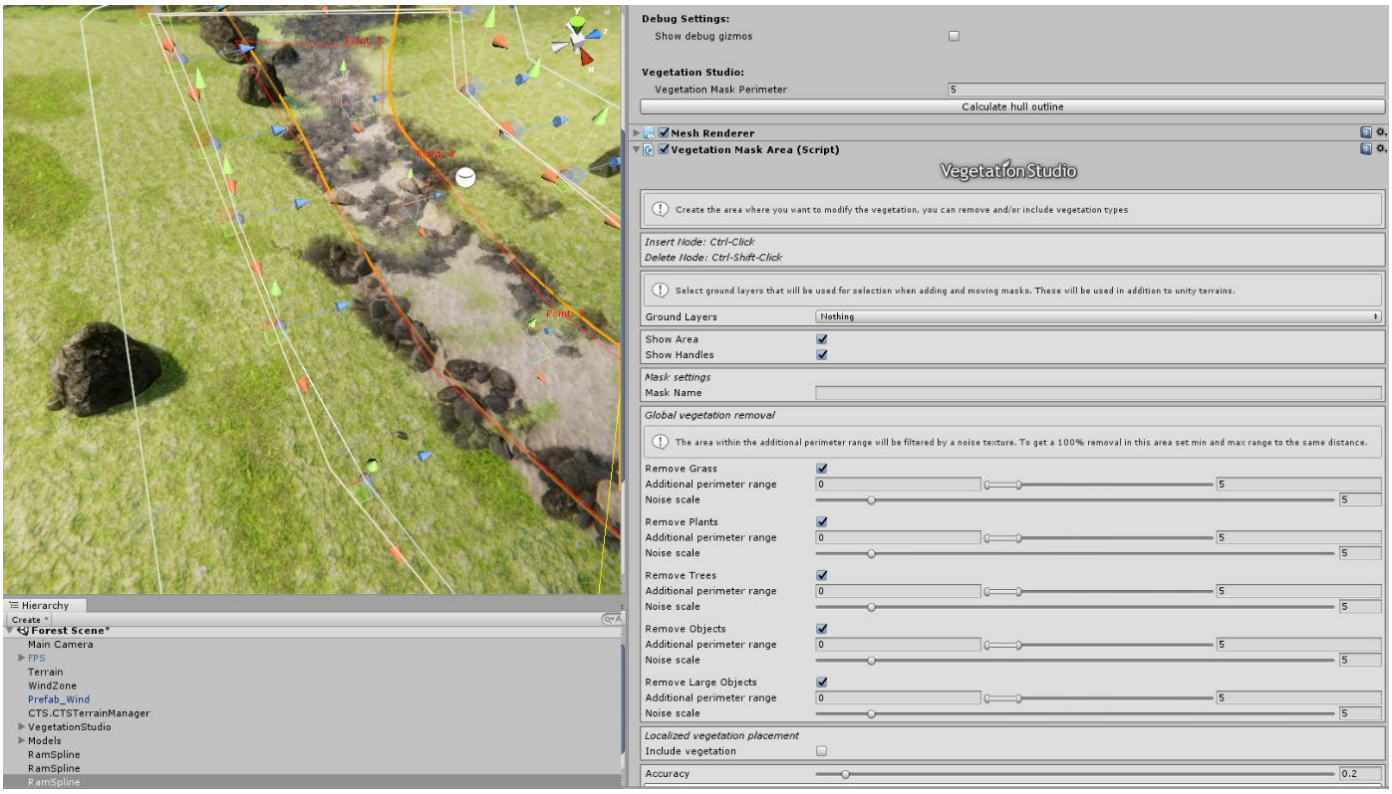


Vegetation Studio Support PRO and NON PRO

Asset support vegetation studio and vegetation studio pro. R.A.M will detect VS out of the box in your project and show additional option. We support automatic Vegetation Studio area mask refresh while you move your spline points but for longer river it could be a bit expensive so leave it as checkbox – “Auto refresh biome mask”

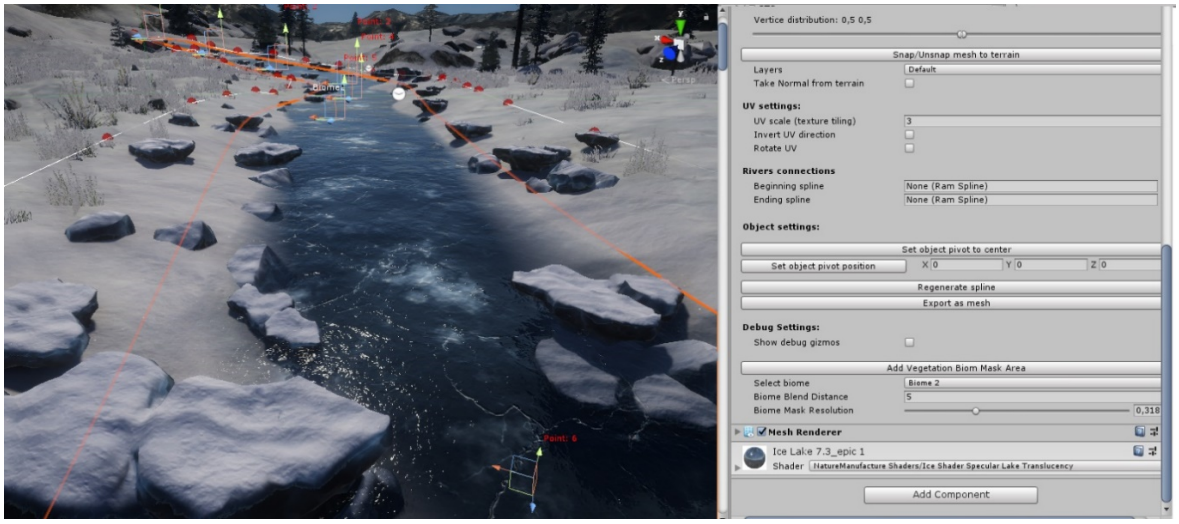


Standard Vegetation Studio it will cut foliage around the spline.

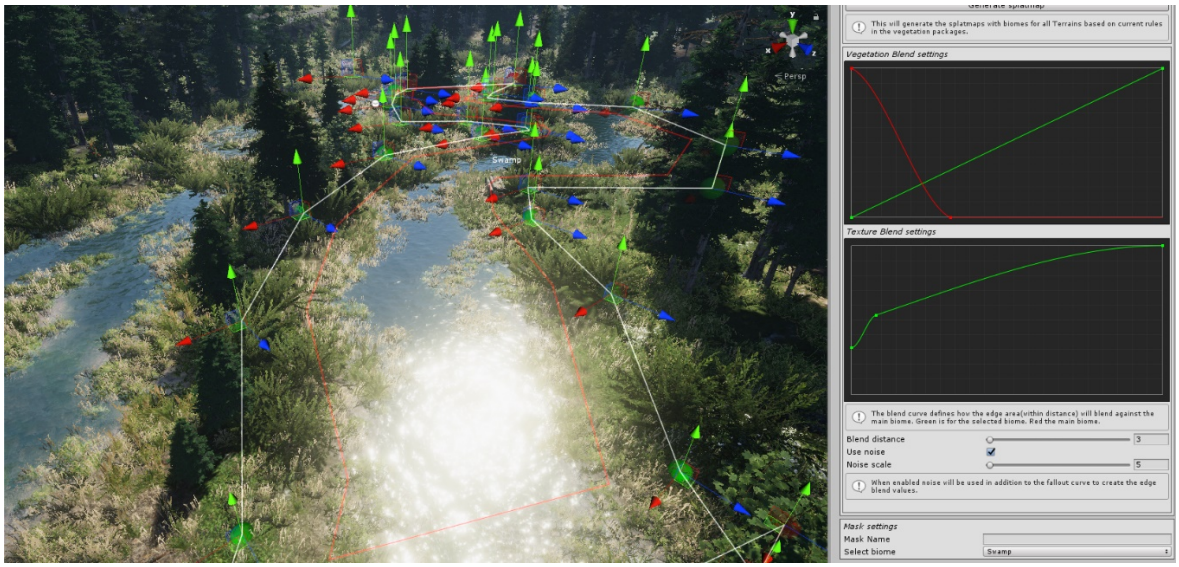


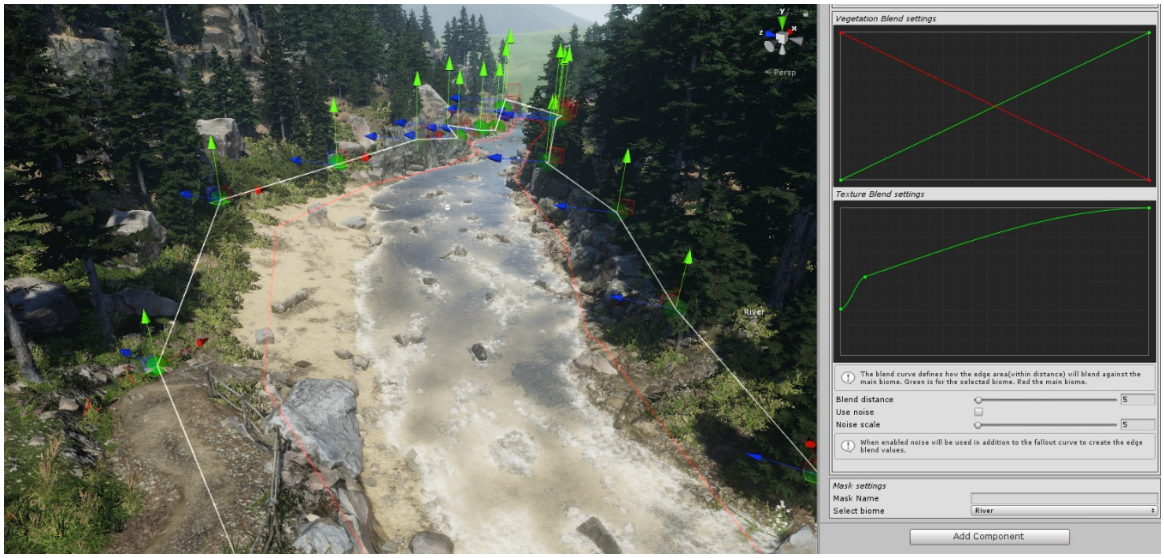
Vegetation Studio Pro it’s could be biome object like in first Lennart biome video presentation. We made there: Frozen river, water, lava river biomes. In this pack you could find example biomes for VS PRO beta. We will keep this up to date as we can. In biomes we mixed our assets so you will get natural biome profiles but probably you need most of our assets for best experience. They will work even without them as they are only math rules and noises to paint and spawn environment.

Frozen river biome: At image below we spawn ice floe around the frozen river, everything is procedural, no single object at this scene at all. It need our dynamic nature starter pack.



Here R.A.M generate swamps. It use meadow environment - dynamic nature, advanced foliage pack, cts 2019 - complete terrain shader.





Small River API

Creates spline with points - CreateSpline(Material splineMaterial = null, List<Vector4> positions = null)

Adds point at end of spline - AddPoint(Vector4 position)

Adds point in the middle of the spline - AddPointAfter(int i)

Changes point position, if new position doesn't have width old width will be taken:

ChangePointPosition(int i, Vector3 position)

ChangePointPosition(int i, Vector4 position)

Removes point in spline - RemovePoint(int i)

Removes points from point id forward - RemovePoints(int fromID = -1)

Generates river spline - GenerateSpline(List<RamSpline> generatedSplines = null)

Adds noise to river widths - AddNoiseToWidths()

Simulates and generates river - SimulateRiver(bool generate = true)

Shows terrain carve - ShowTerrainCarve(float differentSize = 0)

Carves terrain around spline - TerrainCarve()

Paint terrain around spline - TerrainPaintMeshBased()

Clear foliage around spline - TerrainClearFoliage()

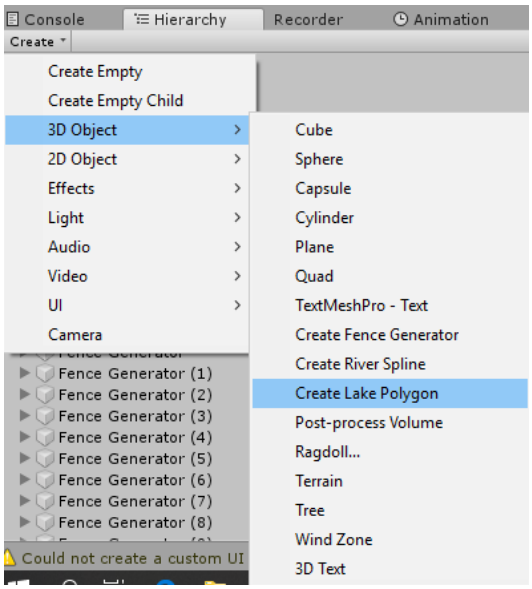
Lake Setup

We design lake system to generate lakes, sea and other curved shapes and avoid big surfaces of water under the terrain or other models. Anyway it's always easier and better to create one surface with options to manage points and shape in one place instead of fighting with tiles. Basically lakes have all features that river have, even similar panel.

