

Proposed Multi Channel Painting in



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Multi Channel Painting

What are the goals of Multi Channel Painting ?

- provide the user a way to prepare Image Sets with matching Channels in advance and paint them on all at once, avoiding having to repaint the same detail in channels like displacement and masks over and over
- make best use of scan data as provided by sites like www.surfacemimic.com
- Allow to the user to do matching PaintFixes through the use of MultiChannel Cloning/Painting

A short history of Multi Channel Workflows

The idea of panting in Multiple Channels at once, creating matching information is obviously nothing new. In fact a variety of approaches are being used:

- Triplanar and Tileable Textures (inside of Mari or Renderer)

Users set up multiple Triplanars or Tilable Texture Modules in different Shaders, replacing the projected images with prepared channels (color, displacement, spec, mask etc.)

Pro: Quick Coverage with matching features. Can be edited and rebaked easily

Con: “Generic” look can only work as a base. As soon as the user starts painting on individual channels the feature-synchronicity breaks

- “Paint and Sculpt”

Tools like Zbrush & 3dcoat allow the user to perform sculpting and painting with the same brushstroke.

Pro: Details match up perfectly

Con: An Alpha or Stencil might work well as a sculpt stroke but may provide poor results in the color brushstroke.

- Manual Channel Switch

Users paint with one Stencil in one Channel, then switch target channel and Stencil without changing its transformation and repeat brushstrokes

Pro: Details match up more or less depending on the time the user spends to ensure the same brush stroke

Con: huge time commitment

- Repainting Channels

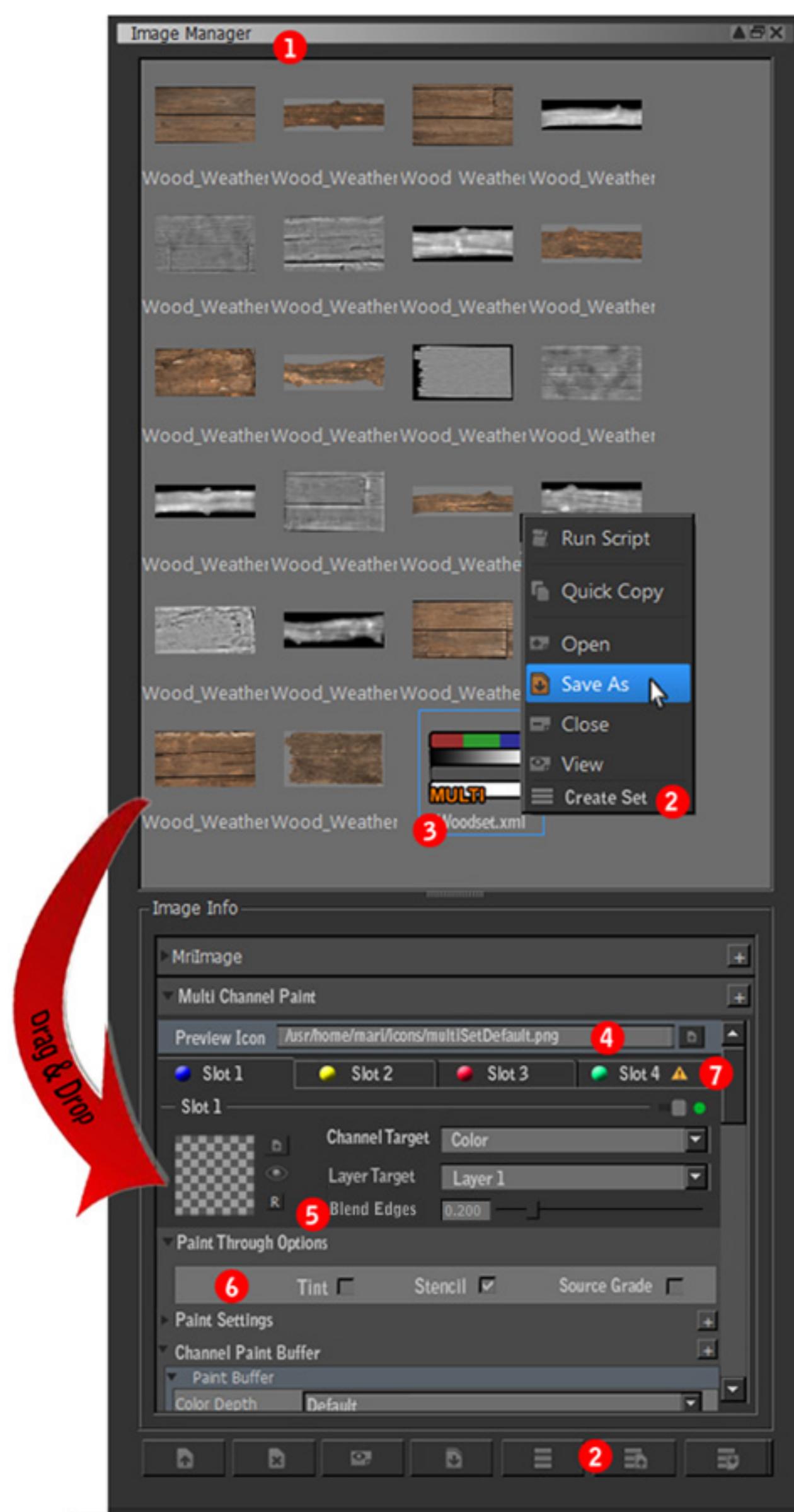
The user starts with one channel (usually color) then creates the secondary channels like spec and displacement from scratch, trying to match what was done in the first channel. This is the primary workflow for Texture Artists for lack of better ways

Pro: No wrangling of channels, details match depending on the skill-level and time of the user. Asset is painted by hand and its features will be very naturally distributed.

Con: On larger assets like trees, cliffs and groundplanes the quality of the secondary channels (displacement, masks etc.) will suffer due to the pure amount of space the user would need to paint, potentially repainting displacements, masks etc for the same color over and over until the asset is covered.

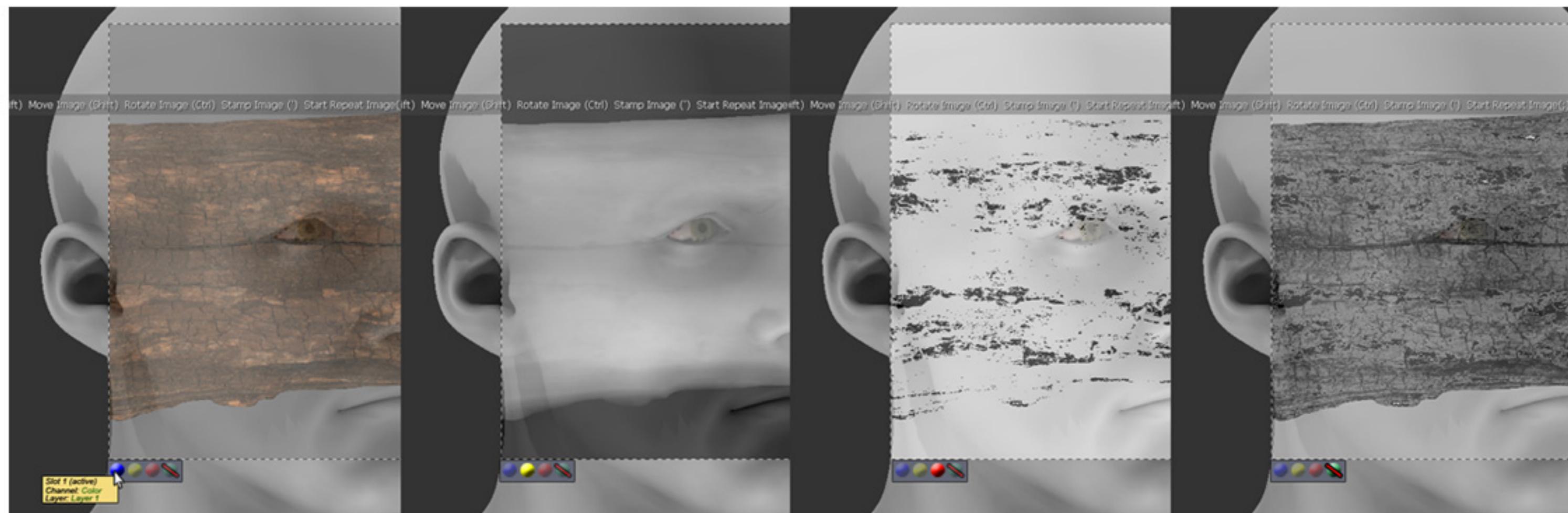
Proposed Multi Channel Painting in MARI

Part 1: Setting up Tool Independent “MultiSets” using the Image Manager



- ① The Image Manager is used as the primary place to store and setup MultiChannel Sets. When a MultiSet is dragged onto the Viewport for PaintThrough, the Parameters are set in the Multichannel Subpalette of the Tool Properties (see next page: Tool properties) to make it active
- ② Users can create Multisets via the RightMouse Click Context Menu or the new button in the Image Manager Palette
- ③ Creating or loading a MultiSet will add a MultiSet Icon to the Image Manager
- ④ Users can choose to replace the default icon for MultiSets with their own to distinguish between different sets
- ⑤ The MultiChannel Paint Sub-Palette in the Image Manager contains all Settings relevant to the MultiChannel Workflow. Refer to the next Page ("Tool Properties") for a detailed breakdown.
- ⑥ Multisets in the Image Manager are Tool Independent. Therefore Options for different Tools are stored
- ⑦ The exclamation mark indicates a problem with the binding of the slot. This can happen when you import a saved MultiSet from disc and a Slot has a binding to a layer that does not exist in the current project. Mari disables the slot by default

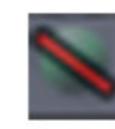
Part 2: Using Multisets with the Paint Through Tool



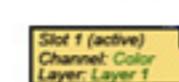
When using a MultiSet with the PaintTrough Tool a new floating Toolbar is visible in the Viewport:



