
























# **Creating and Using Masks**







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# Introduction

A mask is an image used to select part of another image. Masks are one of the most powerful features of Picture Window as they serve several important functions:

- To localize the effects of a transformation to part of an image. For example, to lighten or darken just one part of an image using the Brightness transformation, you must first create a mask that isolates the parts you want to modify.
- To protect part of an image from being modified by a tool like clone or paint. You can use masks the way painters use masking tape, to protect part of an image from being affected by one of the freehand painting tools.
- To identify parts of one image to be composited with another. If you want to place a copy of an object from one image into another, you must first create a mask that identifies the object you want to composite.

A mask is just an ordinary black and white image -- what makes a mask special is the way it is used. There is however one very important rule about using masks: *A mask must be an 8- or 16-bit black and white image and it must have the exactly the same width and height in pixels as the image with which it is used.*

Each pixel in a mask image can be anywhere from totally opaque (white) to totally transparent (black). By default, a mask will apply at full strength where it is opaque and will have no effect where it is transparent, although you will see later how to alter this using Picture Window's double Amount slider. You can use a semitransparent mask to partially mask a region. For example, when using a mask with a transformation to lighten or darken part of an image, it usually works best to soften the edges of the region you want to lighten or darken so the lightening or darkening effect does not have an obvious boundary. This process of softening the edges of a mask is sometimes called feathering.

## Amount Controls

Most transformations that produce an output image the same size as their input image have one or more Amount controls. Initially, the amount control slider is set to 100% and there is a white square to the right of the slider.



As you reduce the amount slider down from 100%, more and more of the input image is blended with the output image to water down the effect of the transformation until at 0% you just get a copy of the input image. Here is an example using the Tint transformation applied at different amounts:



0%



50%



100%

As you reduce the amount percentage, the white square changes to gray and eventually to black when it gets to 0%.



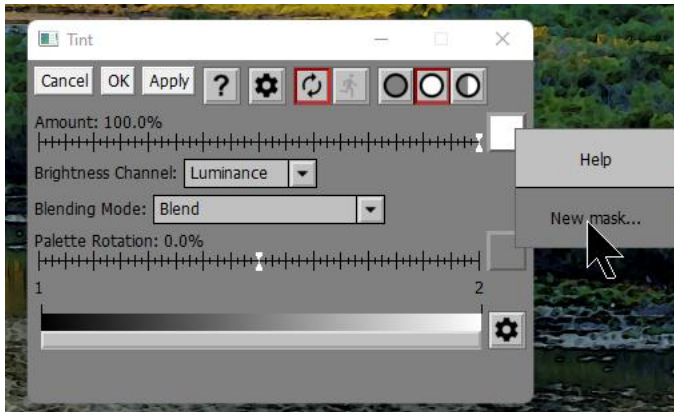
### Zero-centered Amount controls

Some Amount controls run from -100% at the left end of their scale to +100% at the right end, with 0% in the center. In this case, -100% corresponds to a black square, 0% to a gray square and +100% to a white square.

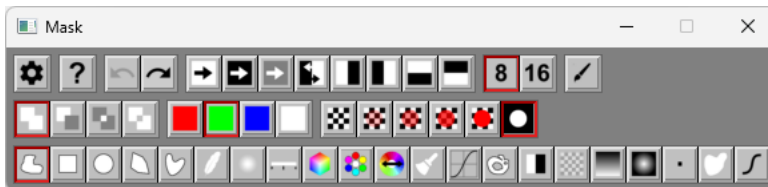


### Using an Amount control to create a mask

To localize the effect of the Tint transformation by creating a mask, click on the amount square and select New mask... from the menu.



This brings up the Mask dialog box which is the primary tool for creating and editing masks.



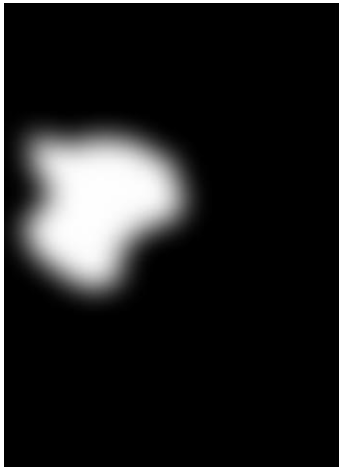
Skipping over the actual mask creation process which will be described in the next section, let's assume we have already created a mask. At this point, the Amount control changes in two ways:



- The amount square is now filled with a miniature version of the mask image. This lets you know there is a mask and also gives you some idea of its shape.
- The amount slider splits into two parts—a black slider and a white slider, initially set to 0% and 100%. The readout indicates the current values of the two sliders.

Where the mask is white, the transformation is applied by an amount determined by the white slider. Where the mask is black, the amount is controlled by the black slider. So, assuming you leave the black and white sliders alone, where the mask is white the transformation is applied at full strength and where the mask is black, the input image remains unchanged. In between, you get a partial effect.





Mask



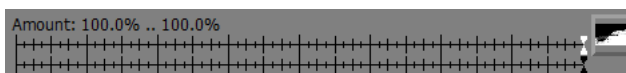
Tint with Mask

Adjusting the black and white sliders varies the amounts where the mask is black or white. In the following example, where the mask is black, the amount is about 75% and where the mask is white the amount is about 25%:



## Dual Amount controls

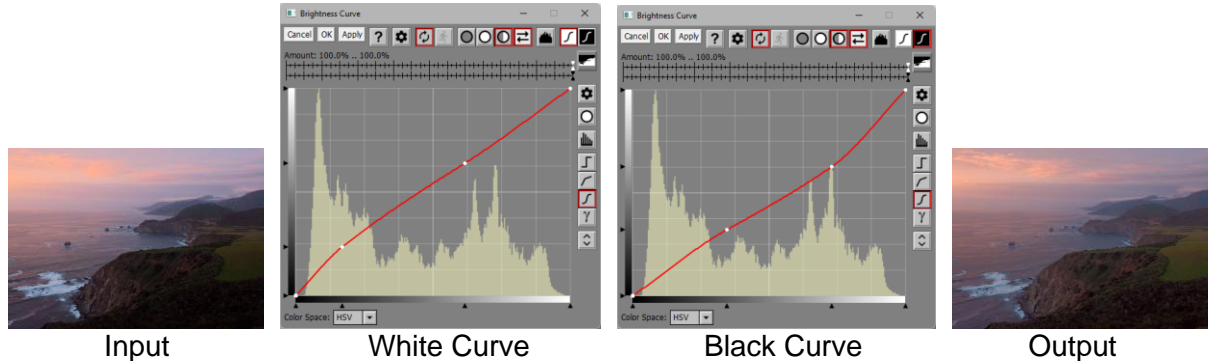
A dual Amount control is the same as a basic Amount control, except when used with a mask. This type of Amount control is used with transformations such as Brightness Curve that have two independent groups of settings – one for where the mask is white and one for where it is black. When you create an Amount mask, the Amount slider splits into two separate sliders, one black and one white.



The white slider controls how much of the white settings are applied where the mask is white, and the black slider controls how much of the black settings are applied where the mask is black.

For example, when you use the Brightness Curve transformation with a mask, you can apply one curve to the masked area and a different curve to the un-masked area. You might use this to lighten one area while darkening everything else or to increase the contrast in one area while decreasing it elsewhere.

In this example, the white curve is used to bring out shadow detail and the black curve it used to accentuate detail in the clouds:



Once you have set up the different white and black curves, you can then use the white and black amount sliders to scale back the effects of either curve to fine tune the effect.

If you only want to adjust the masked area and leave the unmasked area unchanged, you can ignore the black curve -- either leave it as a diagonal from the lower left to upper right or set the black amount slider to 0%.