Basic options

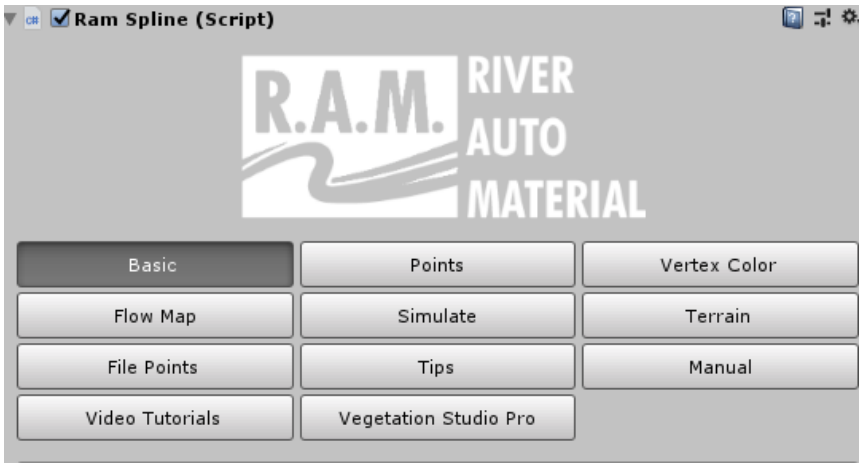
1. Create lake object:

Make note that this option could not show if you got compiler errors in your project. It's because errors block editor script compilation.
Create -> 3D object -> Create Lake Polygon.
This operation will create lake object in your hierarchy.



2. Lake polygon panel.

As you see there are few main pages:

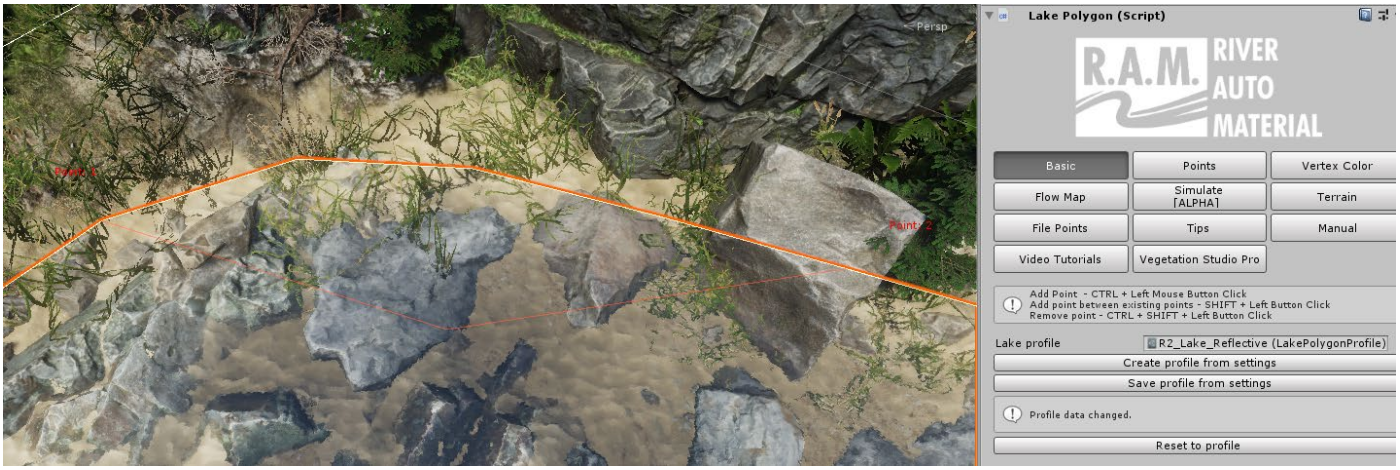


- **"Basic"** - changes which are global for whole mesh. You could manage here uv, vertex density and shape, light setup etc.
- **"Points"** – point changes like, add, remove, select.
- **"Vertex Color"** - modify mesh and customize locally by our vertex color tool
- **"Flow Map"** – modify flow map, manage automatic generated flow map values
- **"Simulate"** – this part allow you to simulate lake shape specific point. System analyze terrain and give result of the future lake shape. It's in early preview, we are not proud from it yet.
- **"Terrain"** – modify terrain under the lake like paint, carve and foliage manage.
- **"File Points"** – here you could import/export points from CSV file to create lake polygon.
- **"Tips"** - info about lighting and tricks.
- **"Manual"** - which drives you directly to this PDF
- **"Video Tutorials"** - which will open YT tutorials where we will explain R.A.M and L.V.E usage.
- **"Vegetation Studio Pro or Non pro"** – it shows only if vegetation studio is inside project and give ability to manage foliage in co-op with that system.

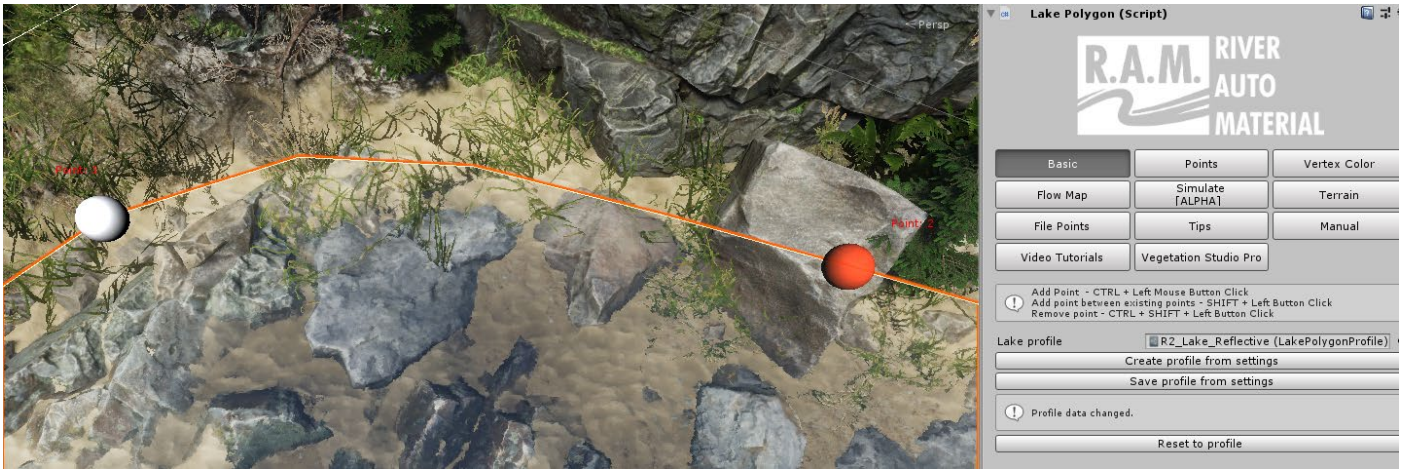
3. Add points / remove points (raycast from mouse)

- Add new points when you hold: CTRL + Left Mouse. Setup few points like that.

- Add point between existing points: Shift then Left Button Click (shows debug lines which fallow the pointer)



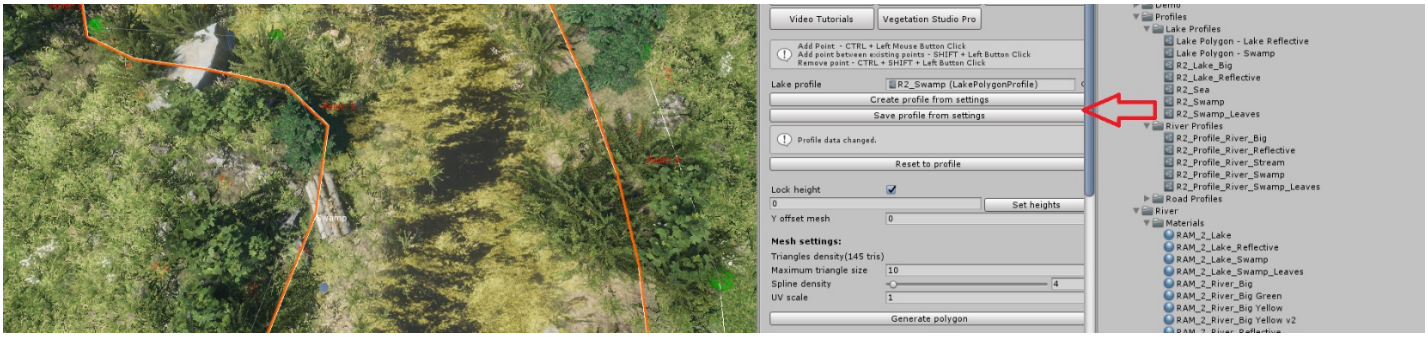
- Remove point: CTRL + Shift then Left Button Click to remove point. (shows debug which fallow the pointer)



4. Setup material or whole lake features.

- You could drag and drop profiles which we prepared which contain info about:
  - mesh shape
  - uv density
  - lake /mesh resolution
  - terrain carve
  - terrain painting
  - flow map
  - shape and flow map noises,
  - vegetation studio pro biomes
  - light setup

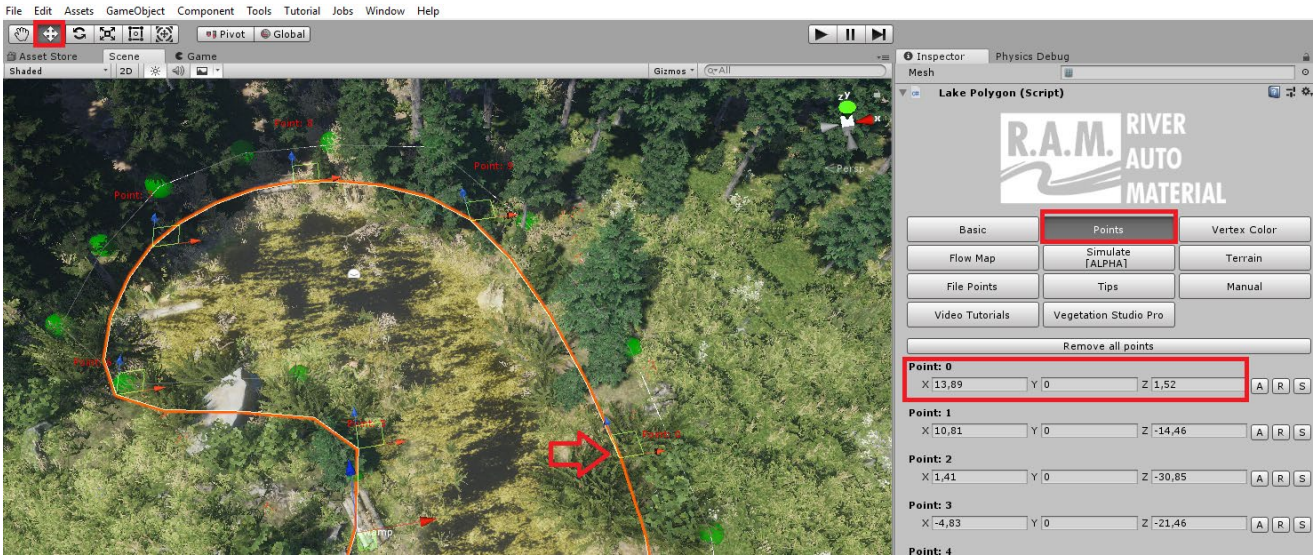
Basically whole lake setup out of the box – drag and drop setup. Try our lake / swamp profiles. It's very useful, you don't have to copy paste any values anymore to create similar effects.



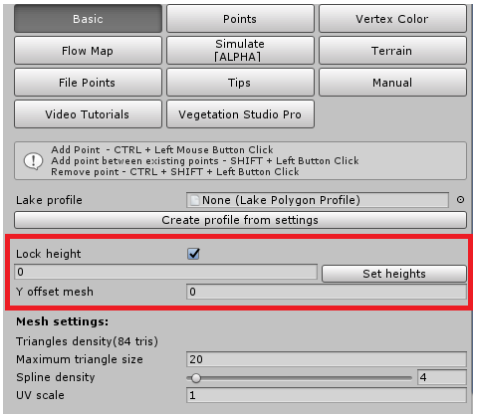
- You could drag and drop material from our library or create your own. Just drag and drop material from project into mesh renderer component at lake object

5. Point movement.

You could start to move your lake specific points by clicking "W" or marked button in left top corner. By moving selected arrow at your screen lake point will change point position.



You also could move point at “Points” page in point label. You can change XYZ values from that panel.