The Spheres indicate the visibility state of each slot in the viewport. Visibility can be changed with a LMB Click and only one slot can be displayed at the same time. Images stay linked to their specific target layer even when the visibility in the viewport changes

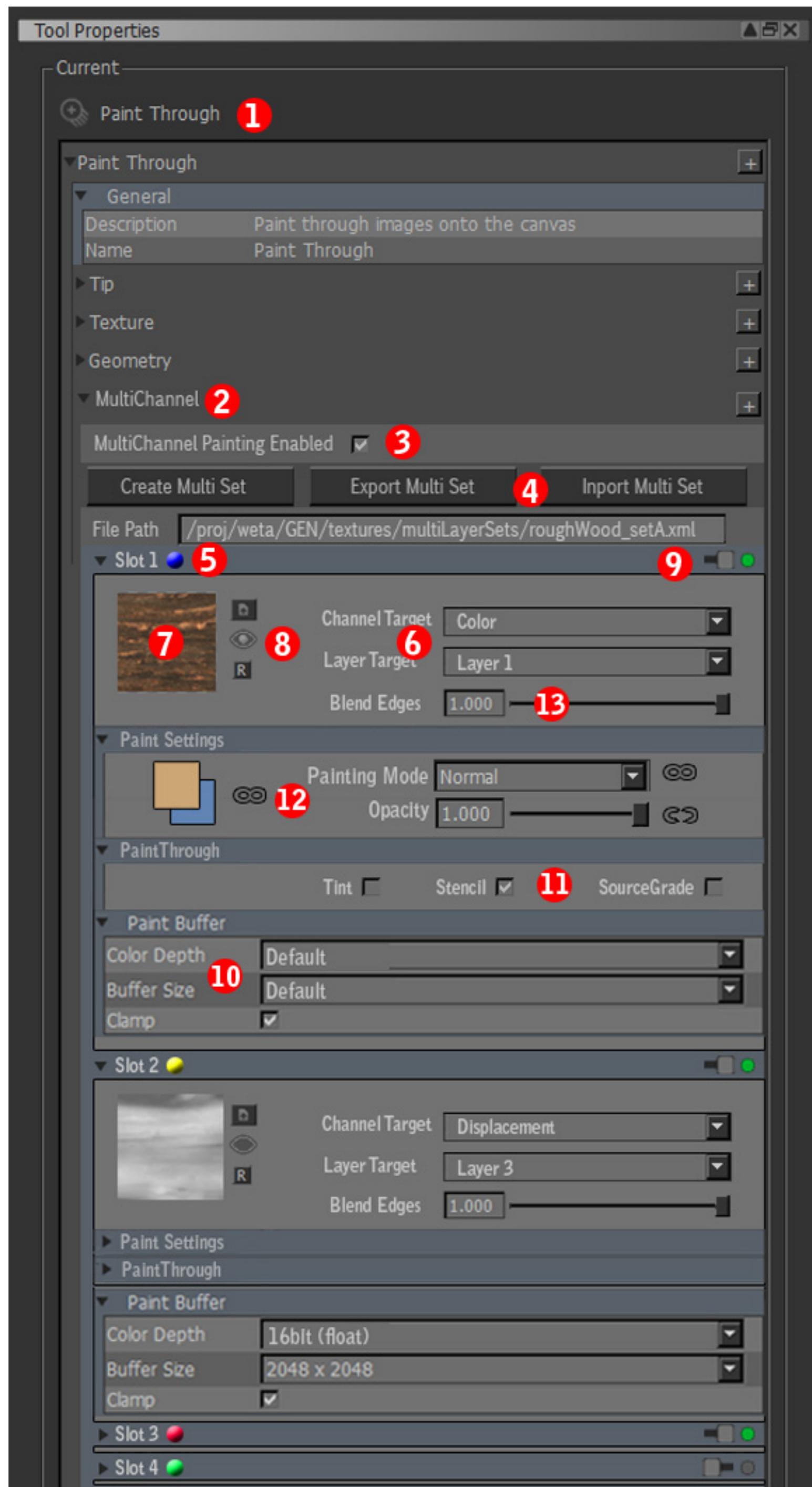


A crossed out sphere indicates the slot is disabled either by clicking the on/off symbol in the MultiSet Properties or by right-mouse clicking on a sphere in the floating Toolbar



Hovering your Mousecursor over one of the spheres will display its properties - SlotName, Linked Channel and Linked Layer. Green text means the Link is successful and the target layer exists, red text means the Channel/Layer was not found

Part 3: The Tool Properties Palette



- 1** The Tool Properties (displayed here: The Paint Through Tool) contains all settings for the currently used multiChannel Paint Process. The Image Manager stores Presets. When a preset is activated its settings get transferred to the Tool Properties to make it active. This is identical to the current implementation of the PaintThrough Process.
- 2** The MultiChannel Subsection of the Palette contains all settings relevant to the MultiChannel Process. Identical sections would be found on the Tool Properties for all Tools that support MultiChannel Paint
- 3** Activates the MultiChannel Painting. For convenience this should also be available to turn on in the Toolbar
- 4** Creating a new MultiSet will add a MultiSet to the ImageManager. Users can export and import sets just as you would do any image. The channel/layer assignement is saved in the exported set. If the user imports a set with a Channel/Layer Target into a Project where those Names exist, the connection is automatically set.
- 5** 4 hardcoded slots are available to the user to assign different Images to. 4 seems like the maximum amount mari could handle while still maintaining interactive performance during painting. Options are available to customize Buffer Size and disable slots to improve performance.
- 6** Each slot provides a Dropdown to select the target channel and a layer from its stack
- 7** The thumbnail of the assigned image in the slot. Images can be loaded by:
- use "Browse" icon next to thumbnail
 - drag Image from Image Manager onto slot (as seen in Triplanar Shader Module)
 - load a multiChannel Preset from disk or Image Manager
- 8** The eye icon next to the thumbnail indicates the visibility state of the current slot when using paintThrough in the viewport. Only one of the slots can be displayed during painting, therefore only one of the slots can carry the "active eye" icon
- 9** Users can choose to deactivate slots when they are not needed or in order to increase interactivity during painting

- 10** Each Slot carries its own Paint Buffer. While size and transformation are always linked, bitdepth and resolution may vary. This is necessary to address different system performance as well as bitdepth needs per channel. An average workstation can usually handle a 4k Paintbuffer pretty well, while only few are equipped to work with an 8k Buffer in an interactive way.

A possible setup here could be a 2k buffer for the color, a 1k/16bit buffer for the displacement (its large gradients may not require more) and a 1k buffer for a mask (slightly blurred masks are usually ok). With the 4th slot and independent settings the complexity can grow when video cards with more video memory are more common, future-proofing the system.

- 11** The PaintThrough Tool has several custom options that would need to be considered when using it in a multiChannel Workflow. The following settings would exist per slot:

Tint

The Tint Option on the PaintThrough Tool multiplies the foreground color - set in the Paint Settings Section (12) - with the active paintThrough Image. This would allow you to activate/deactivate this per Slot as well as set a custom color to multiply it by.

Stencil

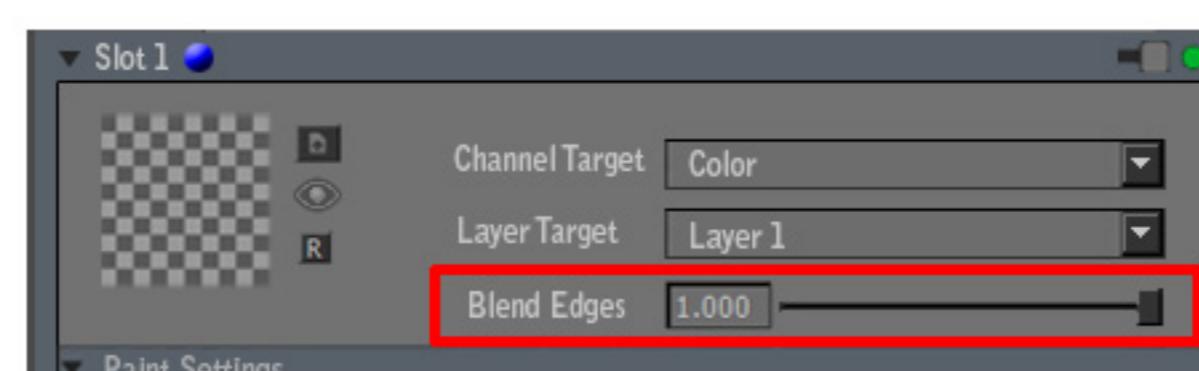
Activates the Stencil Mode per Slot. When active, individual settings (inverted etc.) would be inherited from the main settings on the toolbar

SourceGrade

The SourceGrade Option in the "Painting" Palette allows the user to apply a grading to any paintThrough Image. This per slot checkbox would set if the grading should be applied to a channel or not.