## Editing an existing mask

If you have already created an Amount mask and you want to modify that mask, click the amount square and select Re-open Mask Dialog Box from the menu. This restores the previous Mask dialog box and lets you pick up working on the mask where you left off.

## Resetting a mask

To remove a mask from an Amount control, click on the amount square and select Reset from the menu. This clears the mask and restores the amount control back to a single slider.

## Reversing the black and white sliders

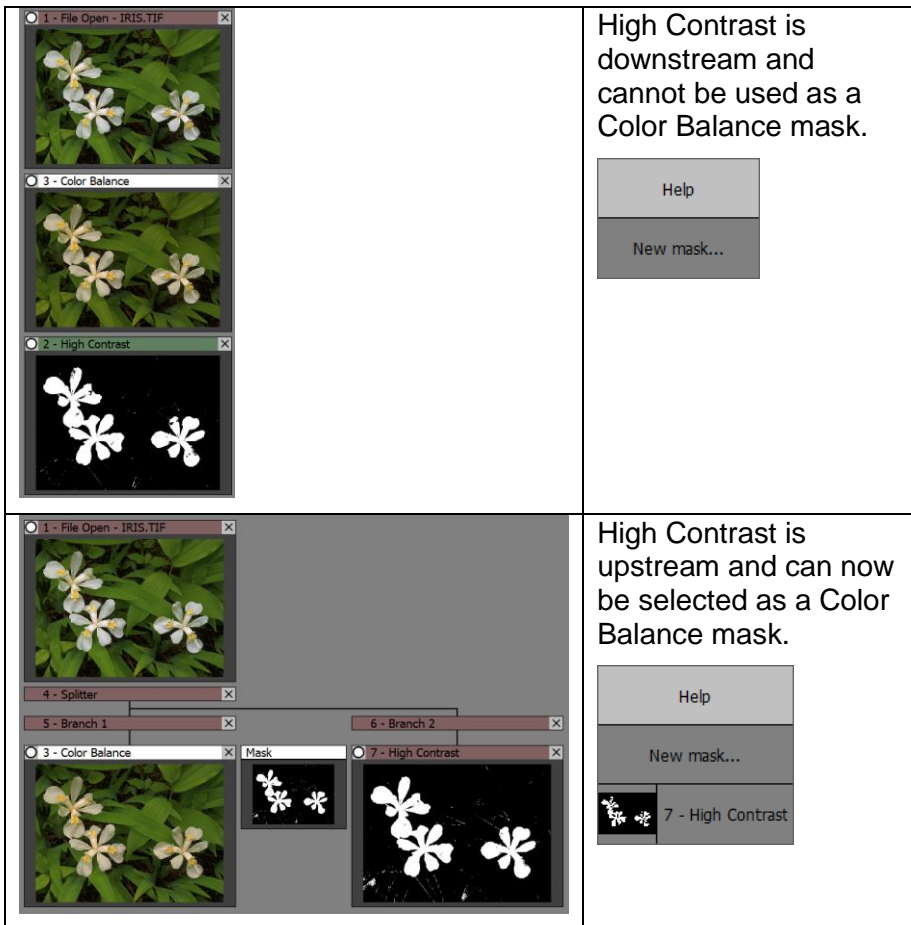
Clicking on the amount square and selecting Reverse from the menu swaps the positions of the black and white sliders. This has the same effect as inverting the mask without having to go into the Mask dialog box. This option is not available for dual amount controls.

## Selecting an existing black and white image as a mask

When you click on the amount square, if any upstream 8- or 16-bit black and white images of the correct size are open and available, their names are appended to the menu. Masks and transparency channels from upstream transformations also appear in the menu if they are the correct size. Selecting one of these images converts it for use as the initial mask.

You can use the mask as is, or you can further refine it if you wish. This technique lets you create masks by opening them from saved image files or from some other image in the image tree, or you can re-use a mask created for some other transformation, as long as it is upstream from the current one.

Downstream images (ones that depend on the current image) are not listed in the mask menu to avoid circular references. Usually you can use a side branch to resolve downstream mask problems. For example, say you start with an image and then create a black and white image from it using the High Contrast special effects transformation. Next you insert a Color Balance transformation between the image and the high contrast black and white version of it. In this configuration, you cannot use the High Contrast image as a mask for Color Balance. If you try, it will not show up in the Amount menu because it is downstream from Color Balance. One way to make this work is to insert a splitter just below the original image and place Color Balance and High Contrast on separate branches below the splitter. Picture Window will then place the High Contrast image upstream from Color Balance.



Notice how the background color of the thumbnail for High Contrast changed from green to red, indicating that High Contrast is now upstream from Color Balance. By creating a side branch, you are giving Picture Window the flexibility to compute the transformations in a different order so it can eliminate any circular references.

Other way of resolving downstream mask issues is to save the mask image as a file and open it as a new top-level image. While this always works, it has the disadvantage that changes in the

mask are not automatically propagated to the image file, so this method should be used as a last resort.

## **Temporary Reset**

Shift-clicking the amount square temporarily resets the amount to 0% which effectively disables the transformation. This is a quick way to compare before and after versions of the transformation. Ctrl-clicking the amount square temporarily resets the amount to 100% which enables the transformation at full strength over the entire input image, even if it has a mask. For zero-centered amount controls, both Shift- and Ctrl-clicking reset the amount to 0% which is the center of the amount scale.

# Using the Mask Dialog Box

The Mask dialog box is the primary tool for creating and editing masks. You get to it from an Amount control by clicking on the amount square and selecting New mask... or Re-open Mask Dialog Box from the menu. Each Amount control has its own independent mask settings.

The caption of the Mask dialog box consists of the name of the mask being edited. If the mask was originally created by selecting an existing image or mask, the name of that image or mask is also included in the caption. This gives you a way to tell which image the mask was derived from, in case you forget.



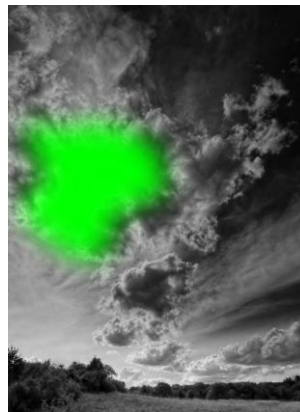
## Mask Color and Transparency

Masks are displayed as a color overlay on the input image. The areas where the overlay is displayed correspond to where the mask image is white—where the mask is black there is no overlay.

By default, masks display as a semitransparent red overlay, but you can select an alternate color or transparency.



50% Red



100% Green



Mask Only

## Masking Mode

This tool bar lets you select the masking mode.



By default, the masking mode is set to Add, so each new region you mask is added to the current mask. For example, to create a mask that contains several regions, you can use the



These buttons give you a quick way to perform certain simple masking operations. From left to right, they set the entire mask to white, set the entire mask to black, set the entire mask to 50% gray, invert the mask, set the left half of the mask to white and right half to black, and so on for the right, top, and bottom of the mask.

## Mask Bit Depth



These buttons control whether the mask created by the Mask dialog box will be an 8-bit or a 16-bit black and white image. 8-bit masks have 256 gray levels while 16-bit masks have 65,536 gray levels. In most situations, 8-bit masks work fine, but there are a few situations in which a 16-bit mask may produce slightly smoother results.

When you switch between 8 and 16 bits, any currently pending mask operation is finalized, the mask is reset, and all the mask operations are re-applied using the specified bit depth.

## Apply Button



This button is hidden when the Freehand Outline or Paint mask tools are selected since they are applied automatically at the end of each stroke.

For all other tools, changes in the mask tool settings cause the colored mask overlay to update, but the transformation is not updated and the mask is not finalized until the Apply button is clicked, until a different mask tool is selected or until the mask dialog box is closed. This lets you experiment with different settings before committing to the action.