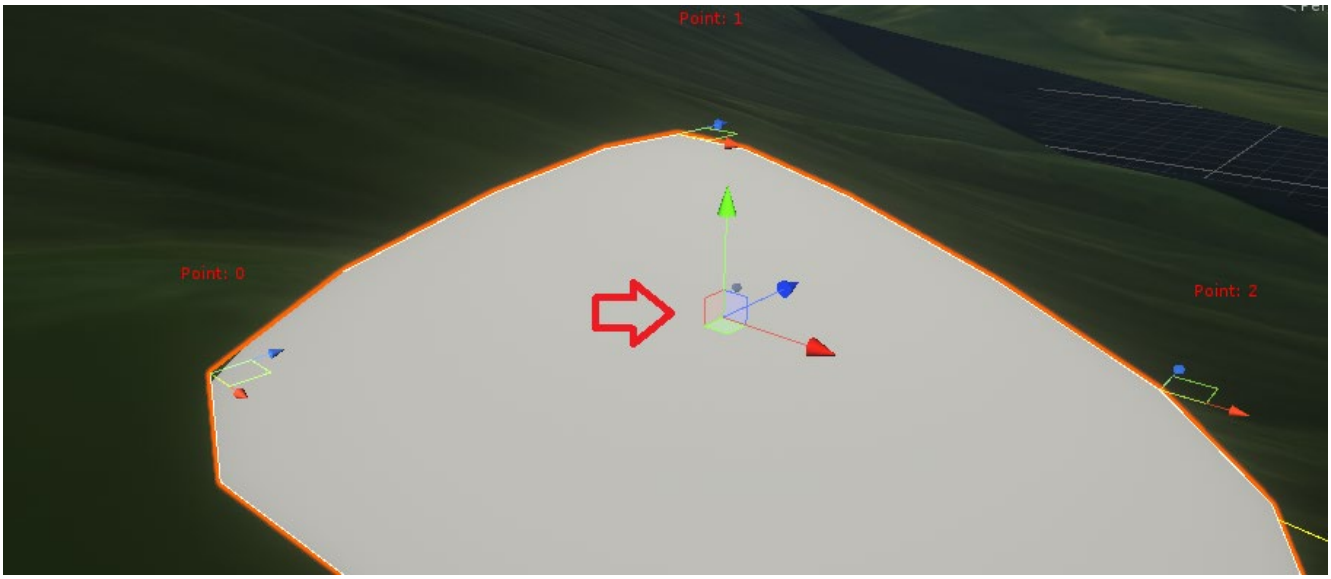


It’s possible to change whole lake position or offset mesh in relation to points. **“Lock height”** force that all new points will be at same position. **“Y offset mesh”** will offset surface from points, **“Set heights”** will change all points position to chosen values.

Sometimes users said that they don’t see any arrows, anything. Please restart engine layout and they will show up.

6. Global lake movement

You could do this by selecting big arrow

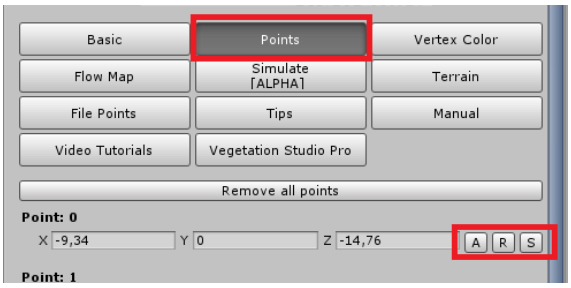


DO NOT SCALE AND ROTATE lake object it will generate issues.

Support: Email contact: Naturemanufacture@gmail.com Web: **naturemanufacture.com**
Skype contact: dahrrrr Manual author: Bartłomiej Galas
Facebook: https://www.facebook.com/NatureManufacture-559454417506747/?fref=ts

7. Additional point options in points page:

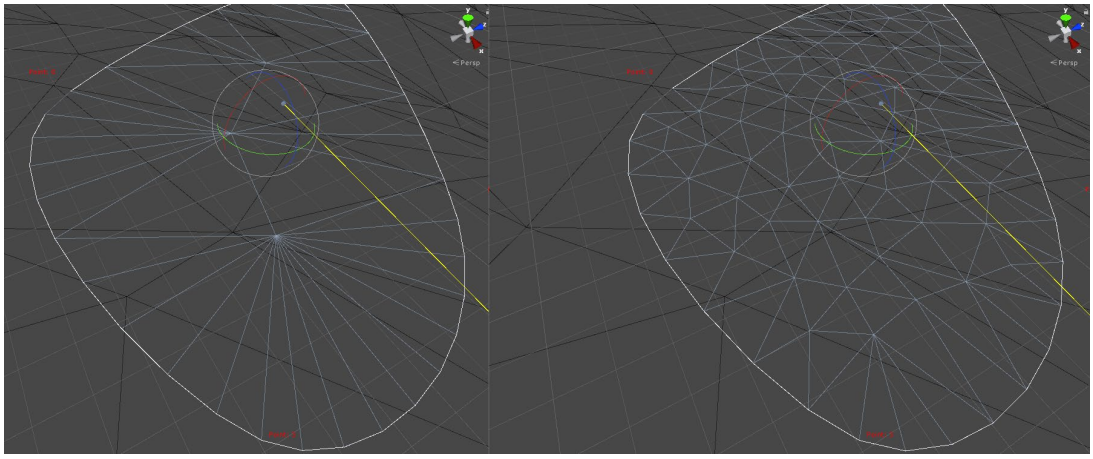
- "R" button to remove points from spline.
- "A" button to add point after this selected point.
- "S" button to select "mark" point at spline. Helpful before remove operation.



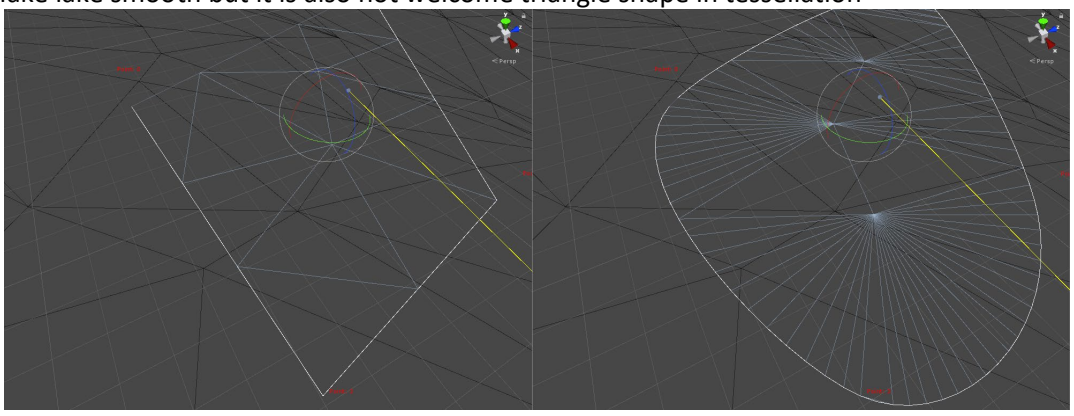
8. Mesh resolution and shape.

You could control it by changing 2 values:

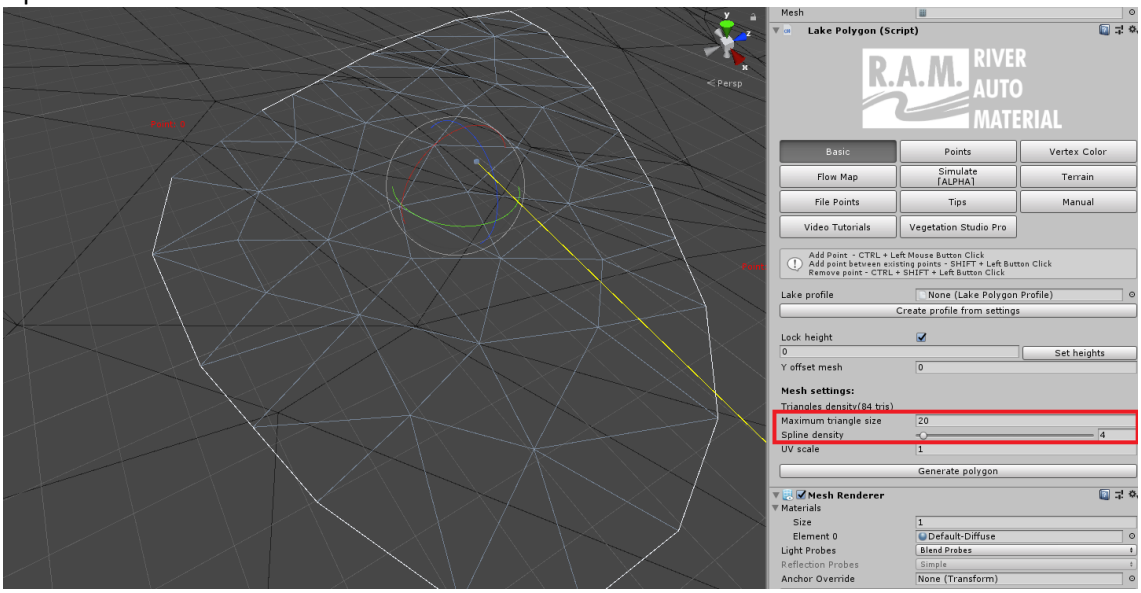
- **"Maximum triangle size"** – it change global resolution of the mesh. Lower values make triangles smaller and generates more tri.



- **"Spline density"** – This value control amount of triangles and resolution of the mesh border. Higher values will make lake smooth but it is also not welcome triangle shape in tessellation

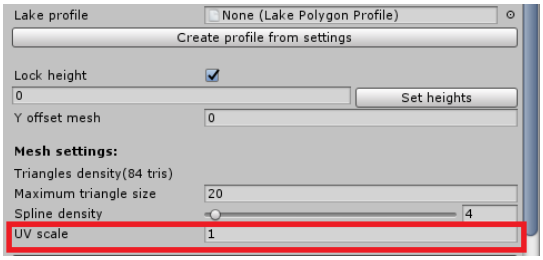


You have to play with it a bit to get nice result. Here example of proper setup for this config. Triangles are pretty equal.



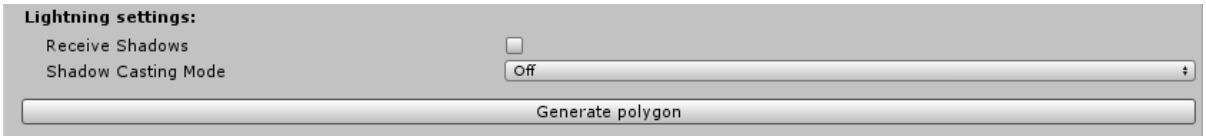
9. UV settings

UV scale gives ability to change tiling of the lake.

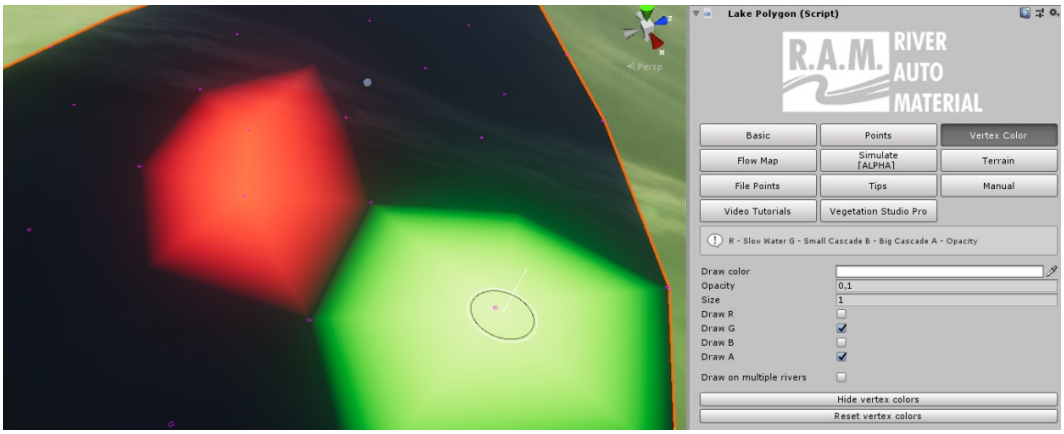


10. Lightning settings

This part controls shadow receive and cast. For water and dirty paths we rather don't want to cast shadows. For all kind of roads and paths we would like to receive shadows and sometimes cast too. If road or lava surface is flat we don't need to cast shadows from it. It's just waste of gpu time.



Vertex color customisation:



- Each color/mask give ability to paint by different water stage.
- You can chose which color you will use in painting – for example only R,G or A. This will help to work with only 1 shader feature connected to chosen color and avoid to modify others.
- Different surface react on their own way on vertex paint. Look below for more information.