- 12** The Paint Settings section allows the user to set custom per slot Blend Modes and Opacity. The BG/FG Color would only be used when the Tint Option is active. Each Setting can be linked to its global counterpart available on the Toolbar
- 13** The Blend Edges Function is a per slot setting to control how Mari blends the contents of the Paintbuffer into the existing Paint on the Model Surface. Please refer to the next page for a detailed explanation

Part 4: The Blend Edge Function

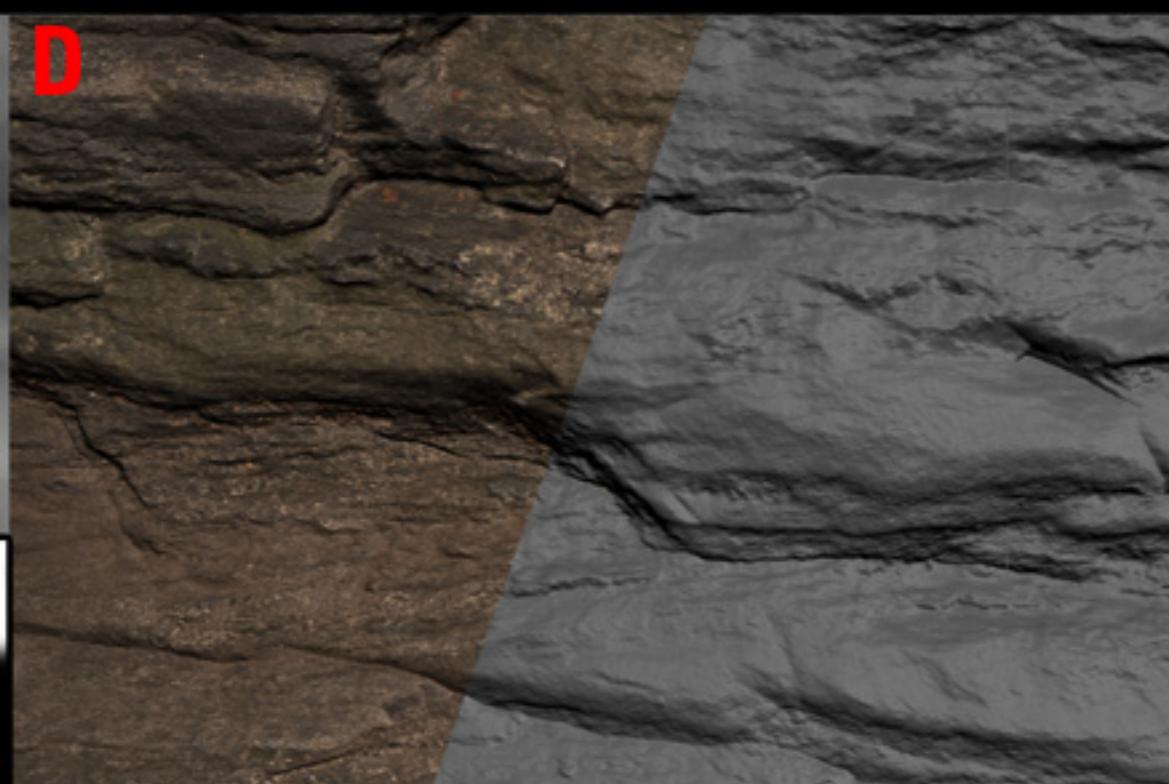
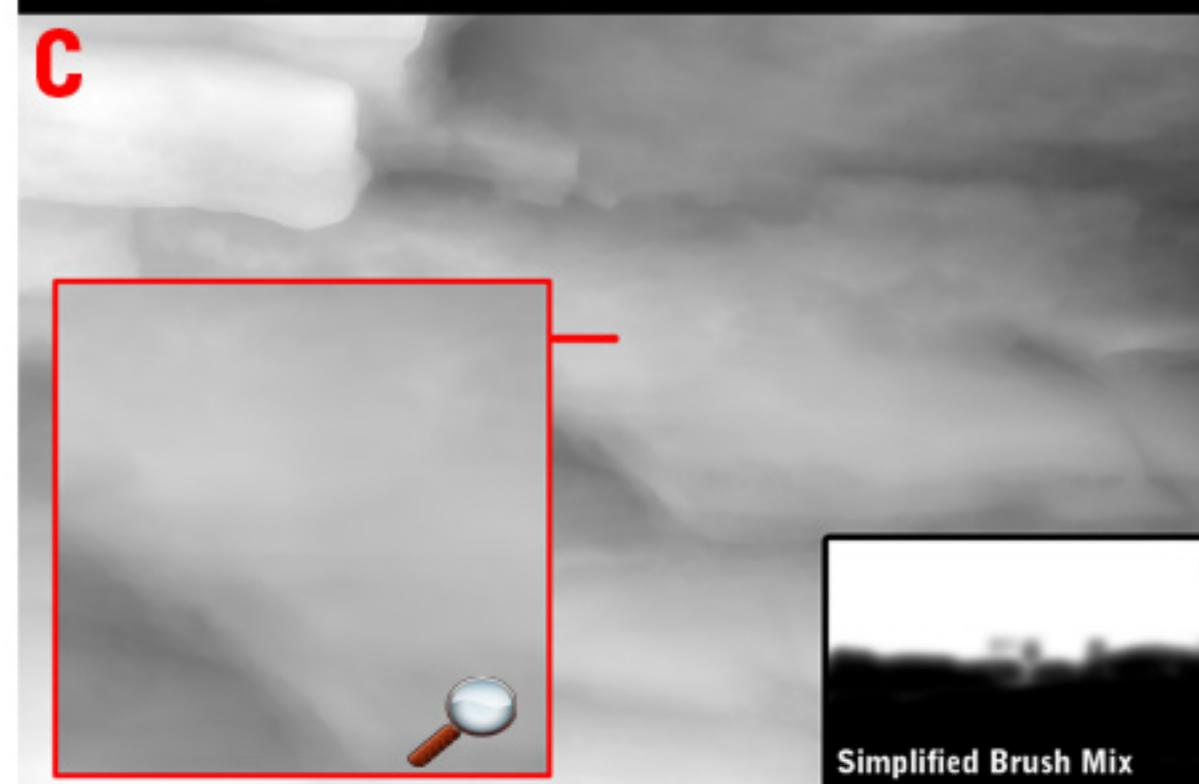
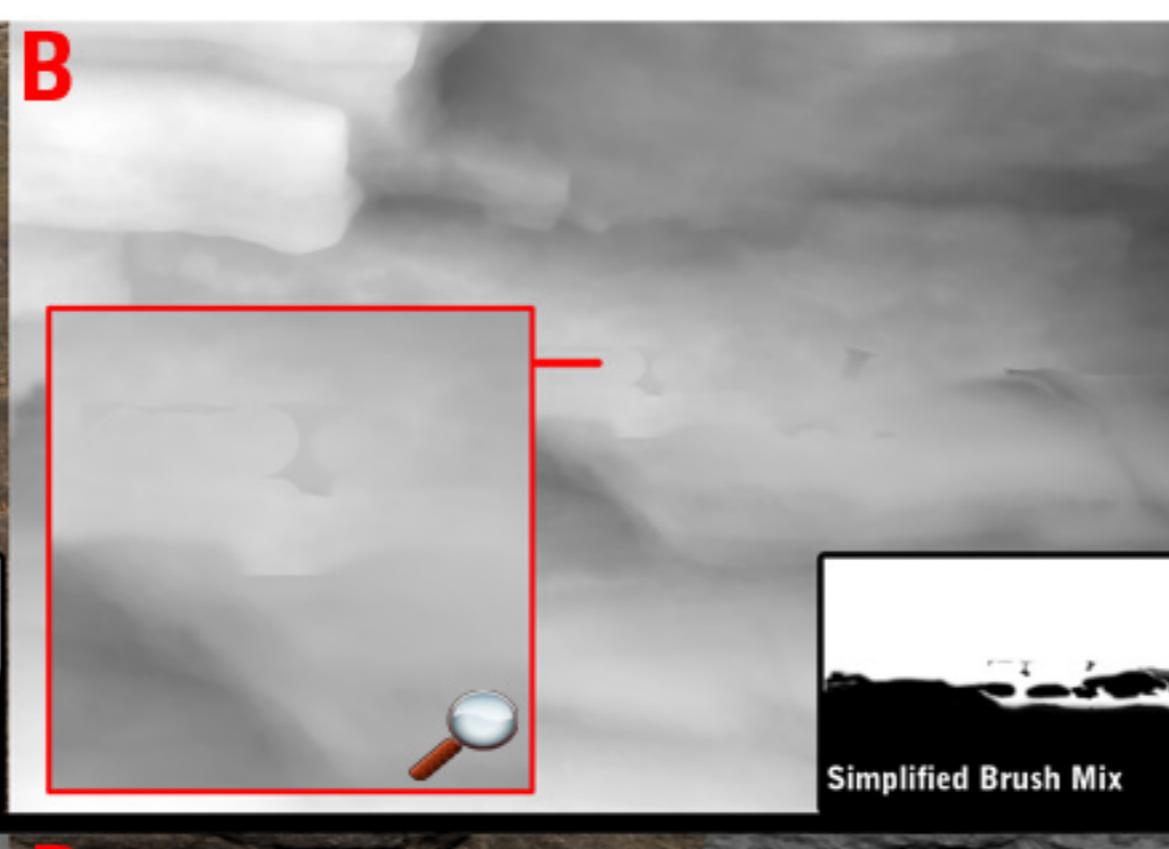
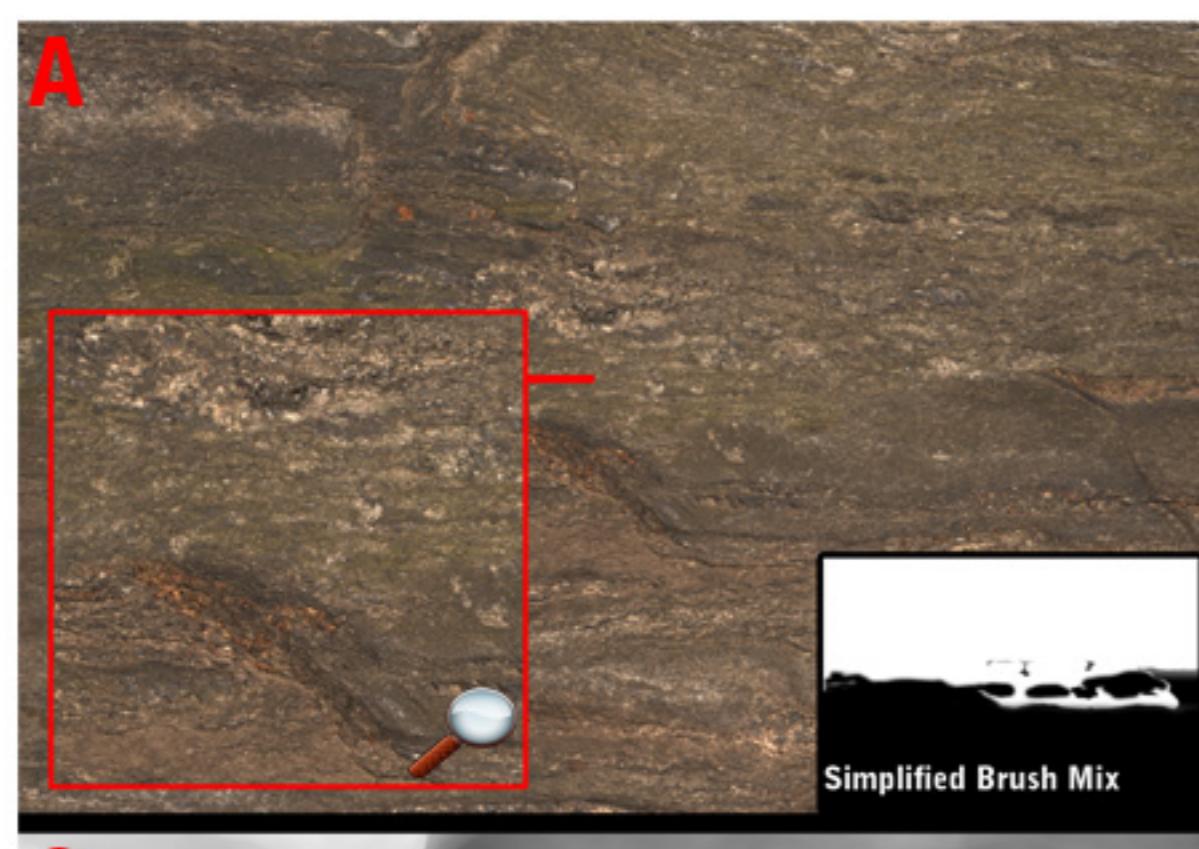