The Apply button is grayed out when a mask operation has been selected but there is insufficient information to apply the operation, or the operation would have no effect. For example, when the Rectangle tool is selected but you have not yet drawn a rectangle or when the Blur tool is selected but the Blur Radius is zero.

Pending mask operations are automatically applied if you click anywhere in the transformation dialog box. This ensures that the transformation's output image is updated with the latest mask information. To un-apply the last mask operation, return to the Mask dialog box and click the Undo button.

## Mask Tools



Along the bottom of the Mask dialog box is a tool bar that lets you select individual mask tools. Each tool lets you use a different method to create or modify masks and has its own settings and controls.

For example, you can select the freehand outline tool (the leftmost button) and simply draw a curve around the part of the input image you want to mask.

## Mask Tool Summary

Here is a list of all the mask tools with short description of each one. More detailed descriptions with examples of each one are found in subsequent sections.



### Freehand Outline

The Freehand Outline tool lets you outline a region of the input image which is then filled and combined with the current mask.



### Rectangle

The Rectangle tool lets you draw a rectangle on the input image



### Oval

The Oval tool lets you draw an ellipse on the input image



### Polygon

The Polygon tool lets you draw a polygon on the input image.



### Spline

The Spline tool lets you draw a region with a curved boundary on the input image.



### Feather

The Feather tool lets you enlarge or shrink the boundary of the current mask by small amounts to soften its edges.



### Blur

The Blur tool lets you apply a Gaussian blur to the current mask.



### Color Range

The Color Range tool lets you create a mask by selecting only colors in the input image that fall within specific ranges.



### Hue Saturation

The Hue Saturation tool lets you create a mask by selecting pixels in the input image based on their hue and saturation.





### **Hue Saturation Histogram**

The Hue Saturation Histogram tool displays a 2-D color histogram of the input image and lets you create a mask by selecting parts of the histogram. It also lets you restrict the selection to a brightness range.



### **Hue Difference**

The Hue Difference tool lets you create a mask based on the difference of two selected hues in the input image.



### **Paint**

The Paint tool lets you paint a mask directly on the input image using a brush of adjustable radius, softness and transparency.



### **Curve**

The Curve tool lets you create a mask based on the brightness or one of the other channels of the input image.



### **Flood Fill**

The Flood Fill tool lets you click on the input image to establish a starting pixel. Then it expands the masked area to all surrounding pixels whose color is similar.



### **Separate**

The Separate tool creates a mask based on two sets of colors—one set for black and one for white. It uses these colors to separate the image into masked and unmasked areas.



### **Texture**

The Texture tool creates a mask based on the roughness of the input image.



### **Linear Gradient**

The Linear Gradient tool creates a mask that transitions smoothly through a set of gray levels. You can set the starting and ending points of the gradient and the angle.



### **Oval Gradient**

The Oval Gradient tool creates a mask that transitions smoothly through a set of gray levels in a series of concentric circles, ellipses or rectangles.



### **Remove Pinholes**

Mask tools such as Color Range or Flood Fill can leave small areas of isolated pixels behind if they fall outside the range or threshold value. The Remove Pinholes tool scans the current mask for black or white pinholes and removes them.



### **Median**

Median filtering is another way to remove noise such as isolated pixels from masks. By setting the radius you can control the size of the areas that will be filled.



### **Mask Brightness Curve**

The Mask Brightness Curve tool treats the current mask as a black and white image and lets you apply a brightness curve to it.

## **Undo and Redo**



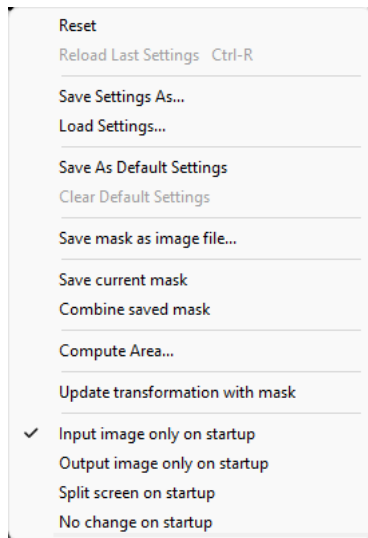
The Undo button lets you undo the last mask operation. The button is grayed out if there are no operations left to undo. Use this if you made a mistake and want to change the settings of an operation you just performed. Once you change the settings, however, you cannot Redo past that point.

The Redo button re-applies the last operation you used Undo to reverse.

When using Undo with mask tools that have an Apply button, the mask operation is reversed in two stages. The first Undo reverses the action of the Apply button and lets you edit the tool settings. The second Undo reverses the entire mask operation and restores the previous mask operation. So, if you click Apply but then want to change some of the tool settings, click Undo once and make your changes -- when you are done, click Apply again.

Unlike Undo, Redo is always performed as a single step, both restoring the next operation and applying it.

## Mask Settings Menu



### Save mask as image file...

This saves the current mask as an image file. If you subsequently open the file you can use the mask as an image.

### Save current mask

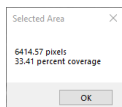
This lets you temporarily save the current mask. Any saved mask is discarded when the Mask dialog is closed.

### Combine saved mask

This combines the mask you saved with the Save current mask command with the current mask according to the mask mode. The purpose of these two commands is to let you create complex masks in sections and combine them later.

### Compute Area...

This computes the area of the input image that is covered by the current mask and displays it in pixels and as a percentage of the entire input image.



### **Update transformation with mask**

This toggles the Update Transformation setting which affects what happens when you use a mask tool (except for the Freehand or Paint tools) to make changes to the current mask.

- With Update Transformation off, the mask overlay is updated but the changes do not trigger a recalculation of the transformation until you click the Apply button.
- With Update Transformation on, the mask overlay is updated and then the current transformation is recalculated automatically.

If you are using a transformation that takes a long time to recalculate, mask tools will be more responsive with Update Transformation off. If you want to see the effects of each mask change on the output image as soon as you make them, turn Update Transformation on.

### **... on startup**

These two menu items let you select how you want the main image area to be displayed when the Mask dialog box starts up. You can set it to display the input image only or the input and output images side-by-side.

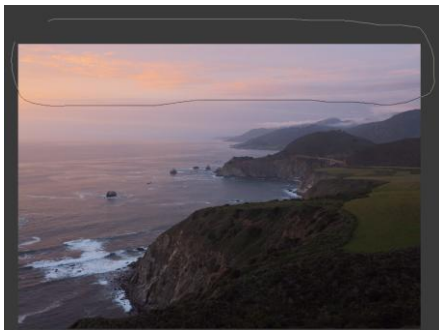
# Mask Tools – Detailed Descriptions



## Freehand Outline



The Freehand Outline tool lets you draw a filled region on the mask. To identify the region you want to mask, click on the input image and drag the cursor around the outline of the region. When you release the mouse button, the endpoints of the curved line are connected to make a closed region whose interior is then filled and combined with the current mask. To mask an edge or corner of the input image, you can draw outside the image boundary. This is the quickest way to select an area, but tracing complex edges can be difficult, and the edges of the mask can be rough. Commonly, this operation is followed by using the Feather or Blur tool, in which case great precision is unnecessary.





## Rectangle



The Rectangle tool lets you draw a solid rectangle on the mask. To place the initial rectangle, click and drag on the input image. If you hold down the shift key while drawing the rectangle, it is constrained to be a square.

You can reposition the rectangle by dragging its corners, edges or interior. When you drag the interior, the entire rectangle is moved. When you drag a corner, the rectangle is scaled larger or smaller while maintaining its center. When you drag a side, just that side is moved. You can rotate the rectangle by dragging the line that runs radially out from the center.

Click to finalize the operation.