- R - Pretty cold lava/small slope
- G - Hot lava/bigger slope
- B - Very hot/waterfall
- A - Frozen lava
- Black - Automatic

Lava Frozen:

- R – Heat your lava
- G – Cover your lava by ground texture or any other
- B – maybe we will add another 2nd ground texture
- A – we will see 😊
- Black - Automatic

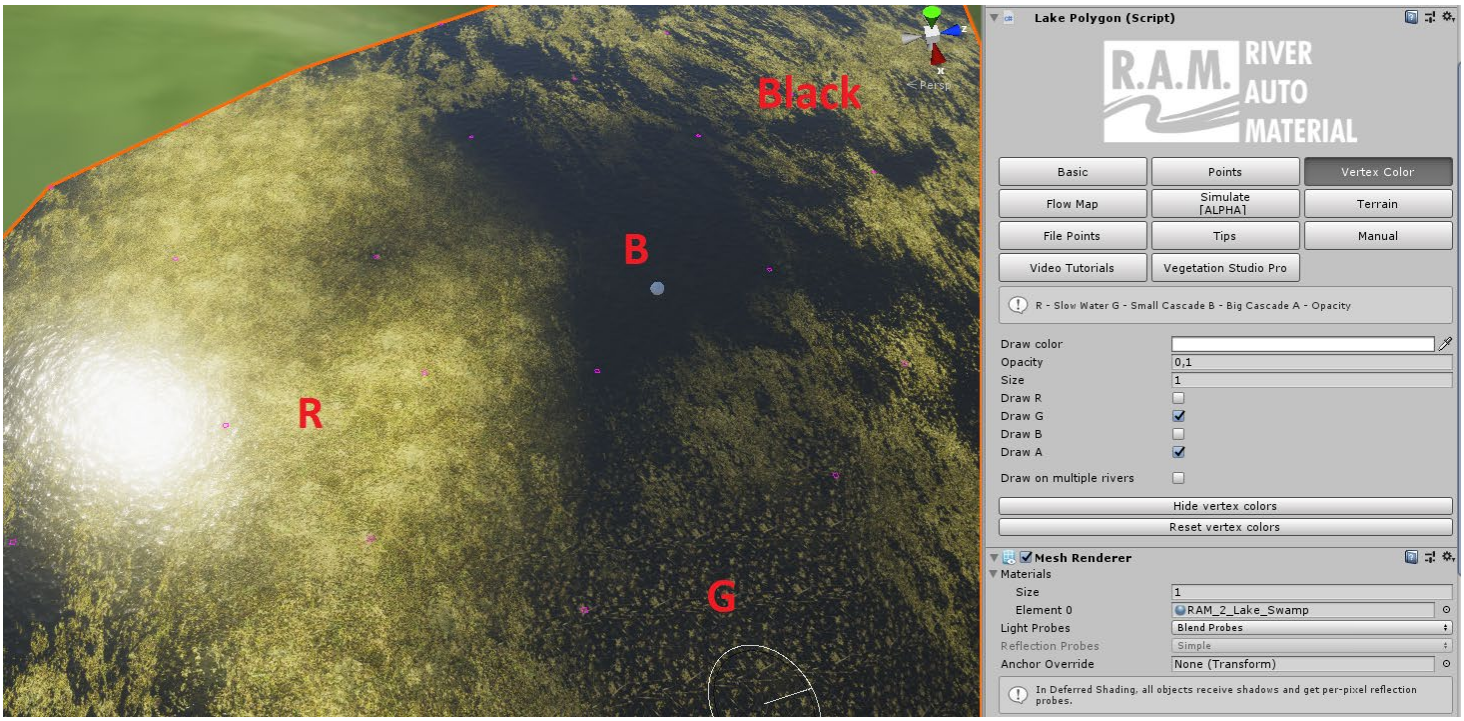
Water:

- R – Slow water Lake
- G –Small fast windy waves
- B – Big windy waves
- A – Alpha color It's useful to blend with other water systems and surfaces.
- Black- Automatic

Swamp:

- R – Green duckweed or Albedo 1
- G –Roots or Albedo 2
- B – Clean Water
- A – Alpha color It's useful to blend with other
- Black – Automatic mix

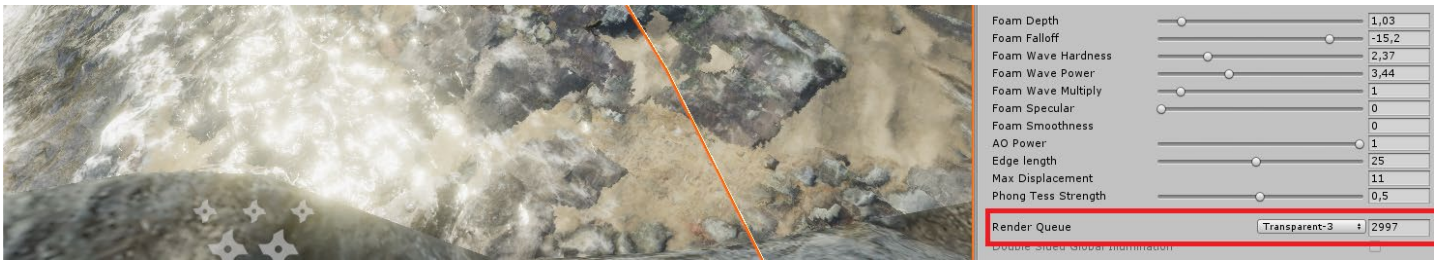
Swamp example:



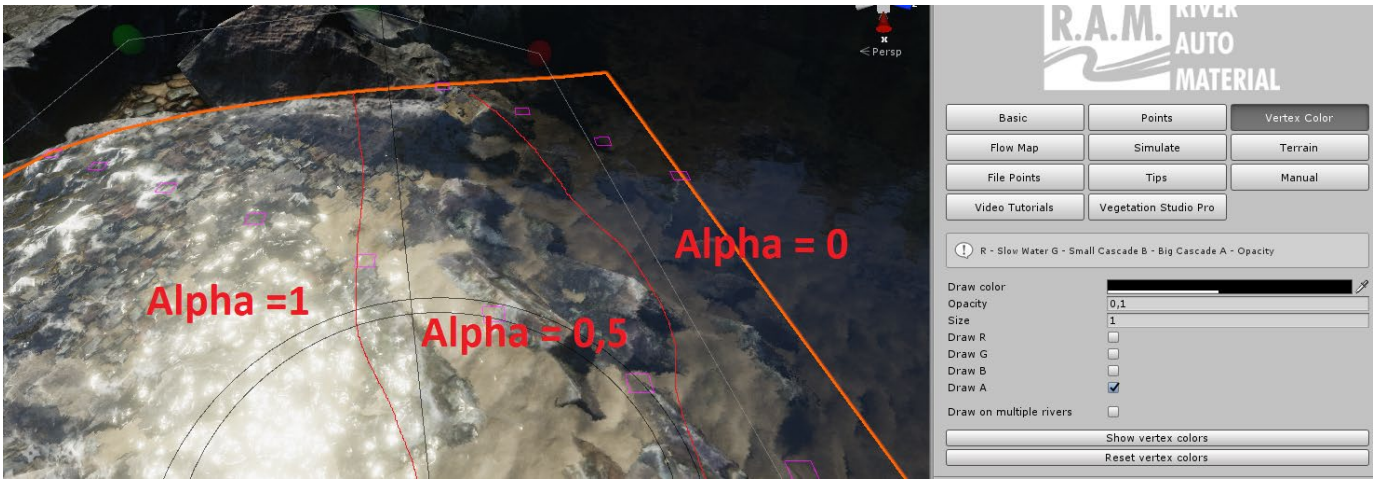
Lake and river connections

We often connect rivers with lakes or sea. With our system your are able to connect them in few minutes. You can connect totally different surfaces like swamp river with sea or any other configuration.
There are 3 things that have to be done:

- River mesh must be above lake mesh, not much just a bit
- River mesh must have higher render queue in material then lake.
  For example river = 2997, Lake = 2998. This will avoid “Z fighting” between transparent surfaces at low angles or far distance.



- River must be blended with lake via vertex alpha in spline vertex painter. This will generate smooth transition.



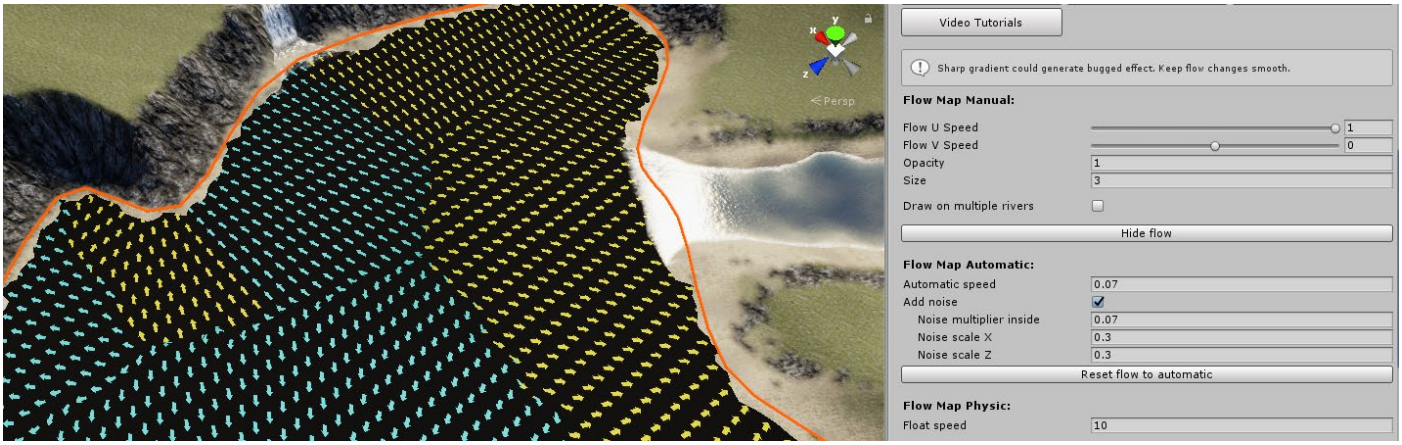
This is how it would look with totally different water materials.

Flow Map

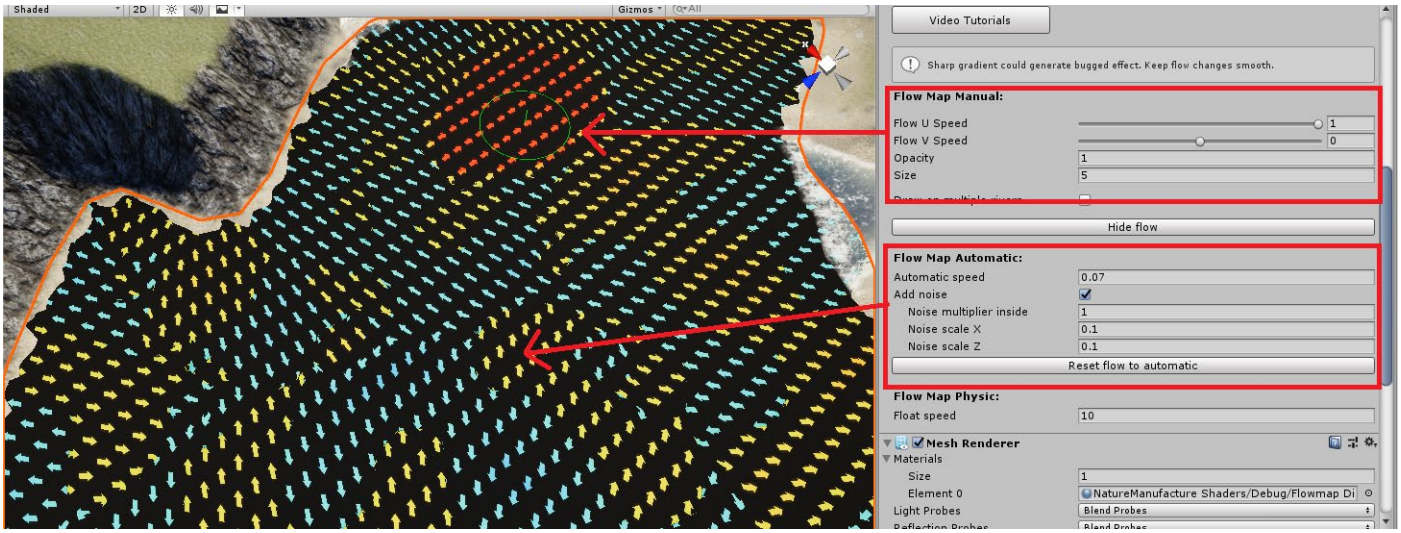
Flow mapped shaders are very sensitive. Gradient between direction must be smooth, mostly in tessellation shaders where verts must smoothly change UV and direction. We gives debug view to control this aspect.
There are 2 ways to work with flowmap:

- **Manual** – gives ability to set any flow map value/speed on lake via marker. You simply set U and V speed on slider, opacity and size of the brush.
- **Automatic** – its based on automatic border detections. Water always move outside from the middle into lake borders, with noises it gives much nicer result but only if they are not so strong. Make note that to big speed or to hard blend will generate issues at uv.