The Blend Edge Function applies a Feather/Heal to the boundaries of the contents of the Paint Buffer before projecting it onto the model.
The Slider sets the size of the blend in relation to the Brush Size at the time of Projecting.

Example:

An active brush radius of 100 and a BlendEdge Value of 0.7 will blend the edges in a radius of 70
An active brush radius of 10 and a BlendEdge Value of 0.1 will blend the edges of the buffer in a radius of 1

When the user paints broad strokes with a large brush the blending will be bigger than when the user works on small details with a small brush



Blend Edge when used with large Brushsize

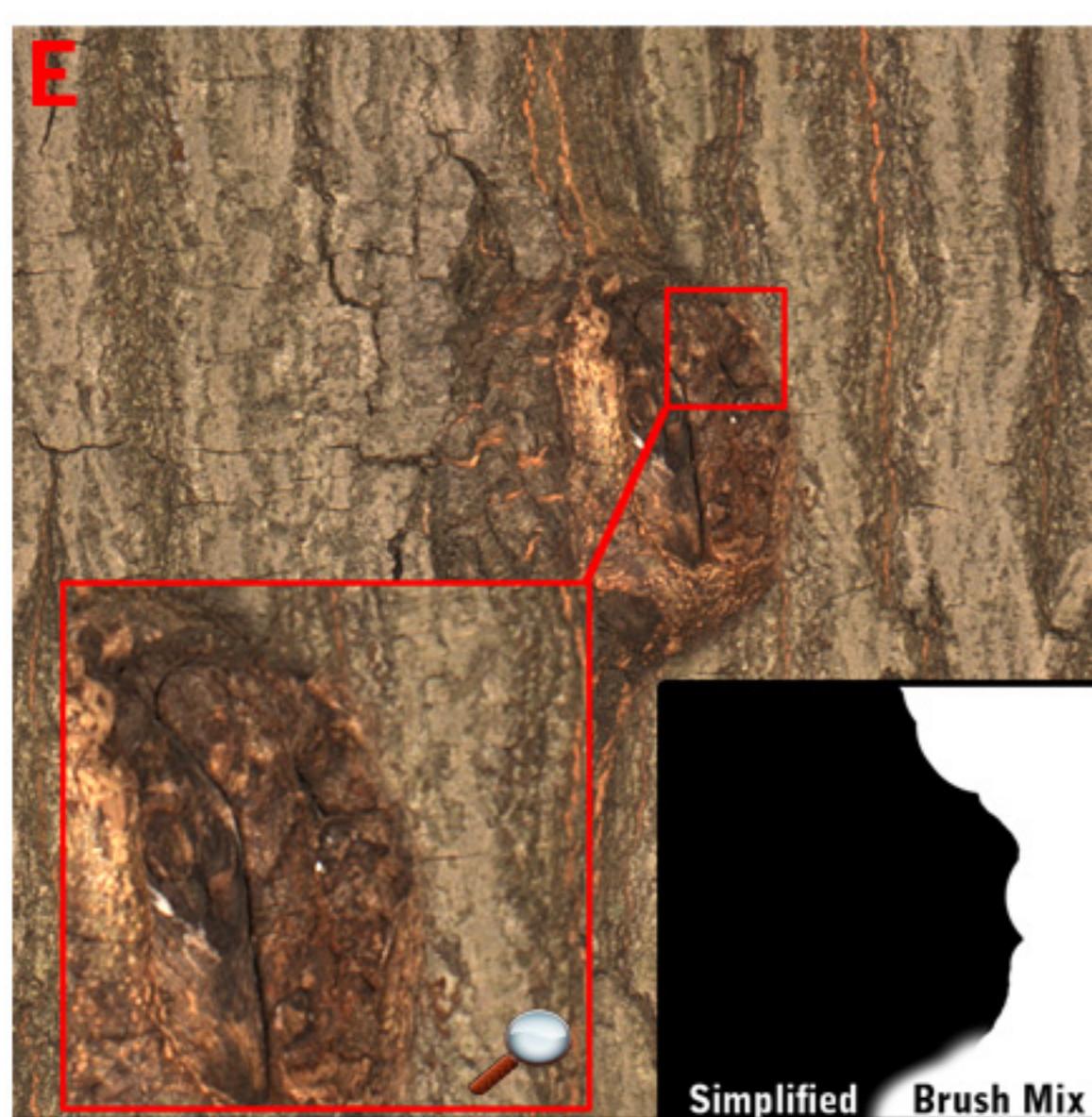
A The user used a large brushsize and roughly painted the color with broad brushstrokes.
No seams are visible in the polarized color

B The same brushstrokes used when applying the displacement resulted in bad value jumps in the long gradients

C The same brushstrokes applied with a "Blend Edge" Value of 1 in the Displacement Slot of the the MultiSet.

A large brushsize was active at the time of projecting the contents of the paint buffer. The long gradients of the displacement blur into each other where they meet at the edges

D No visible seams or quality degrading happened in the displacement, while feature matching between color and displacement is still largely intact.