## Oval



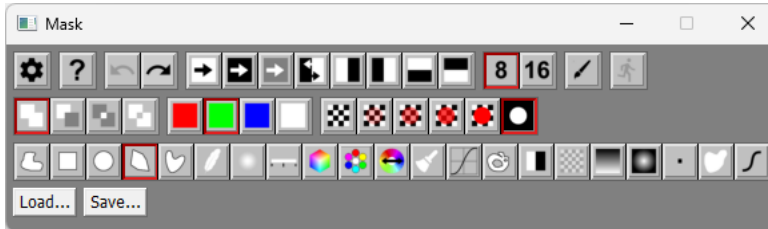
The Oval tool lets you draw a solid ellipse on the mask. To start, click and drag on the input image. If you hold down the shift key while drawing the ellipse, it is constrained to be a circle. You can reposition the ellipse by dragging its control points, edges or interior.

Click  to finalize the operation.



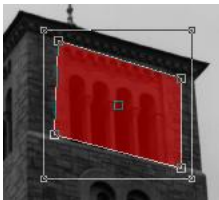


## Polygon



The Polygon tool lets you draw a filled polygon on the mask. It starts out with a rectangle, but you can reposition, add or remove vertices to make any polygon you want.

Click  to finalize the operation.



A large rectangle is displayed around the polygon. Resizing or repositioning this rectangle acts on the entire polygon.

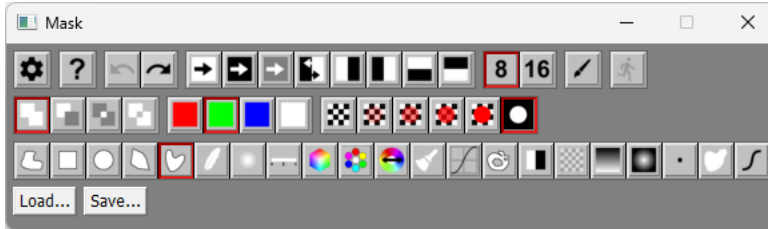
The polygon tool lets you quickly create a mask for a building or for other objects with hard, straight edges. To create a complex outline, start by clicking and dragging the polygon tool to create a rectangle that more or less covers the area of the object you want to mask. To add vertices to the polygon, shift-click at the desired location in the input image. This will replace the nearest edge of the existing polygon with two new edges that pass through the new vertex. Unlike the freehand outline tool, you can reposition polygon vertices by dragging them, so you don't have to be too careful how you place them initially.

Polygon edges are anti-aliased so they are smooth—this means you can position vertices with an accuracy of fraction of a pixel if you zoom in on the image to a high magnification.




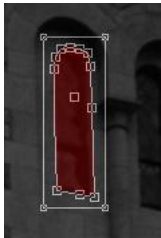


## Spline



The Spline tool lets you draw a filled region with a curved boundary on the mask. It starts out with an egg shape, but you can reposition, add or remove vertices to make any shape you want.

Click  to finalize the operation.



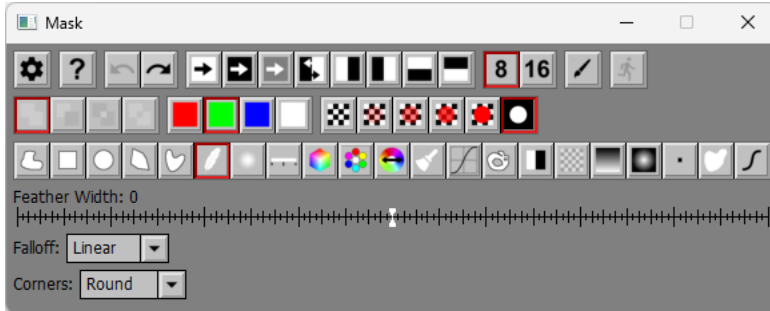
A large rectangle is displayed around the curve. Resizing or repositioning this rectangle acts on the entire curve.

The Spline tool is very similar to the Polygon tool except instead of connecting the vertices with straight lines, it passes a smooth curve through all the vertices. This is useful when you need to create a mask for an object that has smooth edges that are curved such as the edge of a leaf or the outline of an arched doorway.

You add vertices the same way as for the Polygon tool—to control the shape of the curve, simply add more vertices. If you need the curve to change direction sharply to follow a corner or sharp point, insert two vertices at the same location or very close together.




## Feather



The Feather tool lets you enlarge or shrink the boundary of the current mask by a small amount. If you don't feather the edges of a mask, then the boundary between the transformed and unmodified regions of the input image will often be very obvious in the output image. Feathering blends the effects of the transformation around the edges and creates a more natural result. The larger the feather radius, the more the edges of the mask are softened.

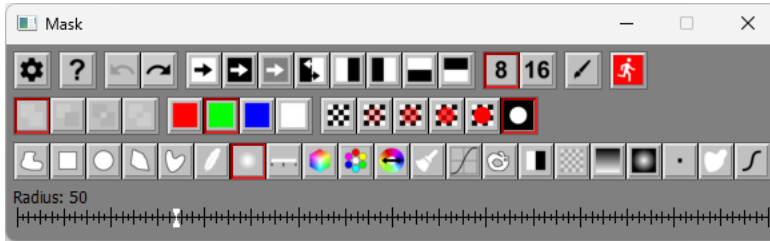
For most transformations that adjust the brightness and color of an image, gradual feathering that falls off out from the regions you are modifying usually creates the best results (4-10 pixel radius). When compositing images, a smaller feather radius (1 to 4 pixels) usually works better.

To feather a mask more than is possible using the feathering tool, you can use the Blur tool. When you use this technique, the mask will shrink by approximately the radius of the blur, so you need to start with a slightly larger mask to allow for the shrinkage.


Click  to finalize the operation – this then selects the Freehand Outline tool to prevent the operation from being applied a second time.



## Blur

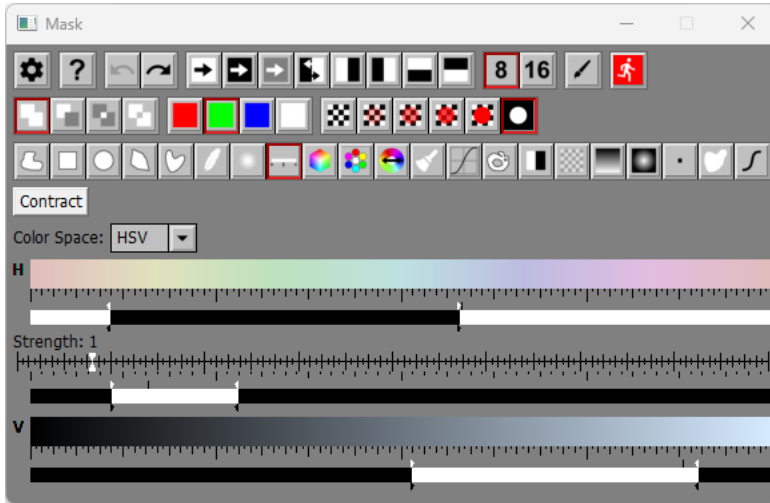


The Blur tool applies a Gaussian blur to the current mask. This is a good way to soften a freehand mask for use in dodging and burning or other selective adjustments.

Click  to finalize the operation – this then selects the Freehand Outline tool to prevent the operation from being applied a second time.



## Color Range




The Color Range tool lets you create a mask by selecting only colors in the input image that fall within specific ranges.

The normal technique for using this tool is to first click on a pixel in the image you want to mask, to define one of the colors you want the mask to cover. Then click the Contract button to shrink the range down to just that color. Next, hold the shift key down while dragging the cursor over other parts of the input image you want to include in the mask. As you do this, the range is automatically expanded to include the colors you pass over.