Raw automatic flow map without noises:



Flow map with noises and manual painted data:

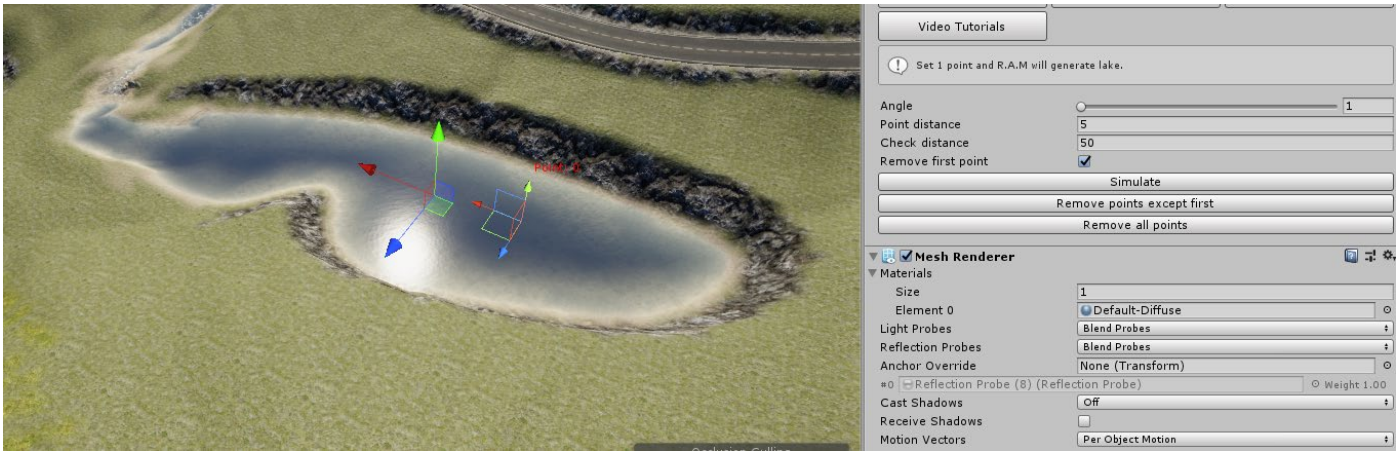


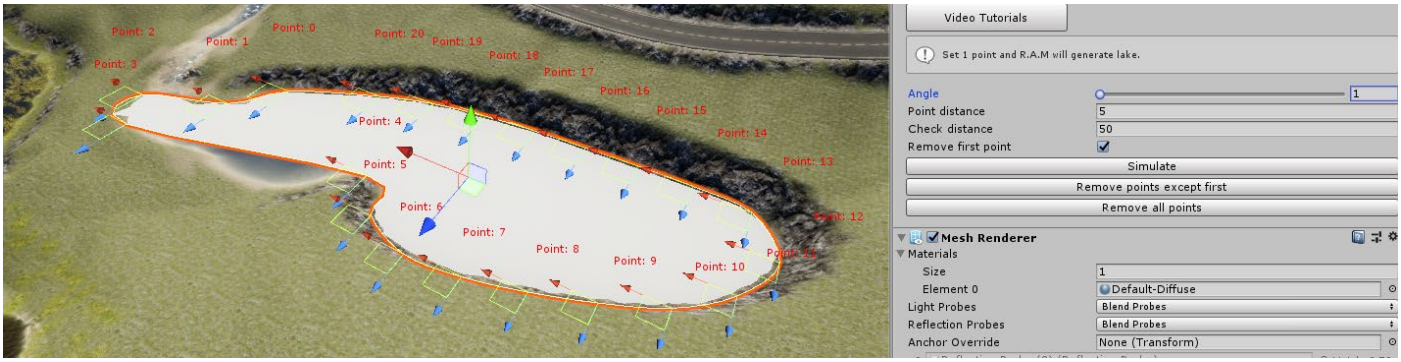
Options available at flowmap panel:

- **"Show/Hide flow directions"** – It will show/hide arrows with colors which shows direction and speed of water. Deep red or blue mean big speed. Be careful and blend speed, don't create hard gradient.
- **"Flow U, V speeds, opacity and size"** - They are used to control direction, speed, size and hardness of brush which will paint flowmap on spline surface.
- **"Draw on multiple rivers"** – It gives ability to paint on lake connections and many rivers at the same time. It help to keep proper blend and correct flow map on lake/river connections.

Simulation

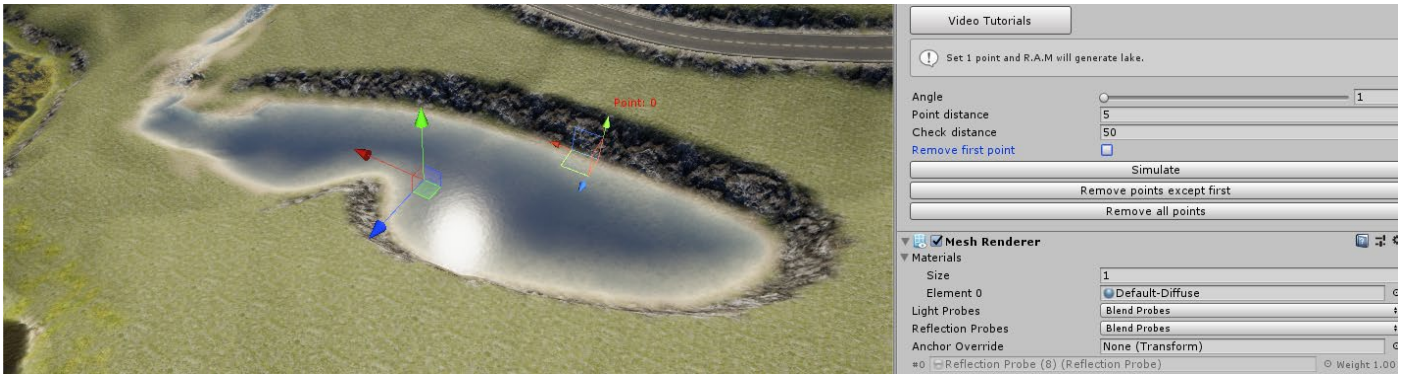
This option is in early alpha. It generate lakes from 1 point.. R.A.M will analise shapes around and show potential lake position. It's useful for natural lake generation. If you want to repeat, operation click remove points except first to start simulation again from 0. System is not fully ready to use, it's just beginning. Results at the moment are not fully proper. Anyway remember that lake doesn't have to be very accurate as you can shape and paint terrain around it. This is how system will create lake from 1 point at the middle of place were lake should appear:

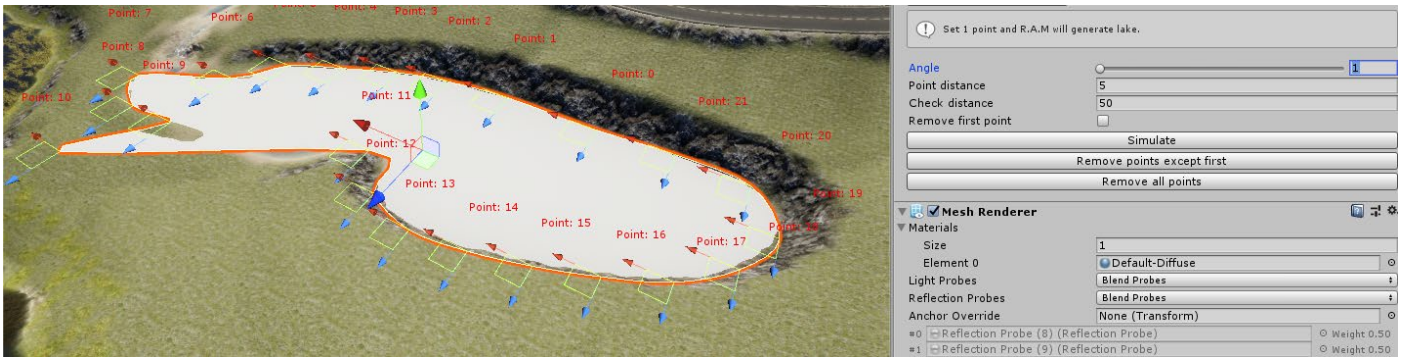




There are few options that can help to adjust potential lake shape:

- **"Angle"** –Minimum angle that could be???????.
- **"Point distance"** – Distance between points at lake border. It is also it's
- **"Remove first point"** – If it's checked system will generate lake from 1 point at the middle of the lake. If you uncheck it starting point should be at the point where lake should met the terrain. As we can se result is pretty similar.





If you want to repeat/ iterate simulation again please use ctl -z to undo result or in case when you don't have checked "remove first point" simply click simulate again. It's because if you remove first point it's hard to get same / similar result without it.

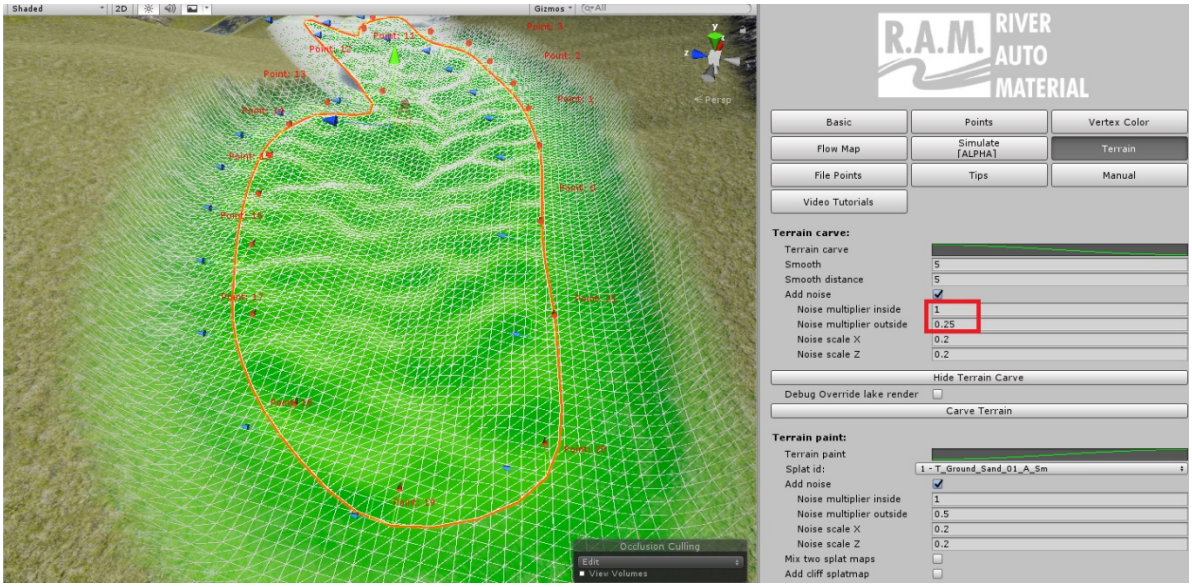
Terrain shape

This is tool is used to shape, paint terrain splat maps and manage foliage around and inside the lake. It works on multiple terrains. Debug "Show hide terrain shape" will show you future terrain shape in real time. System carve terrain also outside the lake and depends on your setup create hard or smooth blend between original terrain shape and lake bed.

- **"Terrain Carve"** – This curve will manage terrain inside and outside the lake. From left of the 0 point it will carve terrain outside the lake, from right inside.
- **"Smooth"** – You can adjust smooth power for terrain shaping outside the lake. It's blending power function between terrain shape and shape which was setup by spline.

- **"Add noise"** – This function add noise to lake inside and outside it bed. It gives more natural result. We separate outside and inside noises, this means that beach could be pretty flat while lake bed have strong noises.
- **"Show and Hide" terrain carve**– It turn on or off debug for future terrain shape. Values are refresh debug surface in real time.
- **"Debug Override lake render"** – It overwrite lake and other materials renderer to show lake bed without any surfaces on the bottom

Example: Notice that noises inside and outside lake shape are totally different.



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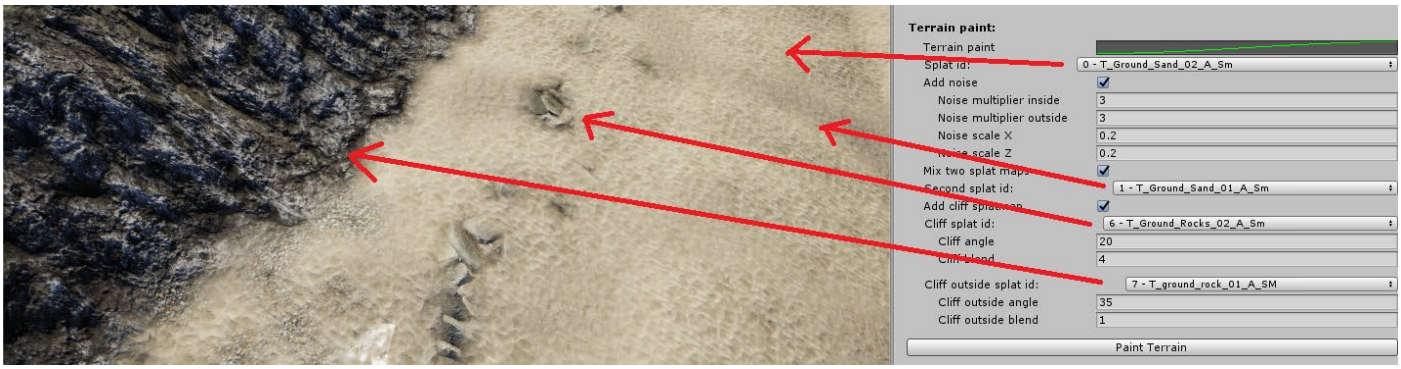
Terrain painting

R.A.M and it's lake polygon is able to paint terrain inside and outside the lake shape using multiple layers and different textures directly for lake bed and outside of it. Basically you can paint terrain via noises and slopes. We will definitely build more features in this direction for sure.

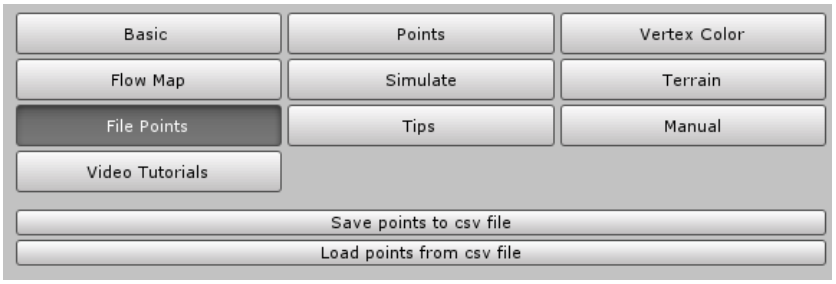


- **"Terrain paint curve"** is very useful when you use textures height-blending and you interest in specific sand or lake bed texture show/pop up.
- **"Spat ID"** – chose splat map which you want to use to cover lake area
- **"Add Noise"** – it add noise to splats and help in 2nd texture mix. By multiply noise value you make 2nd texture stronger. Inside and outside strength help to separate mostly solid covered by sand lake bed from it's beach border.
- **"Mix two splat maps"** – You can use more then 1 splat to cover lake bed like second sand layer or small pebbles like we did in that screen.
- **"Add cliff splat map"** – you can add cliff/rock layer inside lake bed.
    - **Angle** – slope that rocks /cliff show up
    - **Blend** – blend angle values, we rather like to have smooth transition from sand into cliff specially when we use height-blend texture terrain shaders

All this options will help to create naturally painted lake area (not only bed)

CSV File Points

This option allows you to import and create splines from CSV file format. Useful if you want to import data from GIS, and other 3d programs then unity. If spline is broken in any way you always could export csv file and import it again. This should fix any issues. You could always export spline from unity into file in CSV format.