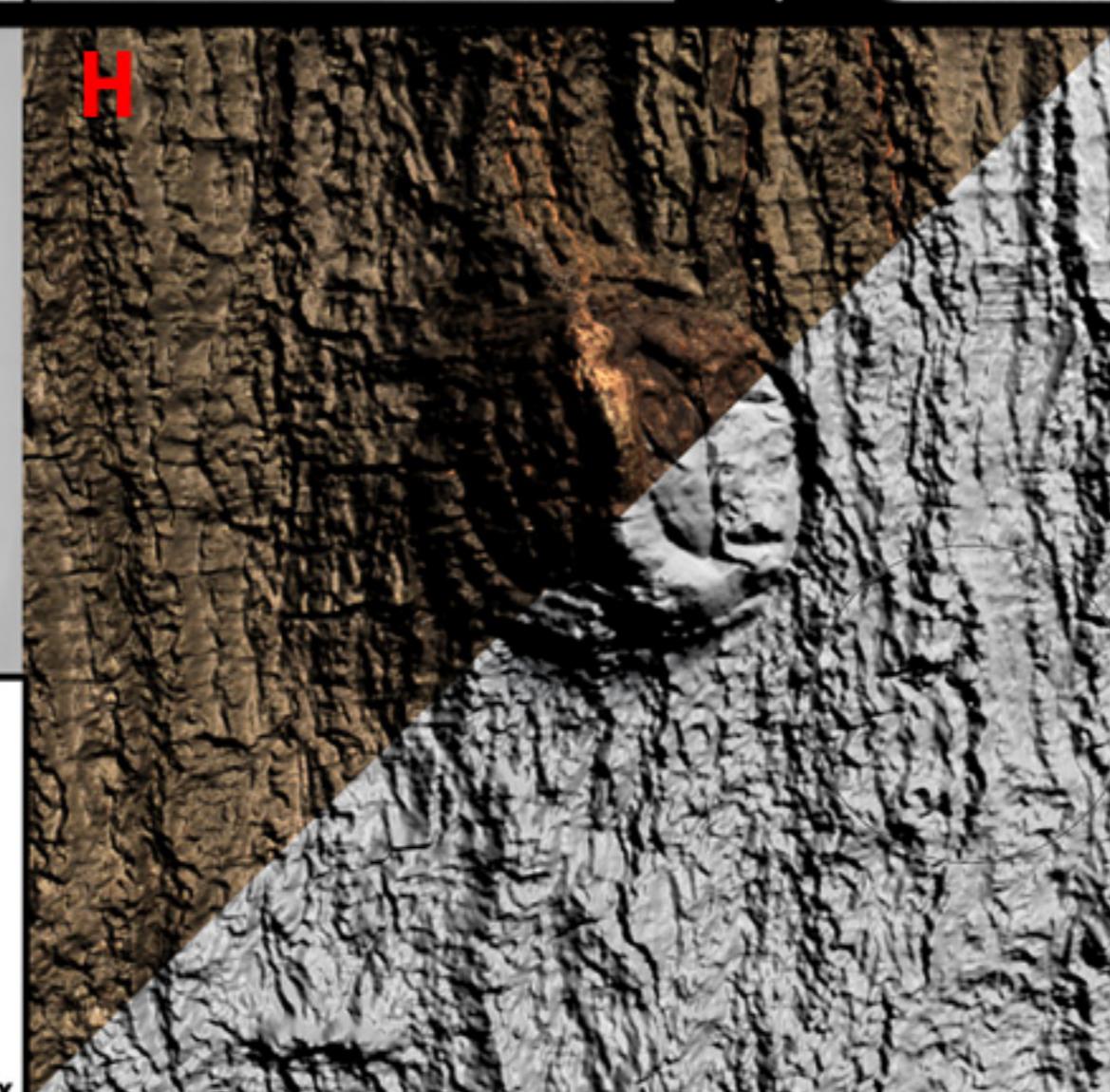
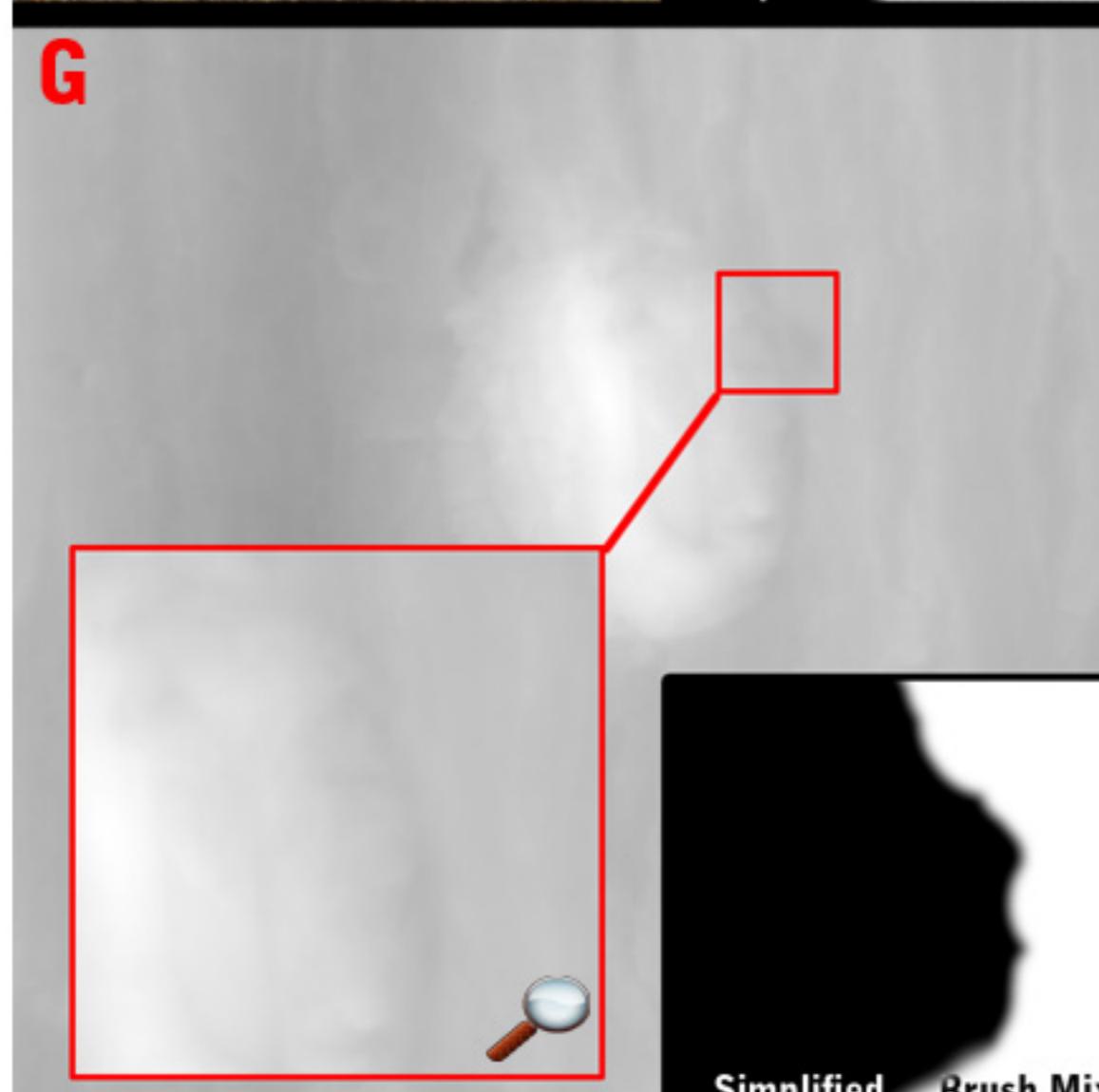
Blend Edge when used with small Brushsize

E The user added the knot in the bark by painting its center with a large brush, then switching to a small brushsize to blend in the edges in the color

F While the polarized color blends reasonably well, the simultaneously painted displacement has large value jumps around the edges

G The same brushstroke applied with an Edge Blend Value of 1. Since a smaller brushsize was active at the time of projecting the buffer the blend between the buffer content and the paint on the model is less wide than in the rock example

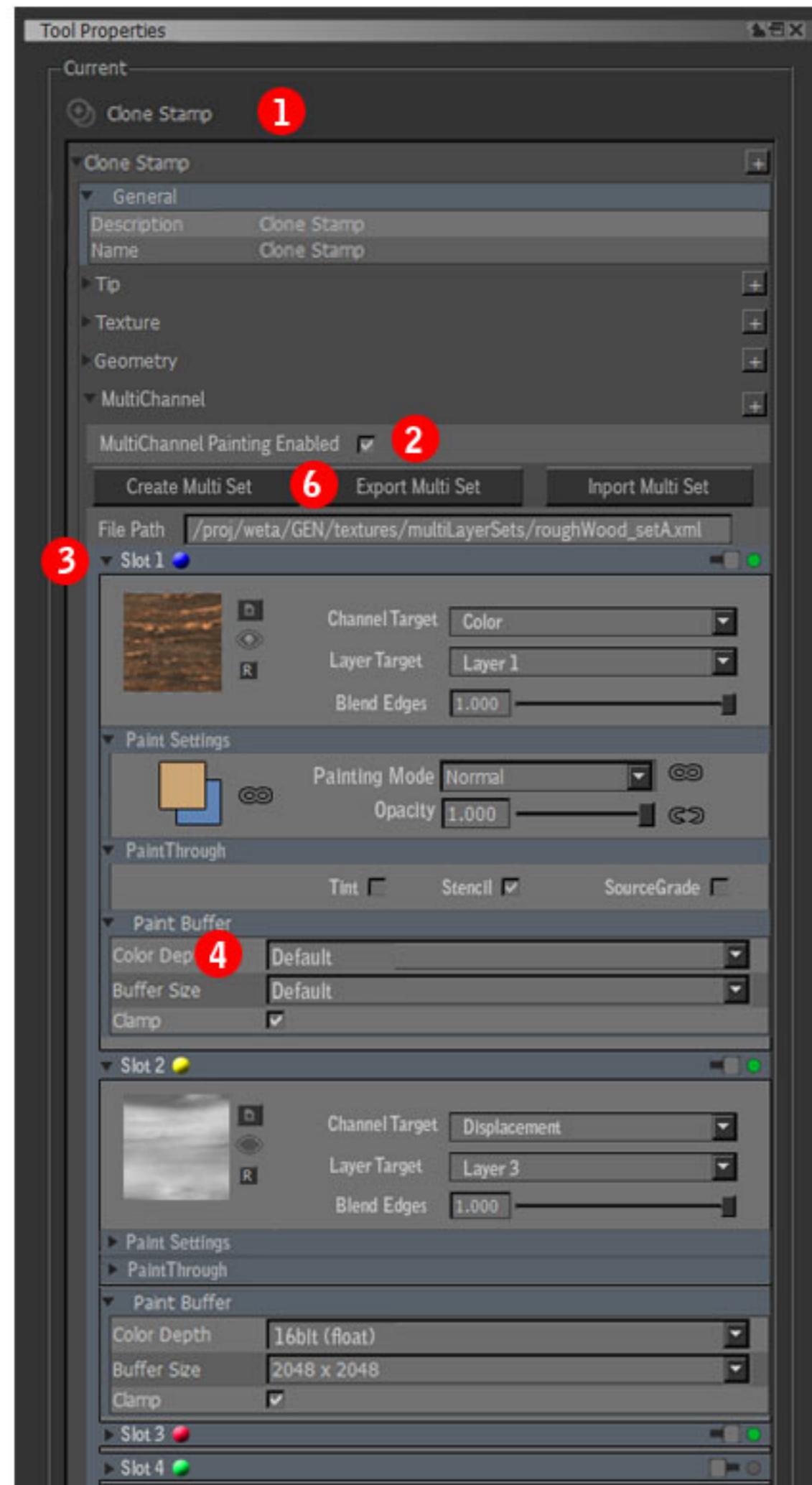
H A seam between the bark and the knot is still visible but it is well rounded off and reads well.