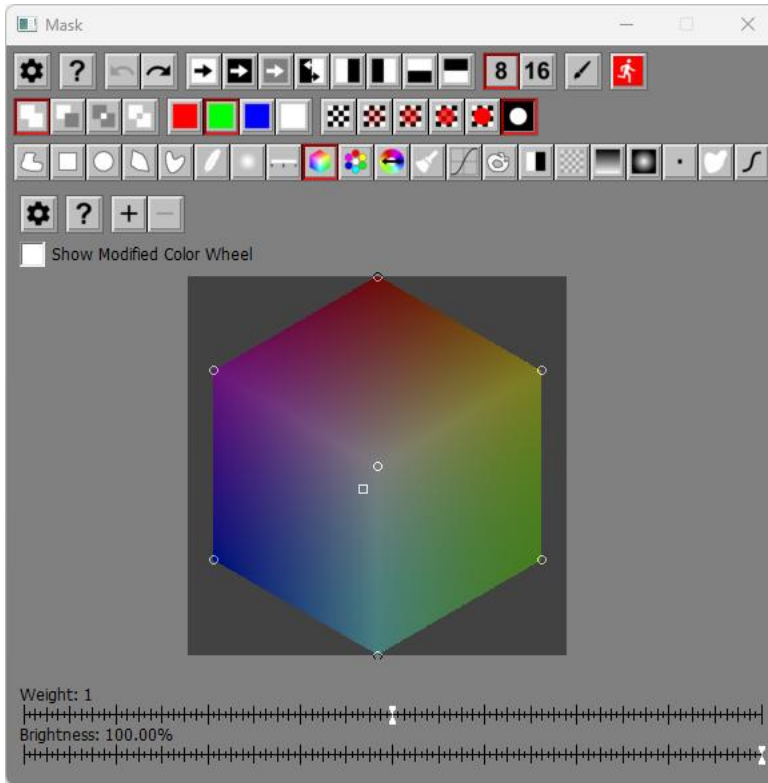
As a shortcut for clicking on the input image and then clicking the Contract button, you can Ctrl-Click on the input image instead to perform the same operation.

To soften the edges of the mask, drag the lower set of markers for each of the selected channels to partially mask colors that are a little outside of the selected range.

Click  to finalize the operation – this then selects the Freehand Outline tool to prevent the operation from being applied a second time.



## Hue Saturation




The Hue Saturation tool lets define an area to mask based on its combined hue and saturation, and without regard to its brightness. This works by letting you create one or more control points on the color hexagon that represent the colors you want to select or deselect.

Each control point has an associated weight and brightness. Weights run from 0.1 to 10.0 and Brightness runs from 0% (black) to 100% (white). There is an initial set of 7 control points set at white in the center of the hexagon and the six primary and secondary colors in the corners of the hexagon. These initial control points all have a weight of 1.0 and a brightness of 0% (black). You can remove or edit the settings of any of these initial control points if you wish.

There are two ways to create a new control point: you can shift-click directly on the color hexagon or you can click on a part of the input image that has the color you want to select. You can have up to a total of 256 control point.

To remove a control point, ctrl-click on it. To move a control point, drag it. To select a control point, click on it – this makes it the current control point and causes its weight and brightness values to be displayed in the Weight and Brightness sliders. The current control point is displayed as a small square – other control points are displayed as small circles. If no control point is selected (for example if you click on the color hexagon away from any of the control points), the Weight and Brightness sliders are not displayed.

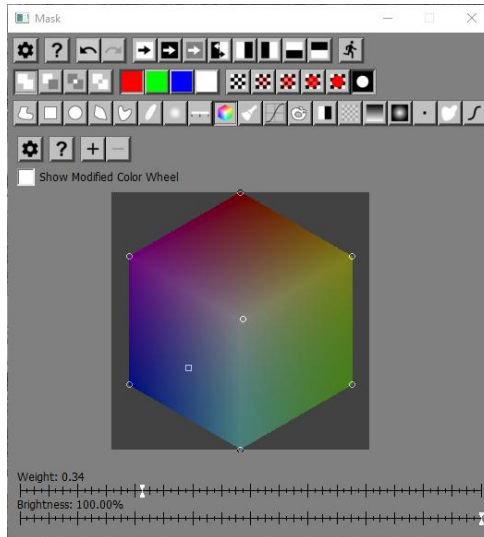
When Picture Window creates a mask from the current set of control points, it examines each pixel in the input image and computes its hue and saturation which in turn defines a location on the color hexagon. The brightness of the mask from 0% for black to 100% for white is determined as a weighted average of the nearby control points. Closer control points are weighted more heavily than distant ones. The weight of each control point can also be adjusted using its Weight slider. Larger weights cause the control point to affect more of the surrounding colors. Smaller weights limit the effect of the control point to colors it closely matches. Setting the Brightness slider to 100% makes the mask white where colors match the control point. Setting it to 0% makes the mask black where colors match the control point. Intermediate values make the mask a corresponding gray level where colors match the control point.

Click  to finalize the operation – this then selects the Freehand Outline tool to prevent the operation from being applied a second time.

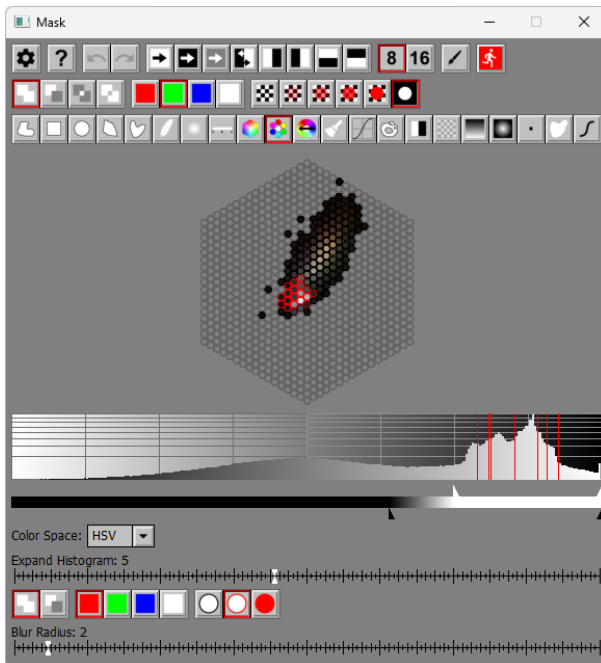
Here is a simple example of using this tool to create a mask that identifies the sky in an image:



This mask was created by clicking on the input image sky area to create a new control point at the corresponding hue and saturation (see below) and then setting its Brightness to 100% to make the masked area white. The Weight was reduced to 0.34 to limit the amount of non-sky color selected.



## Hue Saturation Histogram



This masking tool is closely related to the Hue Saturation transformation which has a similar interface.

### Hue-Saturation Histogram

The dialog box contains a 2-dimensional hue-saturation histogram of the input image created by subdividing the color hexagon into 817 uniformly distributed color patches. The brightness

of each color patch is proportional to the number of pixels in the input image that have the corresponding combination of hue and saturation. If there are no pixels that match a color patch, it is displayed as an empty circle.

You can select one or more color patches in the histogram by clicking and dragging to encircle the region you want to select. This sets the resulting mask to white where parts of the input image match one of the selected color patches, and black everywhere else.

As an alternative, you can select color patches by clicking and dragging on the input image. This selects the color patches corresponding to the pixels you pass over.

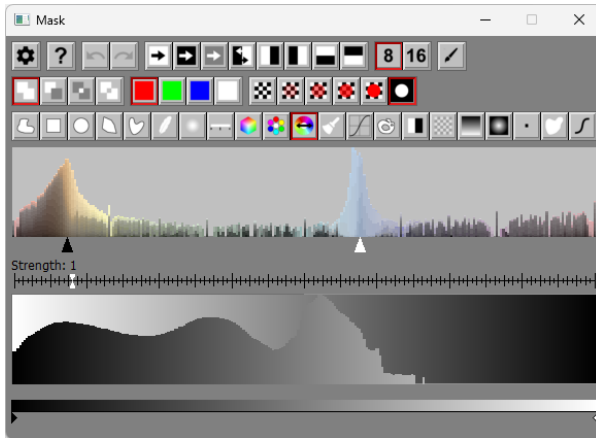
### **Brightness Histogram and Range Slider**

Just below the hue-saturation histogram is a brightness histogram and below that is a range slider. The brightness histogram is computed from the HSV V or HSL L channel of the input image, depending on which color space is selected (see below). The range slider lets you limit the selected colors to those with a specific range of brightness. The range slider has two white and two black markers.