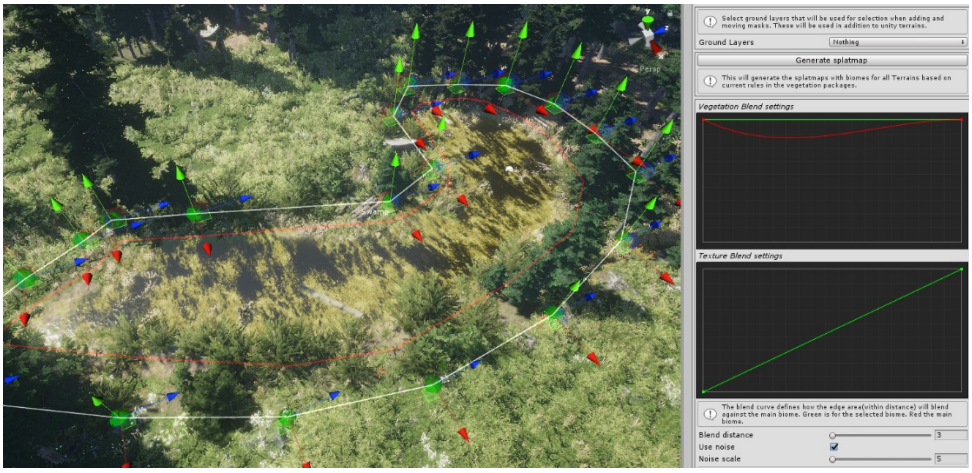


Vegetation Studio Support PRO and NON PRO

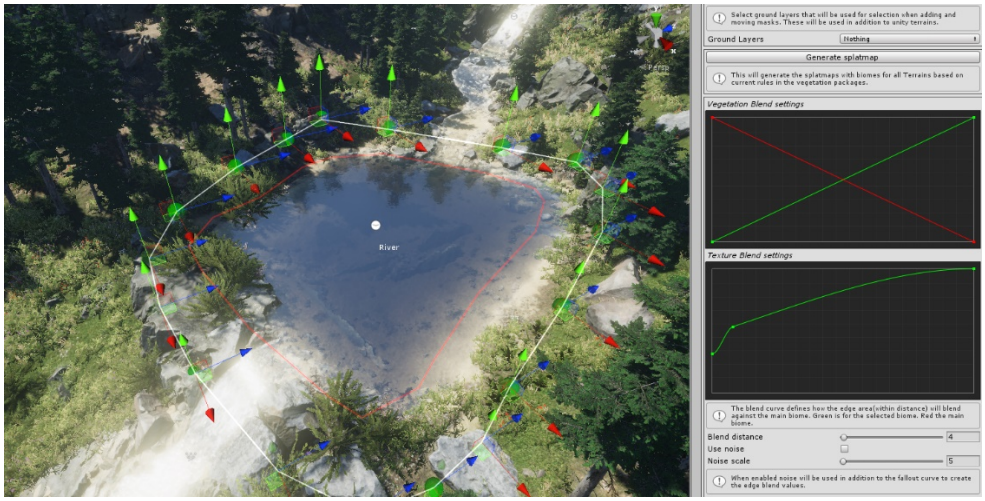
Asset support vegetation studio and vegetation studio pro. R.A.M will detect VS out of the box in your project and show additional option. We support automatic Vegetation Studio area mask refresh while you move your lake points but for bigger lake it could be a bit expensive so leave it as checkbox – “Auto refresh biome mask”

- **Vegetation Studio Standard** it will cut foliage around the lake.
- **Vegetation Studio Pro** it’s could be biome object like In this pack you could find example biomes for VS PRO beta. We will keep this up to date as we can. In biomes we mixed our assets so you will get natural biome profiles but probably you need most of our assets for best experience. They will work even without them as they are only math rules and noises to paint and spawn environment.

Here lake generate swamps. It use meadow environment - dynamic nature, advanced foliage pack, cts 2019 - complete terrain shader.



Typical mountain river generates rocks and sandy borders. It use meadow environment - dynamic nature, advanced foliage pack, cts 2019 - complete terrain shader.



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Small Lake

Creates lake polygon - CreatePolygon(Material material, List<Vector3> positions = null)

Add last point to polygon - AddPoint(Vector3 position)

Add point to polygon - AddPointAfter(int i)

Change polygon point - ChangePointPosition(int i, Vector3 position)

Remove polygon point - RemovePoint(int i)

Remove points from point id forward - RemovePoints(int fromID = -1)

Generates lake polygon – GeneratePolygon()

Carves terrain around lake - TerrainCarve(bool terrainShow = false)

Paints terrain around lake - TerrainPaint(bool terrainShow = false)

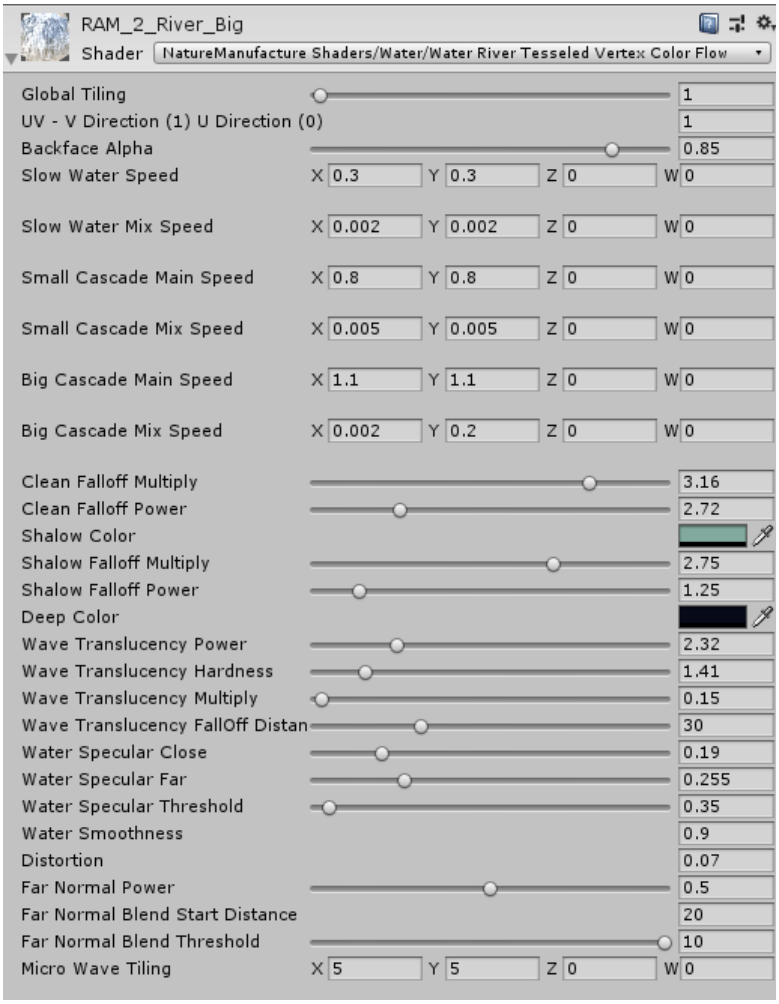
Clears trees and foliage around lake - TerrainClearTrees(bool details = true)

Simulates lake - Simulation()

River and Swamp Materials

River shading

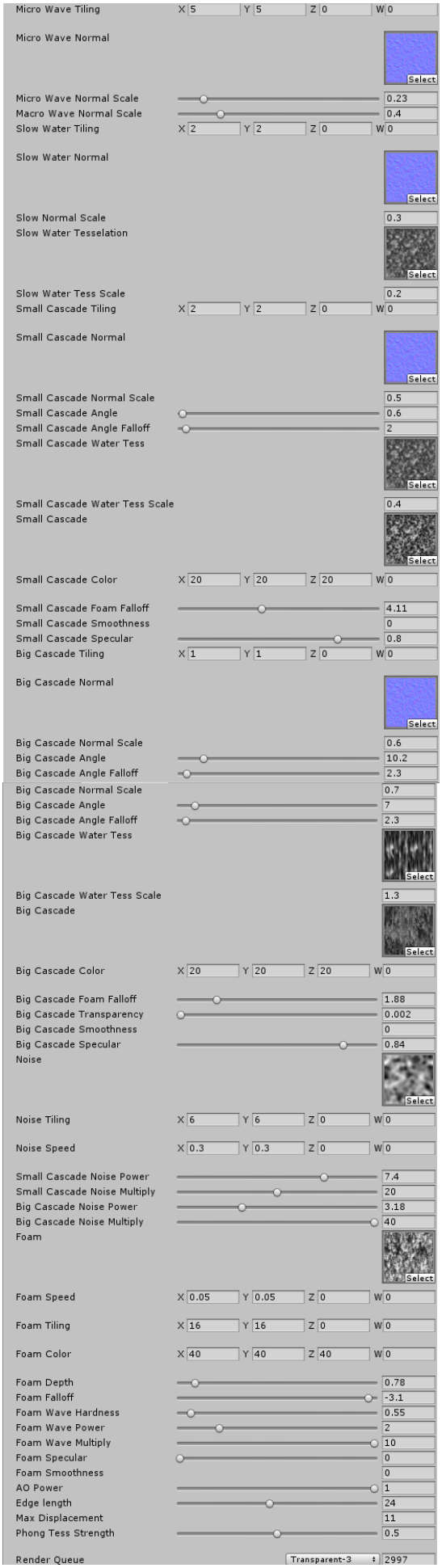
This pack contain few shaders like swamp or water which have different features.



- **Global Tiling** change tilling of all textures and features inside the material. We rather advice to change uv scale on our splines or lakes instead of changing material values.
- **Slow water, small cascade, big cascade main speeds** control main speed of the water and also it's main speed for flow maps system
- **Water mix speeds** are used to create wave noise on the water.
- **Clean Falloff Multiply and Power** controls clean water area – this first water stage which touch the ground.
- **"Shallow Falloff and Power"** control blend between deep, shallow and clean water.
- **Shallow or Deep Color** manage color of water at shallow and deep area.
- **"Water Translucency Parameters**" – we added small effect of over lighted waves, you could control it's intensivity by this sliders. It's based on heightmap or tessellation data.
- **Water Specular Close and Far** – we setup different specular power close and far range to simulate natural water behave where close water surface is more transparent.
- **"Water Specular Threshold"** control blending distance between far and close specular values.
- **"Water Smoothness"** control smoothness and reflexibility of the water surface. Smoothness closer to 1 will generate more sharp and visible reflections on water surface. It also affect how light is mirrored by water surface.
- **"Distortion"** manage power of distortion at water edges mostly. It distort image under the water.
- **"Far Normal Power"** this value multiply normal power in far distance. Effect is blended via " **Far normal blend start distance"** and it's "**Far normal blend threshold**". This effect is used to get nice reflections in far distance at lakes and rivers even when normal maps at close distance are pretty strong.

Here are examples of translucency effect. It should be very delicate. It moves with flow map and normal map.

- **Micro Wave Tiling and Normal** – water contain small normal map waves on it's surface to simulate very small waves. It give additional noise from close distance. They are turned off in far distance. They also give nice noise on reflections if they are not to strong, they distort them.
- **Macro Waves** – this waves are another noise – big waves over the surface.
- In next part you setup normal maps their power , height texture for tessellation and it's bumpiness, tiling.
- **"Small Cascade Color"** here you could manage power of cascade colors, make note that higher values at albedo could become emissive, so for night or dynamic light scene we advise to drop them to around 8.
- **"Small Cascade Angle"** this value setup small waterfalls on water surface when it's stop become flat.
- **"Small Cascade Falloff"** change sharpness of the angle blending between small cascade and flat water.
- **"Small Cascade Foam Falloff"** - manage visibility/ power of small cascade texture. It works like color but it's rather power function which eliminate or make details stronger.
- **"Big Cascade Color"** here you could manage power of cascade colors, make note that higher values at albedo could become emissive, so for night or dynamic light scene we advise to drop them to around 8.
- **"Big Cascade Angle"** this value setup big waterfalls on water surface when it's stop become flat.
- **"Big Cascade Falloff"** change sharpness of the angle blending between big cascade and small cascade/flat water.
- **"Big Cascade Foam Falloff"** - manage visibility/ power of big cascade texture. It works like color but it's rather power function which eliminate or make details stronger.
- **Foam Specular Smoothness, Depth, Color** -this values control foam visibility and render at edges of the water.
- **Cascades Noise Powers –** cacade and waterfalls use noise textures to break the tilling, By this sliders you could manage noise sharpness and multiply. Too big values make waterfalls look a bit strange.
- **Foam** – it manage foam in places where water hit surfaces. It's also moving with flow map. Sometimes when you adjust clean water falloff you have to adjust foam values as well as it lose strength or it become to strong
- **"AO Power"** manage how water behave with ambient light. We advise to keep this value at 1
- **"Edge length"** manage how dense tessellation mesh will be. We setup pretty standard value.
- **"Phong Tess Strength"** – its power how tessellation behave on strongly curved area. Higher value will smooth them, lower would leave them as they are.