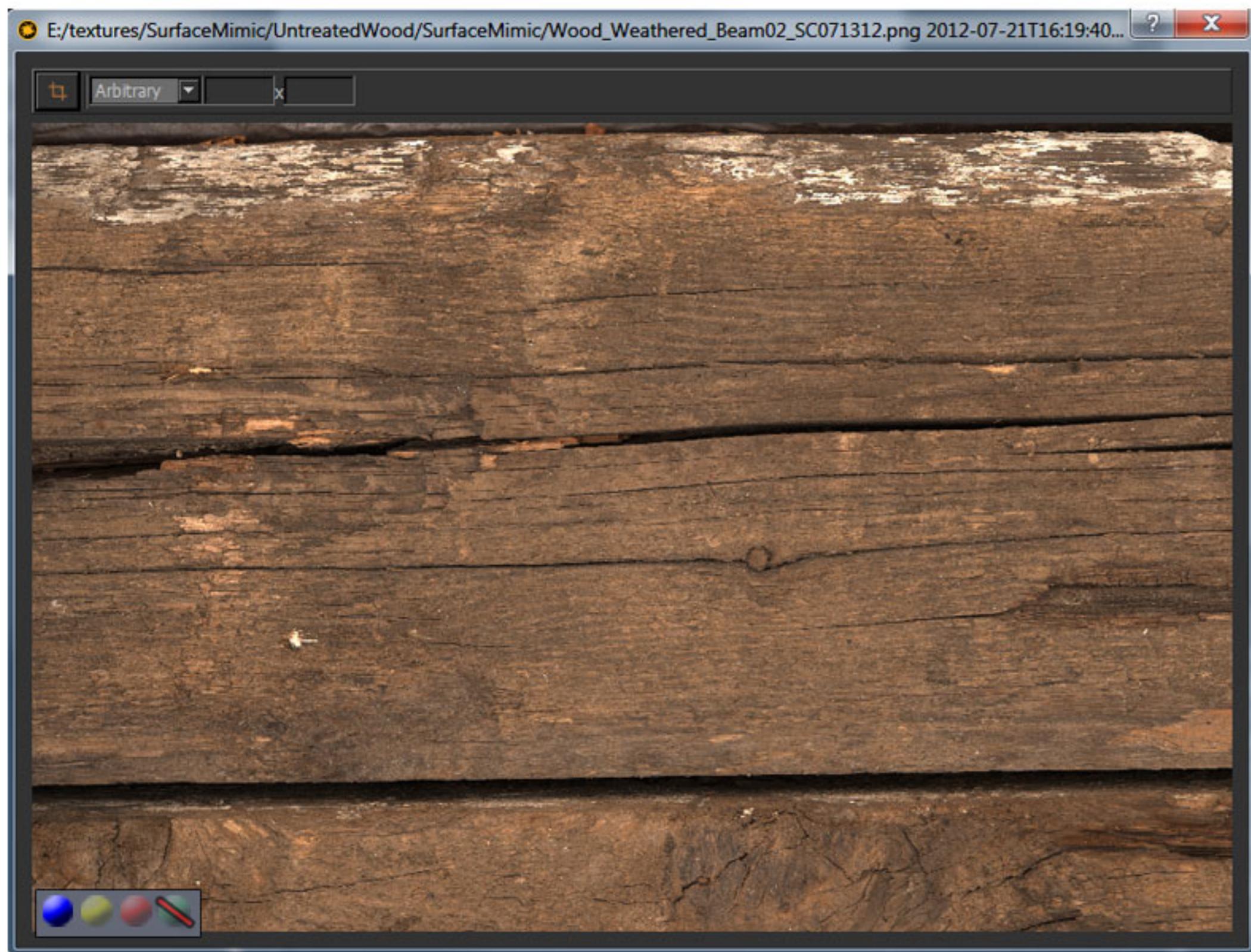
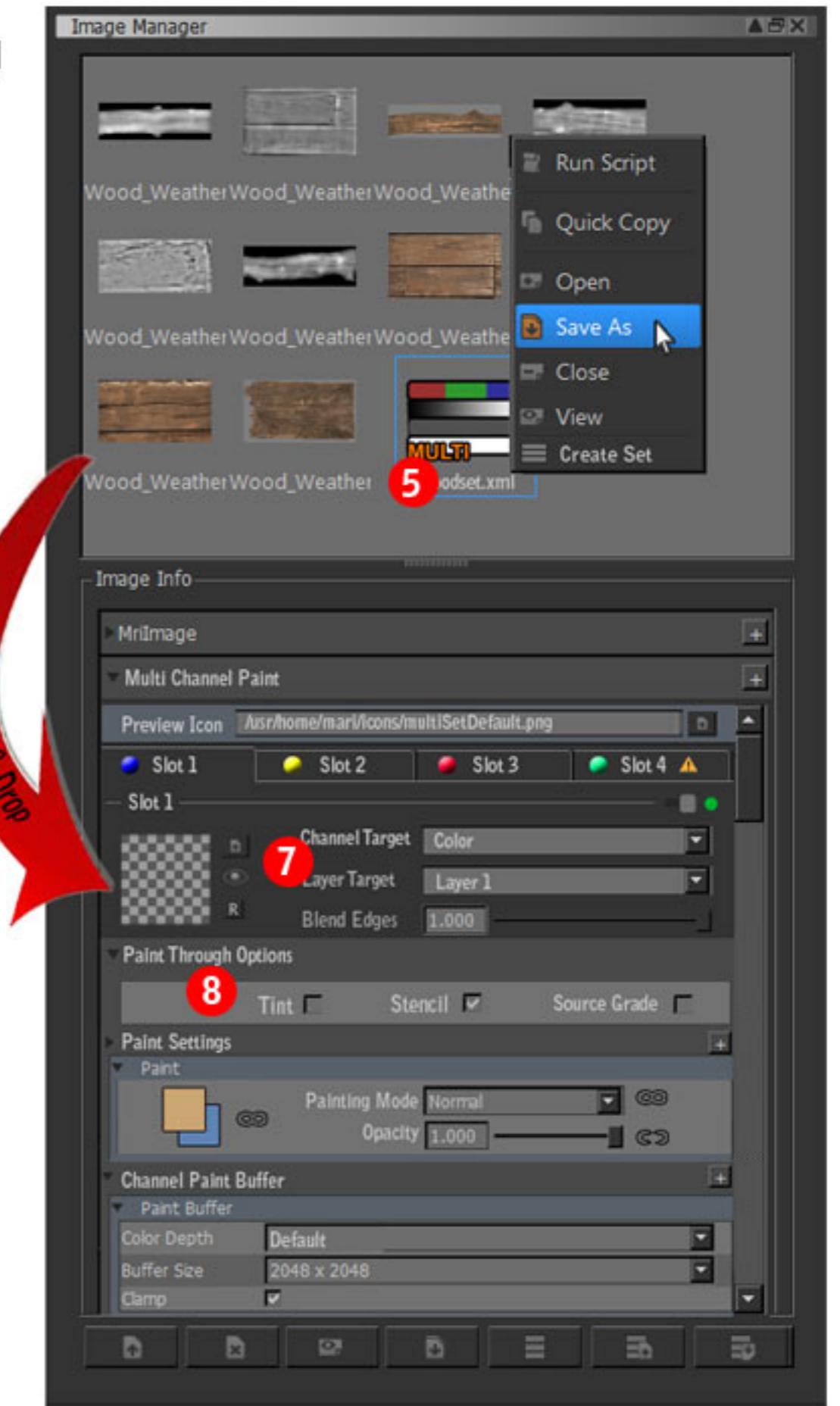
Part 5.1: Multi Channel Painting using the Clone Tool from an open Image



An exact copy of the system displayed for PaintThrough Tool can be used with the clone brush when cloning from an open Image. The advantage is one unified multiChannel Workflow across all tools. Please refer to Page 4 for more detailed feature description.



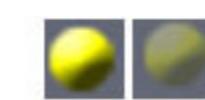
- ① As was the case with the PaintThrough Tool, the Tool Properties of the Clone Brush house all relevant connections while MultiChannel Painting is used.
- ② A checkbox in the Tool Properties and on the Clone Tool Toolbar activates MultiChannel Painting
- ③ 4 Slots are available. Each Slot can have a separate Chanel/Layer Target and Clone Image. These settings get populated manually by the user, by importing an existing set from disc or opening a "MultiSet" from the Image Manager Palette.
- ④ A separate Paintbuffer exists for each slot. While size and paintbuffer transformations are linked inbetween slots, resolution and bitdepth may vary to allow for performance customization
- ⑤ Multisets are the way Mari stores MultiChannel Assignements for easy reuse between Tools (Clone, PaintThrough etc.) They can be created separate from any tool in the image manager, imported from disc or get created by setting up a new MultiSet through the Tool Properties ⑥
- ⑥ Settings in the MultiChannel Paint Sub-Palette of the Image Manager are identical to the ones found in the Tool Properties. When using a MultiSet for Painting the stored Parameters are inserted into its counterpart in the Tool Properties/Multi Channel Subpalette.
- ⑦ Since MultiSets are not Tool specific, it needs to store options for Tools other than the current one. In this example the Clone Tool is active however the MultiSet still holds parameters relevant to the PaintThrough Tool in a separate section.



View of a Multiset when opened from the Image Manger. The spheres in the left corner indicate a MultiSet is open and allow the user to switch between Images



DOUBLE-CLICK
When a Multiset is opened via DoubleClick, Mari opens the set in the built-in Image Viewer. A Toolbar in the corner allows the user to browse through the 4 different slots



The Spheres indicate the primary visibility state of each slot. Visibility can be changed with a LMB Click. This is for display reasons only as the specific paint layer target is linked in the MultiSet options



A crossed out sphere indicates the slot is disabled either by clicking the on/off symbol in the MultiSet Properties or by right-mouse clicking on a sphere in the Toolbar

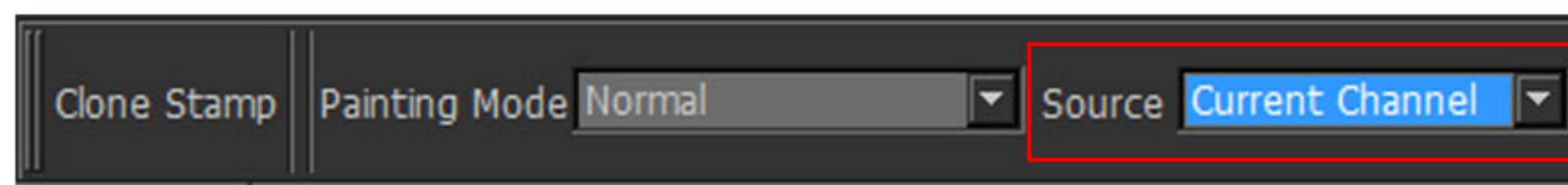


Hovering your Mousecursor over one of the spheres will display its properties - SlotName, Linked Channel and Linked Layer.