## Hue Difference



This tool is designed to create masks based on the difference between two selected hues in the input image.

### Hue Histogram

The hue histogram displays the relative amounts of each hue in the input image. Peaks in the hue histogram correspond to hues that occur frequently. The image that corresponds to this histogram is predominantly tan rocks and a blue sky.



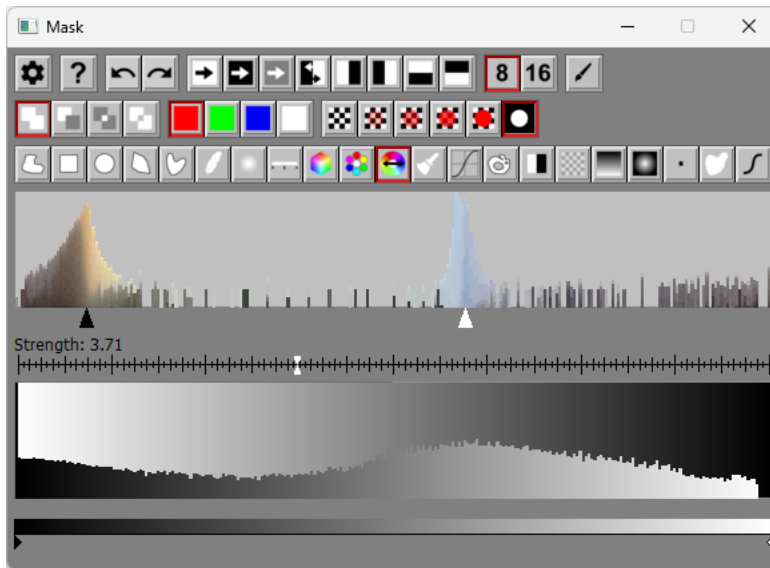
Just below the hue histogram are two markers, one black and one white. You can drag these markers to select a black and a white hue. You can also set the markers by clicking or shift-clicking on the input image. Click to set the white hue or Shift-Click to set the black hue. The mask will become lighter where the input image has the white hue and darker where the input image has the black hue.

The input image is converted to monochrome first using the white hue as a color filter and then using the black hue. The mask is computed as the offset difference of the white image minus the black image. Here is what the mask looks like at this point.



## Strength Slider

The Strength setting magnifies the offset difference, so light areas in the mask become lighter and dark areas darker. To spread out the tonal information in the mask without clipping, a strength of 3.71 can be used:



After increasing the strength, the mask looks like this:



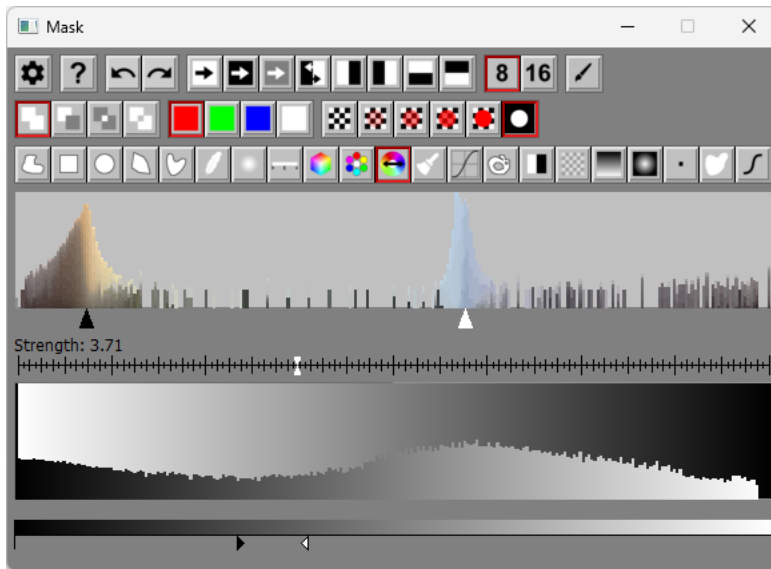
## Brightness Histogram

The Brightness Histogram displayed just below the Strength Slider is the histogram of the offset difference mask. This histogram is updated whenever you change eight of the hue settings or the strength.

## Dynamic Range Slider

The Dynamic Range slider displayed just below the Brightness Histogram lets you further increase the contrast of the mask by setting its black and white points. Moving the black marker right darkens the dark parts of the mask. Moving the white marker left lightens the light parts.

Moving the two markers toward each other produces a mask that does a better job of isolating the sky from the mountains:

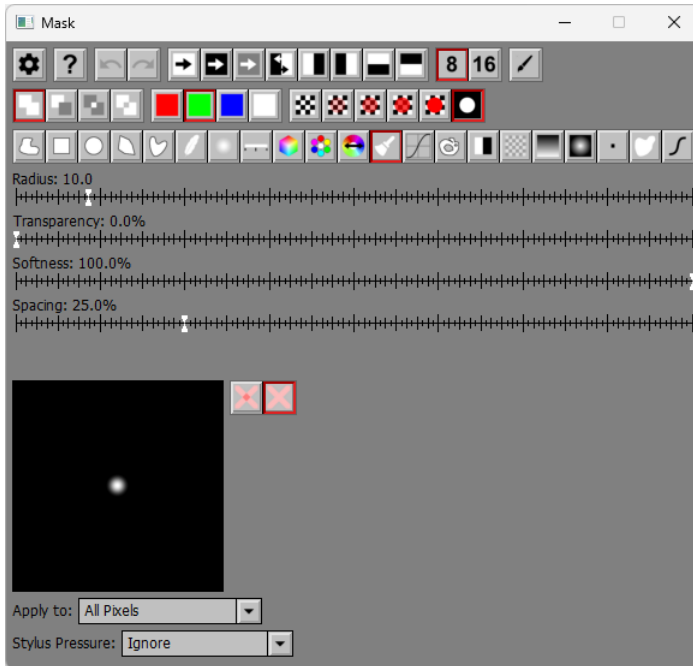


And here is the final mask:





## Paint



The Paint tool lets you paint directly on the mask with a brush of adjustable radius, transparency and softness. A large hard-edged brush is good for masking out large areas quickly. A smaller hard-edged brush is good for filling pinholes left behind by the color range tool or flood fill tool. If you have a tablet with a pressure-sensitive stylus, you can decide which brush setting, if any, is changed when you press the stylus harder.

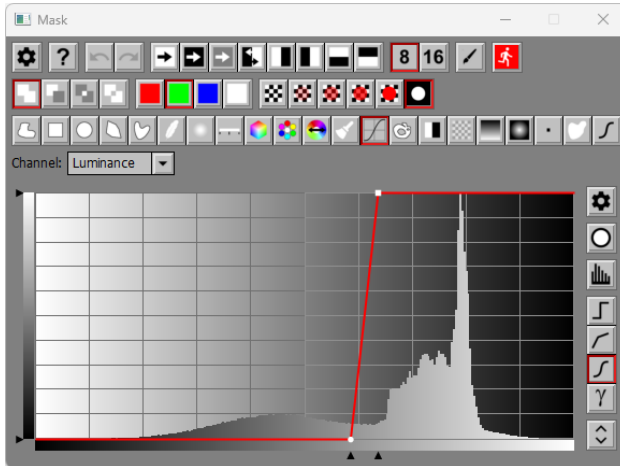
One of the most difficult masking situations arises when you need to mask an object with complicated edges against an irregular background. One technique is to select Similar Pixels (Fixed) or Similar Pixels (Track) as the Apply To option. Then, as you paint around the outside of an object the effects of the brush will be limited to colors that match the background color at the center of the brush within an adjustable tolerance. The lower the tolerance, the more closely pixels need to match the background color to be included in the mask.