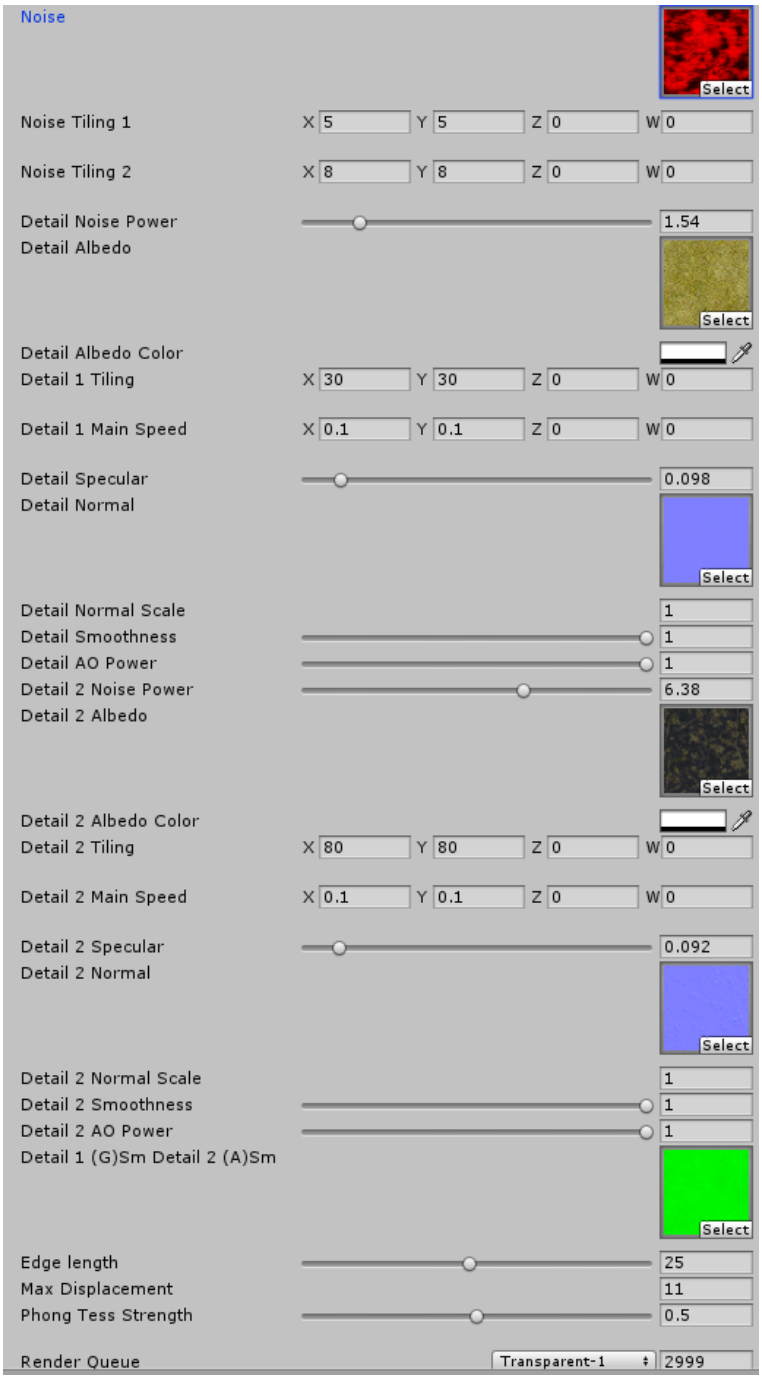


- **“Render Queue”** – very important in blending between 2 water surface to put their correct render order. Correct values will avoid flicker on transparent water surfaces connection.
  As river have queue 2999 so for example lake connected with river should have around 2998 or 2997. This means river water will be rendered at the top and.. when you will blend surface by vertex color alpha at spline, you will get VERY smooth, invisible blending.
- **“UseGrabScreenColor”** – uncheck for only low end mobiles which doesn’t support this feature.

Swamp shading

For swamp most setup is the same, the difference is that Detail albedo 1 and 2 are non-transparent and there is noise texture to mix them each other and with clean water. Use vertex colors to get different swamp looks. In lake section there is example of vertex color usage with swamp.

Swamp contain one very important texture which hold smoothness for Albedo 1 and Albedo 2. It’s Detail 1 (G)Sm Detail 2 (A) SM. It means that in this texture green channel hold smoothness for detail 1 texture and alpha channel hold smoothness for detail 2 texture. We did this to compress data and avoid using additional textures in material as it already use plenty of them.



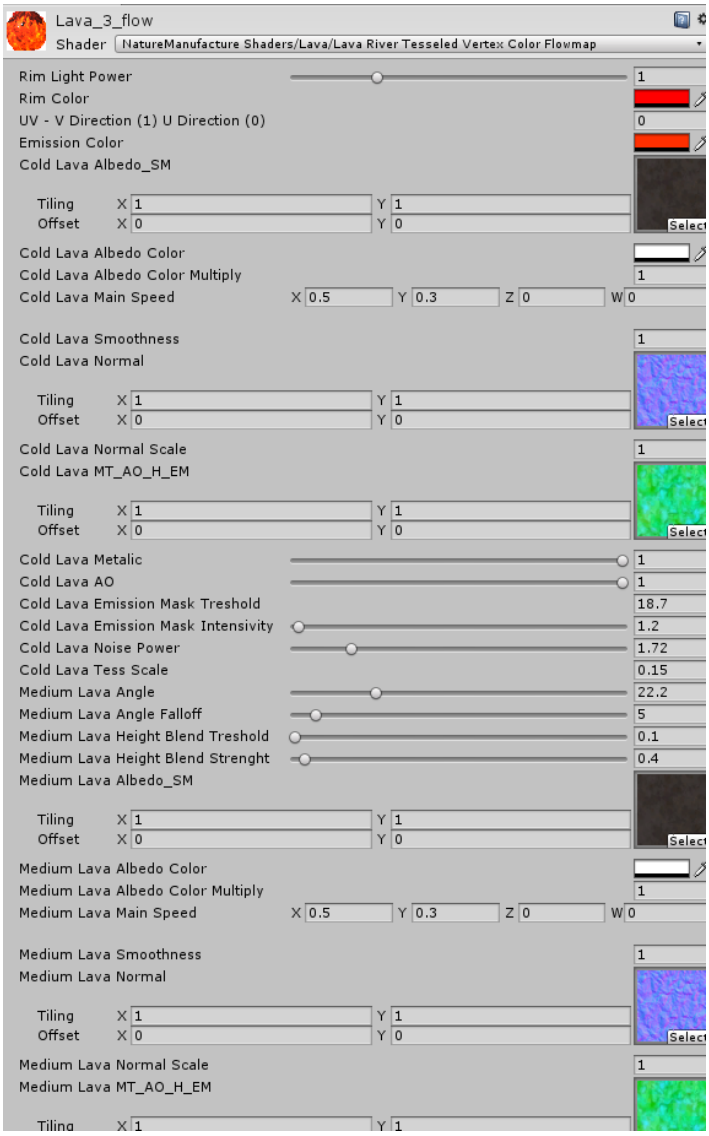
Lava Materials

In Lava shading be sure that you have bloom turned on, its impossible to adjust emission without bloom on screen. Emission only show up when bloom effect is turned on at engine post processing stack or other post process that you use.

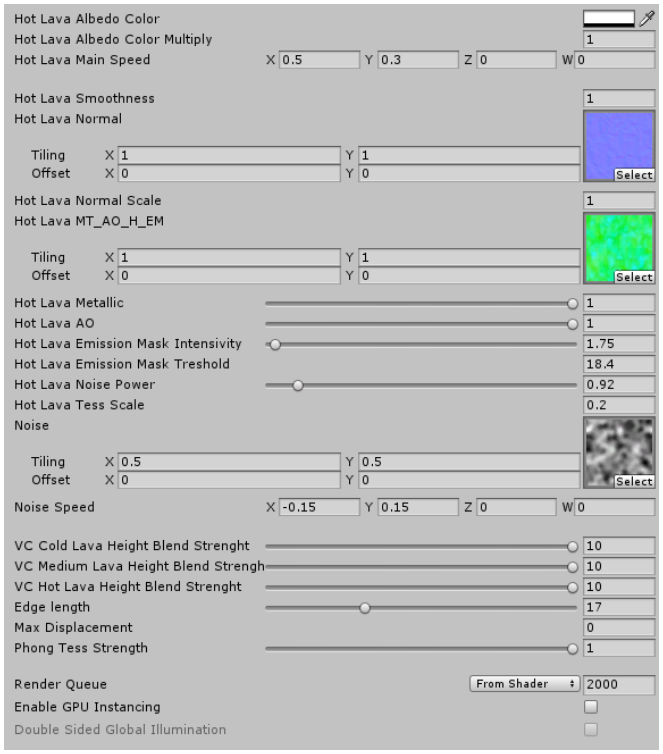
This pack contain few shaders which have different amount of features. We will show here most advanced as rest simply have just lower amount of options but they work the same.

Lava contain 2 kind of materials hot and frozen.

Hot lava shading



- **Rim Light Power and color** – this kind of emission
  show up only at lava borders or very high angle view. It over-light lava in such view and create nice effect on background models like they become heated.
- **"UV- V U directions"** – it manage lava moving direction. By changing it you could rotate movement by 90 degrees.
- **"Emission color"** is color that lava will use in emission.
- **Cold Lava means** – this sentence means behave on flat area
- **"Cold Lava color and it's multiply" –** will manage albedo color.
- **"Cold Lava Main Speed"** – is used to control lava speed also on flow map.
- **Cold Lava Metallic, AO, Smoothness** – This values manage PBR character of the cold lava surface.
- Notice that at alpha channel lava MT_AO_H_EM texture contain emissive mask. B chanell is used for height-blend and heightmap for tessellation.
- **"Cold Lava Emission Mask Threshold"** – it adjust threshold of emission mask, you could make it more or less sharp (not the same as power)
- **"Cold Lava Emission Mask Intensivity"** – it manage power of emission from mask which left from threshold adjustment above. This is main value to manage emission power for each lava layer.
- **"Cold Lava Tess Scale"** – if you use tesselled shader it will pop up verts using heightmap texture.



- **Medium Lava Angle and Falloff** – this values manage angle value and blending where lava start to use second layer textures and setup
- **"Medium Lava Heightblend Threshold"**– you could adjust heightmap used height-blending at mix between cold and medium lava. Threshold value will make this blend harder, sharper. It
- **"Medium Lava Heightblend Strenght"** – this value could multiply heightmap used for height-blend.
- All medium, hot lava values are working the same.
- **Hot and medium lava noise power** – Lava use noise on emission to simulate physical heat movement inside lava surface, this values are used to control it's sharpness. Too sharp noise could generate strange results.
- **VC Cold, Medium,Hot height blend strenghts** – as you are able to paint on lava via vertex paint, this values help you to manage height blending between when you mix via vertex colors.
- **"Edge length"** manage how dense tessellation mesh will be. We setup pretty standard value.
- **"Phong Tess Strength"** – its power how tessellation behave on strongly curved area. Higher value will smooth them, lower would leave them as they are.

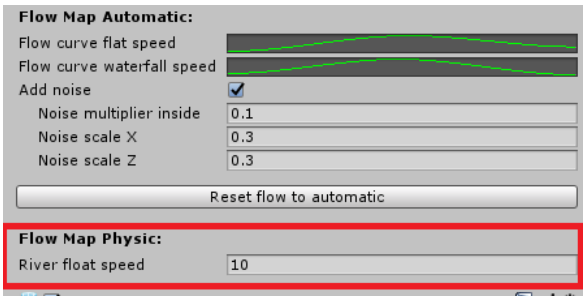
Frozen Lava Shading

This shader is used to simulate eroded old lava rivers which could be blended via vertex colors with background textures. It basically blend 2 layers, lava and cover. Tesselled shader is designed to fill gaps in main texture by cover slowly while amount of cover is rising. Ash or background start to filling holes and move verts up and at the end it start to cover top verts. It's very realistic construction which gives a lot of fun. Shader very sensitive but you also could use it in rocky road at forest or any other case. Anyway shader works the same as this above but it's focused on different blending type between surfaces.

- **"Max Tesselation"** – desity of tessellation at lava surface
- **Tess Min and Max Distances** – manage tessellation rendering distance.
- **"Phong Tess Strengh"** – its power how tessellation behave on strongly curved area. Higher value will smooth them, lower would leave them as they are.
- **"Cover Heightmap Contrast"** – This value is able to fix, manage a bit contrast of the heightmap used for height-blend
- **"Cover Heightmap Threshold"** – By this value you could adjust sharpness of height-blend between cover and bottom surface.
- **All** rest values work the same as in shader above. This is still lava shading so It could be emissive etc. This mean lava could be still a bit hot like in our video

Physics

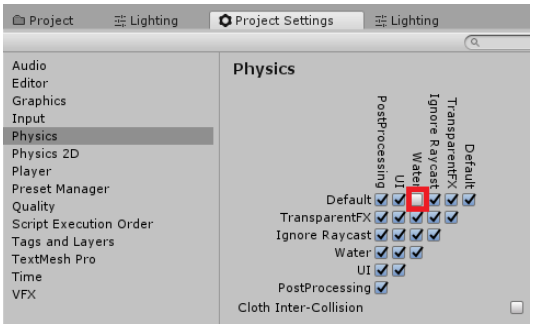
Physics move is based on information from our river and lake flow maps. Object will speedup in places where flow speed is high etc. You probably notice that lake and rives have "**River float speed**" in "**Flow Map**" panels. This value can multiply relation between flow map and physics speed at water surface .