Green text means the Link is successful and the target layer exists, red text means the Channel/Layer was not found

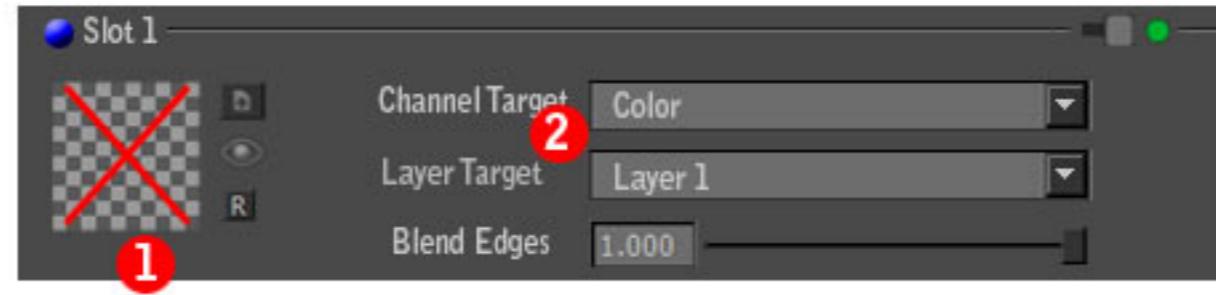
Part 5.2:

Multi Channel Painting using the Clone Tool from the Viewport+UV View



The same implementation of MultiSets and Tool Properties can be applied to cases where the user clones with his CloneSource set in the Viewport.

In such cases the “SourceImage” Field (①) of each Slot would be disregarded and only the Channel/Target Fields (②) evaluated.



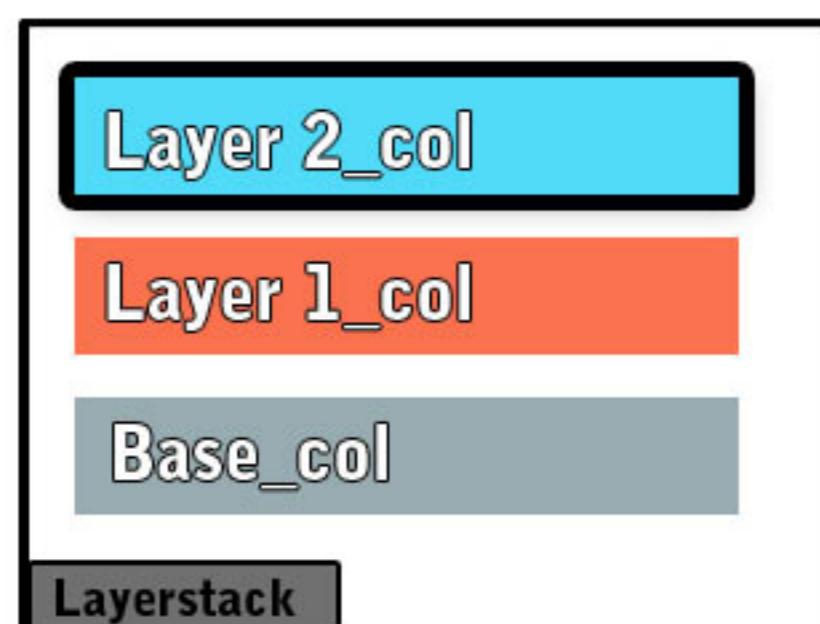
By introducing a Clone Sample Feature like Photoshop



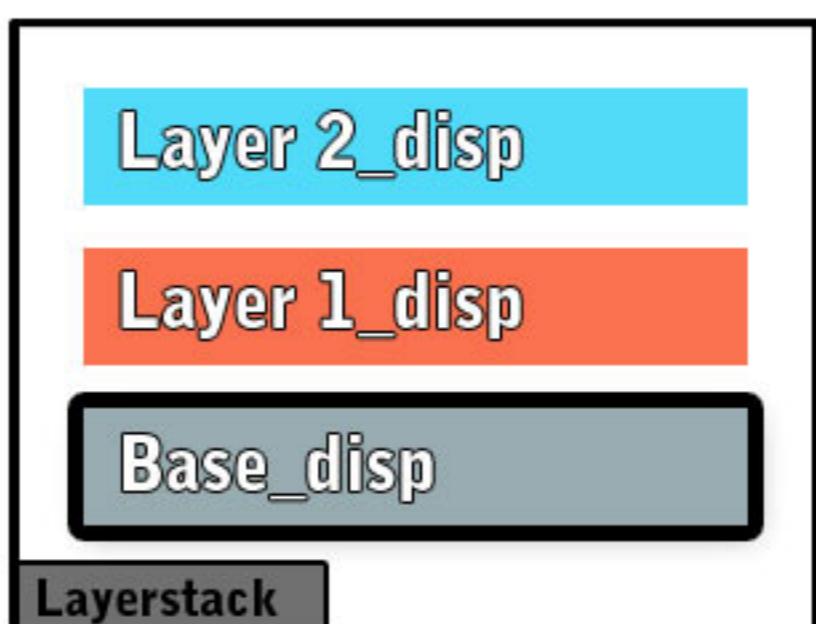
users can specify exactly what they want to clone. All clone information would be projected into the specified target Channel/Layer

Since the object of multiChannel Painting is keeping feature alignment, these options would be global for the clone tool and not a per Slot Setting

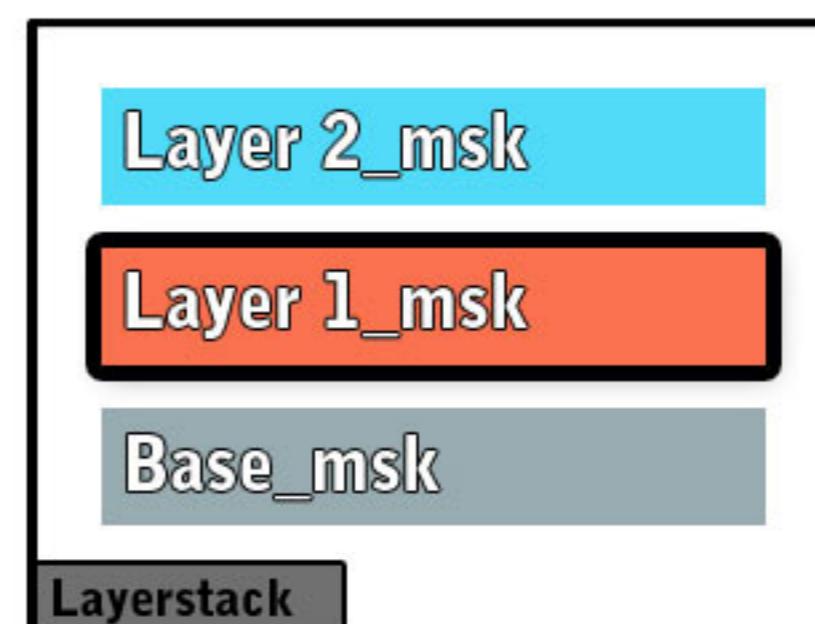
Channel “Color”



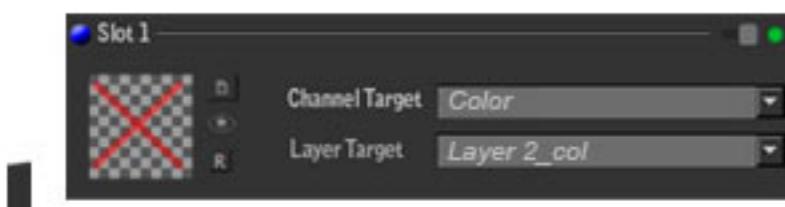
Channel “Displacement”



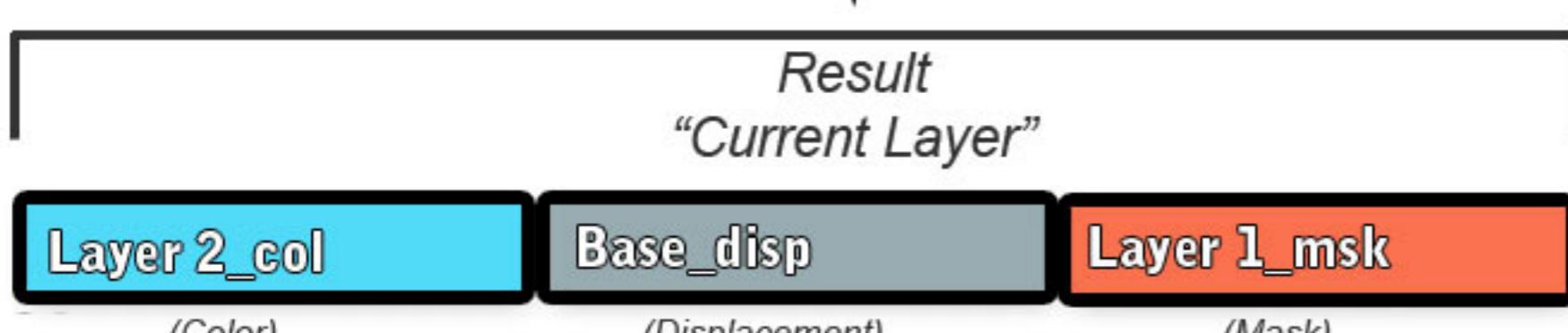
Channel “Mask”



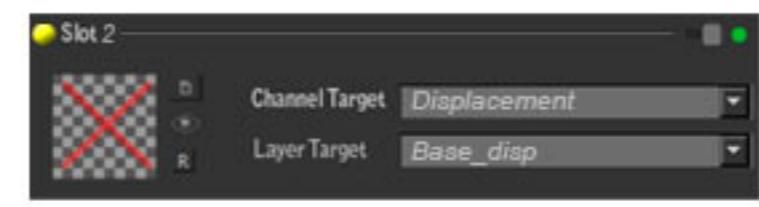
Slot 1 - Target
Layer 2_col



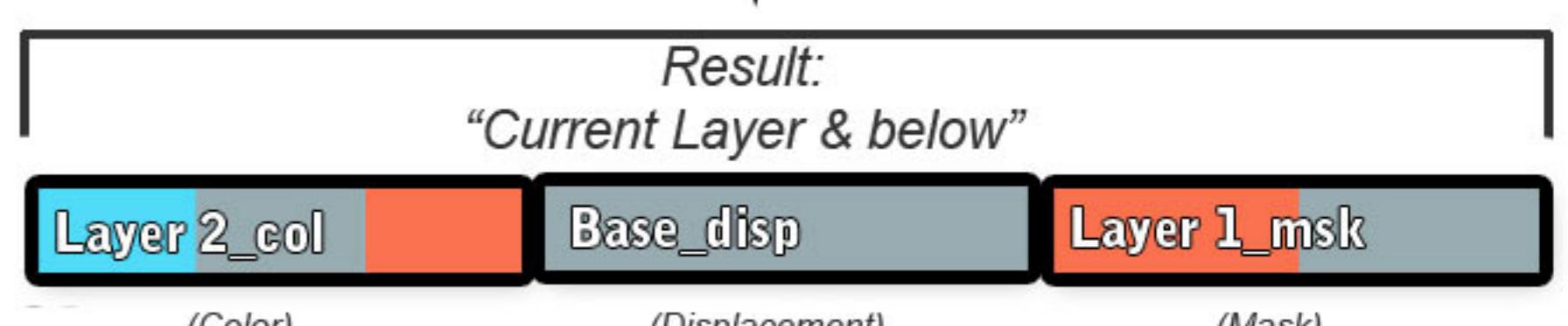
Clone Sample
“Current Layer”