If you use the Similar Pixels (Fixed) option, the brush tool samples the background color once when you start a new stroke. If you use the Similar Pixels (Track) option, it samples the background color each time you move the cursor, automatically tracking variations in the background. When you use either of these options, make sure you keep your brush just outside the edge of the object you are masking so you don't accidentally pick up colors from inside the object.


Another technique for making the Paint tool more intelligent is to select Pixels in Color Range as the Apply To option. Now when you apply the brush, only pixels that fall within the current color range will be affected. You can flip back and forth between the color range and brush tools to change the color range as you work with the brush.



## Curve

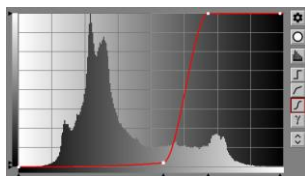


The Curve tool lets you create a mask based on one of the channels of the input image. The most commonly used channel is brightness (Luminance, HSV V or HSL L) as this lets you create a so-called density or luminosity mask that applies differently to parts of the input image that have different brightness levels. However, you can base the mask on other channels as well.

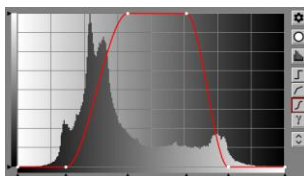
Click  to finalize the operation – this then selects the Freehand Outline tool to prevent the operation from being applied a second time.

### Density Masks

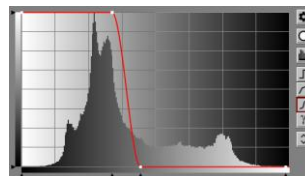
A density mask (sometimes called a luminosity mask) is simply a mask whose transparency is a function of the brightness of the image. Say, for example, you want to increase the saturation of the mid-tones in an image. If you create a mask which is white where the image has mid-level brightness and fades to black in both shadow and highlight areas (see the middle example below), you can then use this with the Saturation transformation to adjust the saturation of just the mid-tones. By adjusting the location, slope and shape of the transitions from white to black, you can fine tune the results. Here are some simple curves and their effects:



Select Highlights



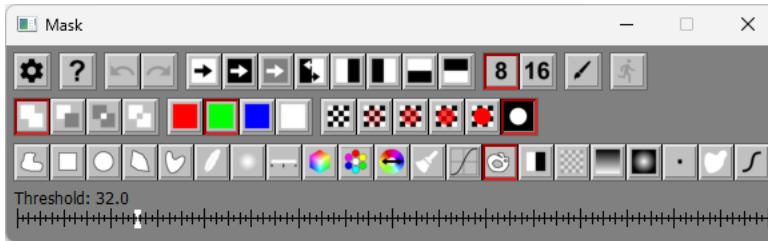
Select Midtones




Select Shadows



## Flood Fill



The Flood Fill tool lets you click on the input image to establish a seed pixel. Then it expands the masked area in all directions to all adjacent pixels that are within some threshold value of the starting pixel. This is repeated until no more adjacent matching pixels can be found.

Click  to finalize the operation.

When you first click on the input image, the flood fill mask is computed, and a small circle is displayed as an overlay on the input image at the seed point. If you then adjust the threshold slider or click on a different spot on the input image, the mask is recomputed, but the transformation is not updated. Once you get the result you want, click the Apply button to finalize the flood fill operation. After you click Apply, the next click on the input image starts an entirely new flood fill operation.

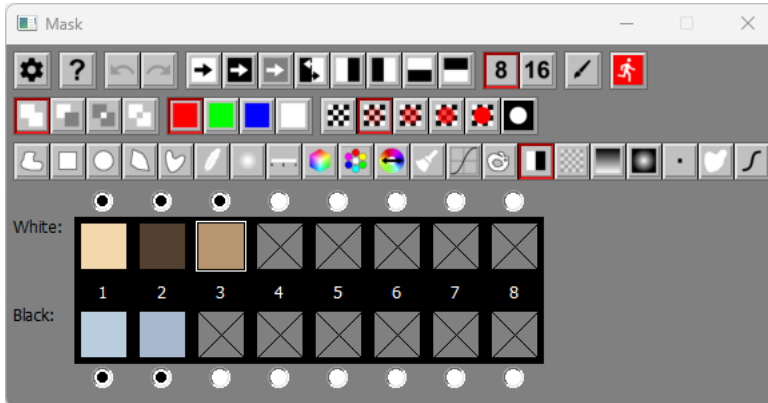
To perform a flood fill matching a range of colors and not just the color of the input image at the seed point, you can create a seed line. To extend a seed point to a seed line, Shift-Click on the input image. This defines the other end of the seed line. To return to a seed point from a seed line, Ctrl-Click on the input image. Once you have defined a seed line, the flood fill operation still starts at the seed point, but expands to all adjacent pixels that match, within the Threshold, any of the colors along the seed line. Using a seed line instead of a seed point can be helpful, for example, if the area you are trying to select has a smooth gradient or just consists of several specific colors.

As a convenience, if you Ctrl-Shift-click on the input image instead of just clicking on it, any pending operation is applied before the flood fill operation is initiated. This lets you quickly perform several flood fill operations in a row without having to click the Apply button after each one. The last flood fill operation remains pending until you click the Apply button.

Using the Flood Fill tool is a good way to mask large areas of more or less solid color with complicated boundaries, but you may need to feather the mask since the edges can be rough. This tool can also leave pinholes behind. You can use the Remove Pinholes tool, the Median tool or the Paint tool to fill them in.



## Separate



The Separate tool creates a mask based on two rows of colors – one for white and one for black. For each pixel in the input image, it looks for the nearest black color and the nearest white color and then sets the mask value based on which combination of these two colors matches the input image best. This tool lets you separate two elements of the same image (for example sky and trees) based on their color differences by sampling up to eight colors from each element.

### Selecting Black and White Colors


You can assign up to eight white and eight black colors. The current set of colors is displayed in the dialog box as numbered color patches. Inactive colors are shown with an X through them. To enable or disable a color, click on its associated radio button.

Initially, there is one active white and one active black color, and no control points in the input image are assigned to either one.

To select a color, first click on its color patch to make it the current color – the current color is highlighted by a white box outlining it. Next click on the input image to set the current color to the color you clicked on. This also adds a labeled control point to the image so you can see where the color came from. Control points are labeled with a W or B followed by the patch number. Each time you select a new color or enable or disable a color, the mask is updated.

You can add a new color by shift-clicking on the input image. This adds a new white or black color and control point, depending on whether the current patch is in the white or the black row. You can switch between rows by pressing B or W on the keyboard.

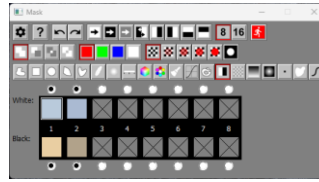
You can also right-click on the color patch area to display a popup context menu. This lets you reset all the colors or swap the black and white color, effectively inverting the resulting mask.

Click  to finalize the operation – this then selects the Freehand Outline tool to prevent the operation from being applied a second time.