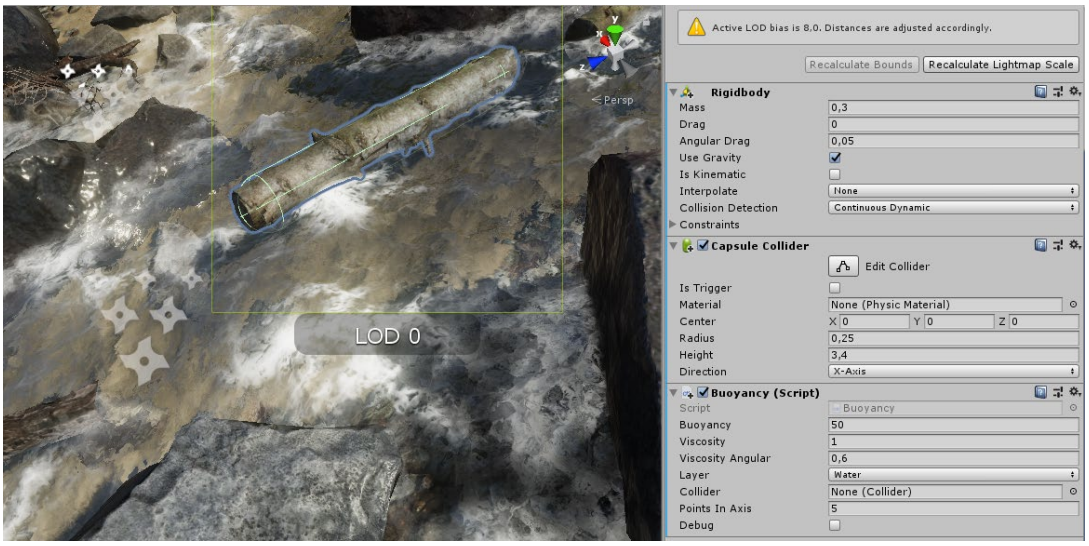
To move objects dynamically on river and lake surfaces you have to do only few things:

- All water surfaces must have water layer and mesh collider

- In physics options at project settings interaction between default and water must be turned off



- You have to add ram buoyancy script to your object. If it have lod's it must be at the top of lod's object. It will automatically add rigidbody to your object. Set **Water layer** as layer for collision detection inside script.



- Add collider to your object. It could be box, capsule, or mesh with checked "convex". Remember that collider type will have big influence on object behave. Do not add box collider on rounded object, use rather capsule etc.

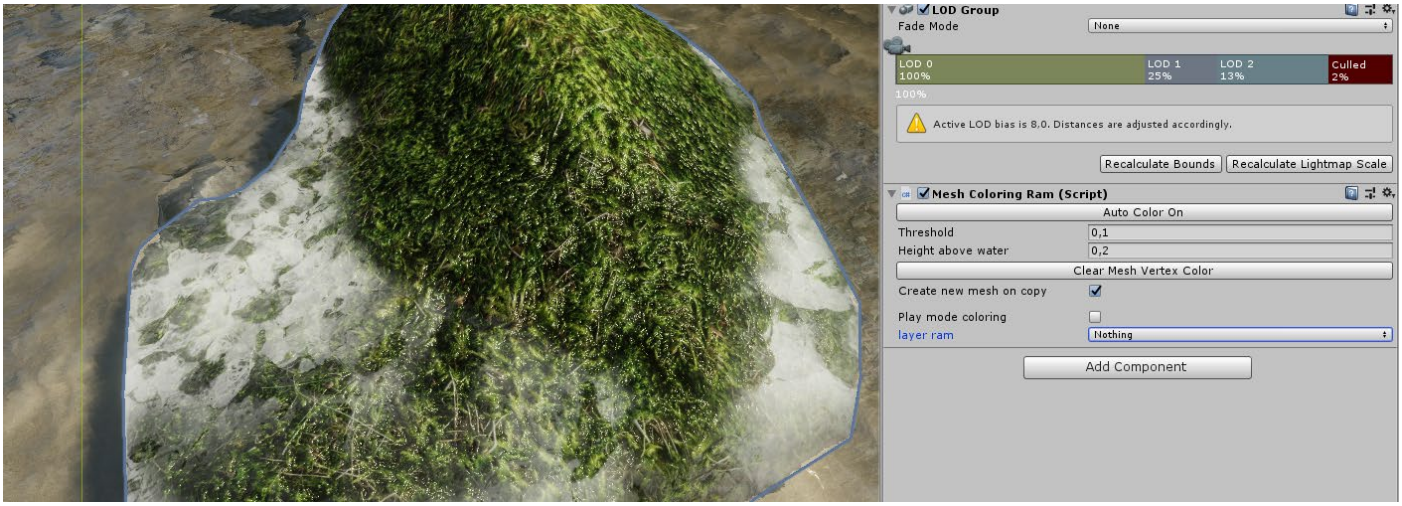
- Adjust mass in rigidbody and buoyancy script. We type pretty nice values at screen above, I hope they will fit your goal. Values are estimated and for different object must be different. Too high mass or too low buoyancy will force object to go into river bed instead of flow on it's surface
- You could also play with Collision detection in rigidbody. Continuous Dynamic will give best result but it's most expensive.
- Points in axis – Amount of points in each axis taken into physics calculation. Keep it pretty small to reduce cpu overhead. 3 is enough

When you hit play physics will start working and objects will start to move.

Automatic rocks heating and wetness.

Simply drag and drop our Mesh Coloring Ram script into object, LOD parent. It will detect R.A.M and make stones wet by water or heated by lava.

- **"Threshold and Height above water"** – this 2 values are used to adjust blending between wet and dry surface.
- **"Create new mesh on copy"** - gives ability to copy this mesh many times without overwrite the data.
- **"Auto Color ON/OFF"** – it turn off or on automatic vertex color painting while object is moved in editor
- **"Play mode coloring"** – it turn off or on automatic vertex color painting in play mode at real time. Its cool feature if you want to heat or make object wet when it hit the spline. Same rules could be used with dirt and car which moves on dirty road.
- **"New mesh on copy"** – as we often copy objects in editor we prevent to share same mesh across many meshes when you copy an object. Without it this would generate problems like when you color 1 object it will change all of them.

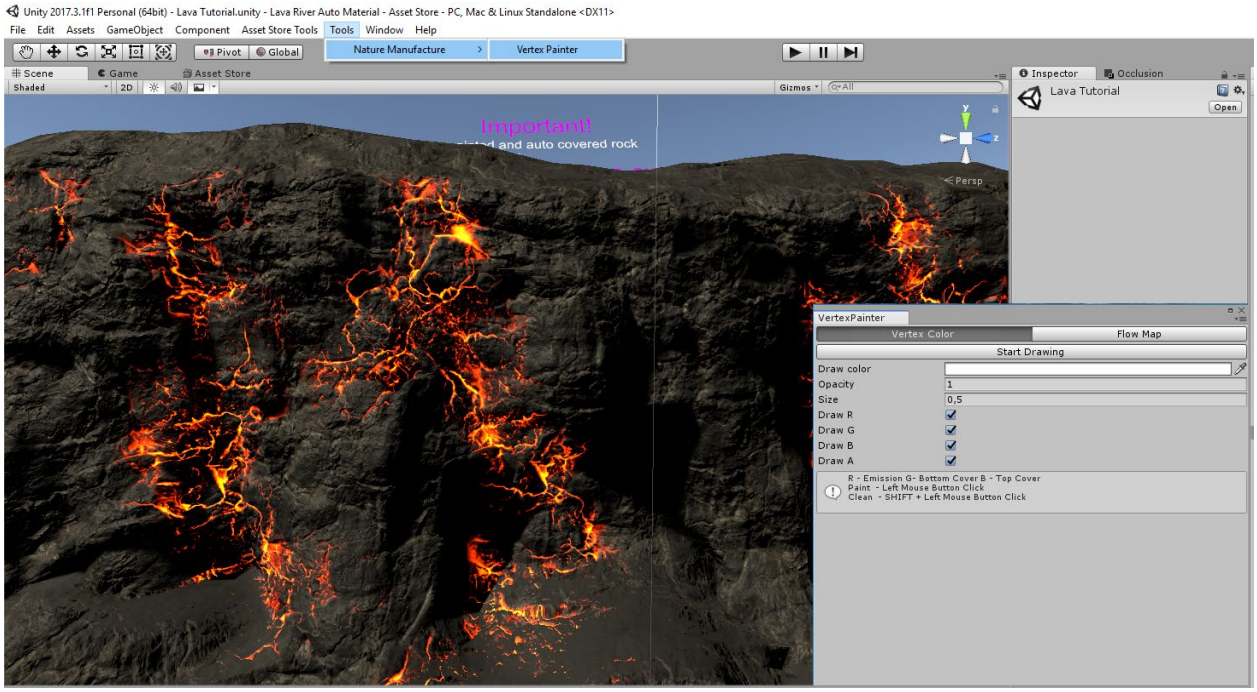


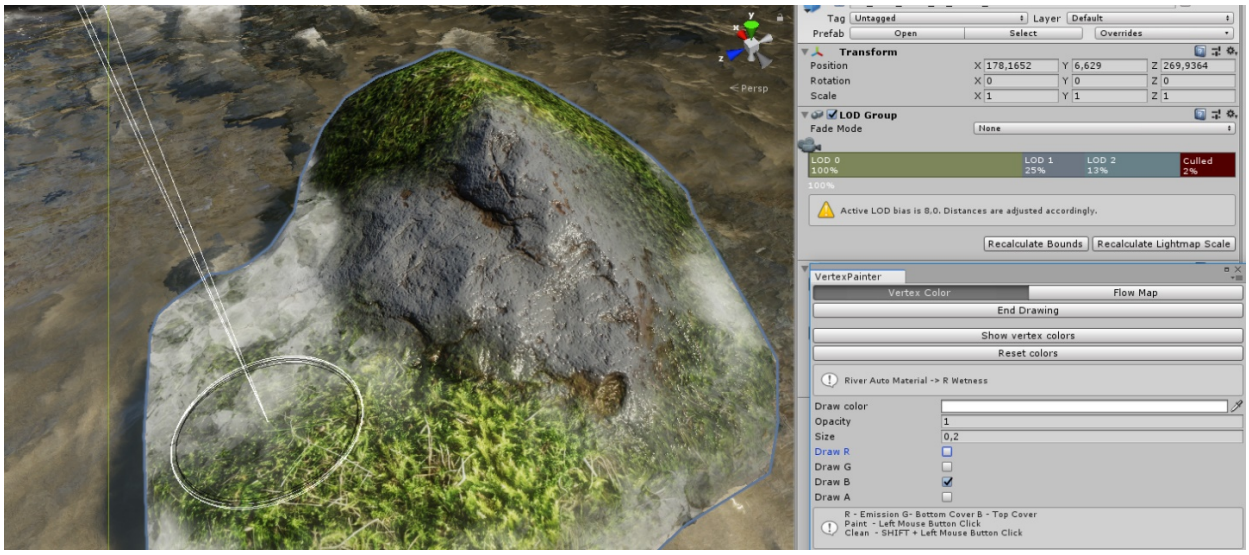
You can connect automatic wetness with physics!

Vertex / Flow map Painter (all other meshes then spline)

This tool give ability to paint on vertex and UV to get additional effects which depends on shader that object have. In river it will make rocks wet, but in lava it will heat stone or even overlay it by chosen textures like rocks or sand. By uv painting you could paint flow map on models – this means that you could put our water or lava on any object and paint flow map etc on it like we did in floating island object. **R.A.M spline and lakes mesh should be painted via spline tools and lakes tools**, otherwise systems will restart your data, for all other meshes this tool will be best.

- Default color is white – no actions. By decreasing power or turning off color R,G or B it starts to shows effects in our shaders.
- We choose white because shader must work without any effects on default white meshes too.
- **Always check mother** (object with LOD group) to paint on every LOD at the same time. If you will check only LOD_0 etc only this lod will be modified. Rest will be untouched. For small changes its pretty cool to leave last LOD untouched to save GPU and memory. You always could paint on all LOD's and at the end change/reset last LOD mesh to default.
- We added flowmap painter which works exactly the same as at spline river. Flow map painter on meshes was used in our floating island demo.





Flow mapped shaders are very sensitive. Gradient between direction must be smooth, mostly in tesselation shaders where verts must smoothly change UV and direction. We gives to debugs.

- **"Show/Hide flow directions"** – It will show/hide arrows with colors which shows direction and speed of water. Deep red or blue mean big speed. Be careful and blend speed, don't create hard gradient.
- **"Flow U, V speeds, opacity and size"** - They are used to control direction, speed, size and hardness of brush which will paint flow map on spline surface.