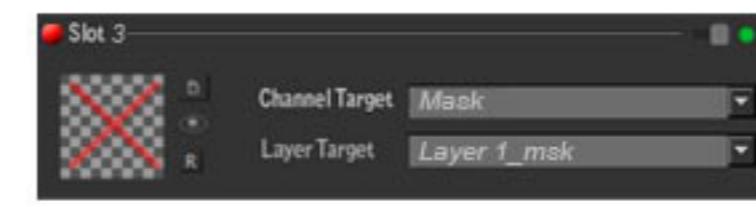
Slot 2 - Target
Base_disp



Clone Sample
“All Layers”



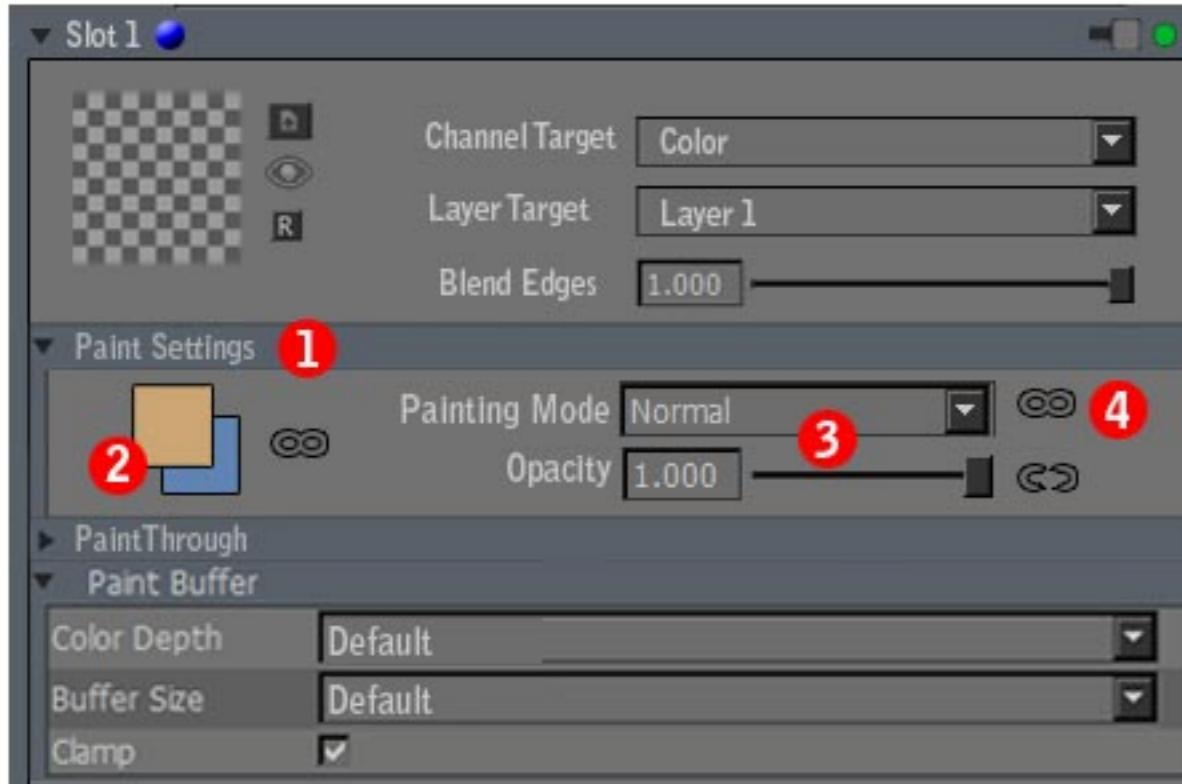
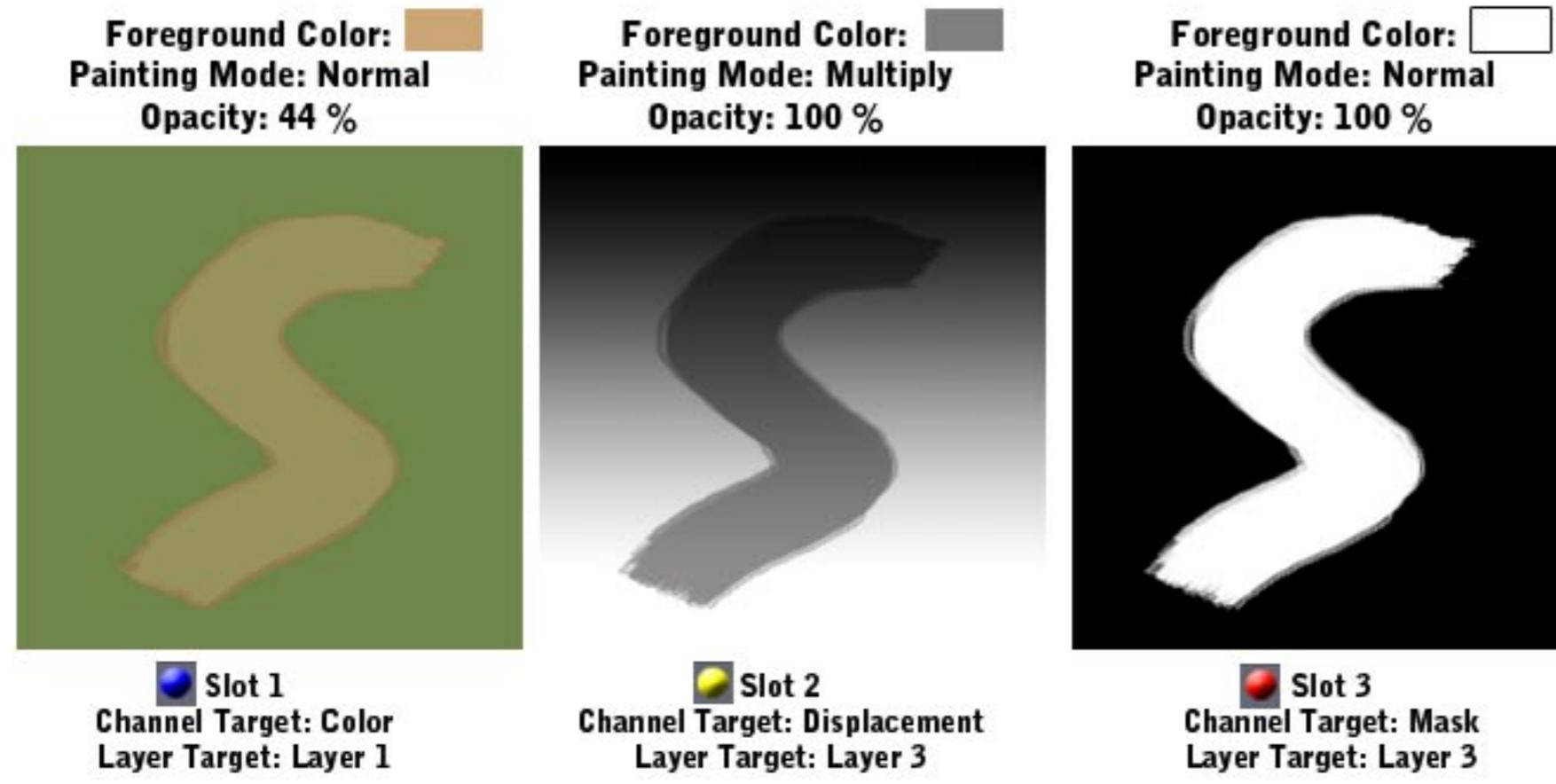
Slot 3 - Target
Layer 1_msk



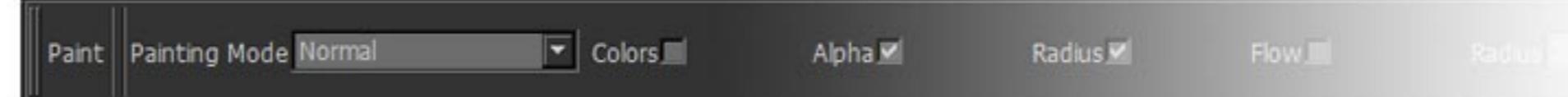
Clone Sample
“Current Layer & below”



Part 6: Multi Channel Painting using the Paint Brush Tool



- ① When using the standard Paint Brush Tool with multiChannel Painting, the “Paint Settings” section of the individual Slot is being evaluated.
- ② Users can specify custom Foreground/Background colors. When using the Hotkey “x” to toggle between colors, all slots toggle between their colors
- ③ Custom Painting Modes and Opacity per Slot
- ④ Each Attribute can be linked to the global setting available in the Main Mari Toolbar



Part 7: Conclusion

The System outlined above provides a comprehensive solution for a multiChannel workflow within the confines of the existing interface and available toolset, however a concession has been made to include Layers (Mari 2.0)

By using the Image Manager to setup universal, tool independent sets and by providing one unified interface for all Tools in the Tool Properties, Users only need to learn one system.

By separating the options out into a subsection of the Tool Properties, novice and new users to Mari are not overwhelmed while still giving advanced users all the options needed..