## Example



Input Image



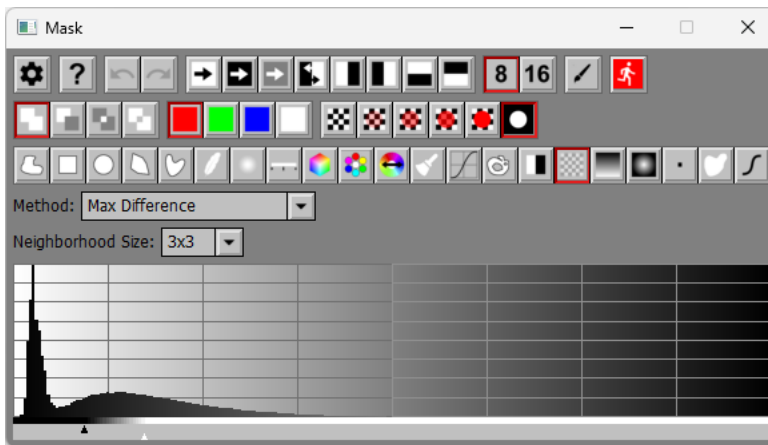
Mask

In this example, two colors were sampled from the trees and two from the mountains. For each pixel in the input image, the closest Black and White colors are determined, and the mask is set to the relative proportions of each of these two colors in the input image. Including enough representative colors on each side of the edge gives you a good separation between the two parts of the image. The more similar the black and white colors, the more accurate the mask.

Having gotten a good initial mask for the complex region where the tree meets the sky, you can quickly clean up the rest of the mask with the Freehand Outline or Paint tool.



## Texture



The Texture tool creates a mask based on the roughness of the input image. For example, if you use a mask with one of the Sharpen transformations, you can use a texture mask to keep it from sharpening smooth areas in the image.

The Texture tool lets you select one of three methods for measuring the roughness of the image.

### Max Difference

Computes the maximum difference between any pixel in the neighborhood and the central pixel.

### Average Difference

Computes the average difference between the pixels in the neighborhood and the central pixel.




## Difference from Average

Computes the average of all the pixels in the neighborhood and then computes the sum of all the differences between each pixel in the neighborhood and the average.

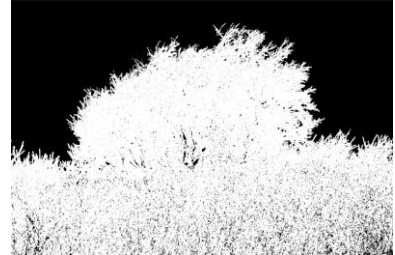
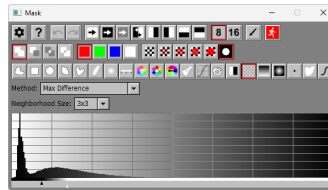
You can also select the size of the neighborhood over which the roughness is measured as 3x3, 5x5 or 7x7.

The histogram shows the number of pixels in the input image that have different levels of roughness, with perfectly smooth at the left and very rough at the right. By setting the black and white markers you can select what part of the roughness scale to mask. Moving the black slider to the right lets you exclude smooth areas from the mask. Moving the white slider to the left lets you control the transition from smooth (black) to rough (white) as indicated by the gray stripe below the histogram.

Click  to finalize the operation – this then selects the Freehand Outline tool to prevent the operation from being applied a second time.



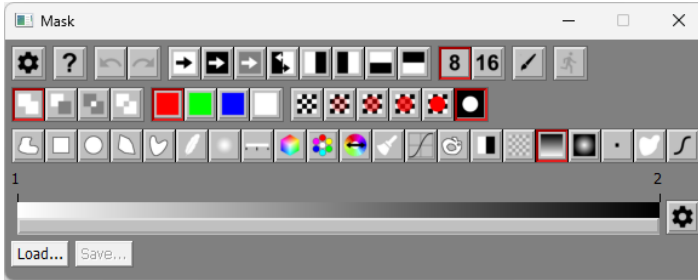
Input Image



Mask

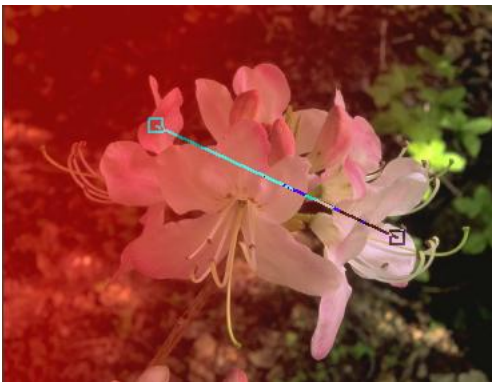


## Linear Gradient



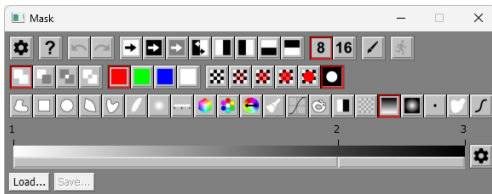
The Linear Gradient tool creates a mask that transitions smoothly through a set of gray levels. You can set the starting and ending points of the gradient as well as the angle.

To use this tool, click on the image to set the starting point and drag the cursor to the ending point. To constrain the angle of the gradient to multiples of 15 degrees, hold down the Shift key while dragging. This draws a line on the input image with control points at each end and previews the gradient mask.



Adjust the endpoints or color line to fine tune the gradient and then click the Apply button to finalize the operation when you get the result you want.

If you create intermediate control points in the color line, they show up on the overlay as intermediate control points along the gradient line. Dragging one of these control points adjusts the position of the corresponding control point in the color line and vice versa.



For example, you can use a linear gradient mask as a way to simulate using split neutral density filters.



Input Image



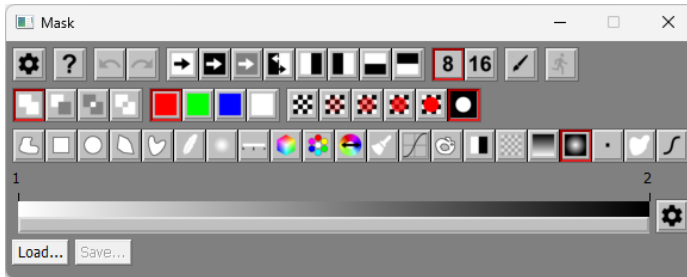
Mask



Lightened Using Mask



## Oval Gradient

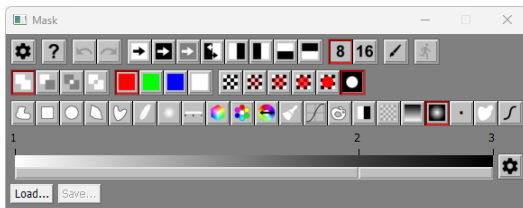


The Oval Gradient tool creates a mask that transitions smoothly through a set of gray levels in a series of concentric ellipses. You create an initial ellipse by clicking and dragging on the input image. If you hold down the Shift key while dragging, the ellipse is forced to be circular. As soon as you stop dragging, the gradient is previewed on the input image. You can resize the ellipse by dragging any of the four control points on its circumference, move it by dragging its center point, or rotate it by dragging the line that extends from its center. Use the color line to control how the mask varies in density from the center to the edge of the ellipse. The gray level at the edge of the ellipse is applied to the entire part of the mask outside the ellipse.



Click the Apply button to finalize the gradient when you have the result you want.

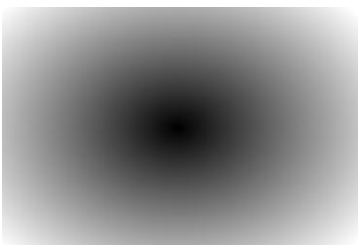
Intermediate control points in the color line, if any, show up on the overlay as intermediate control points along the line you use to rotate the oval. Dragging one of these control points adjusts the position of the corresponding control point in the color line and vice versa.



For example, when used with the Brightness transformation, this is a way to do a vignette.



Input Image

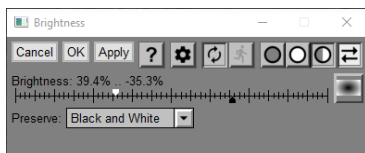


Mask

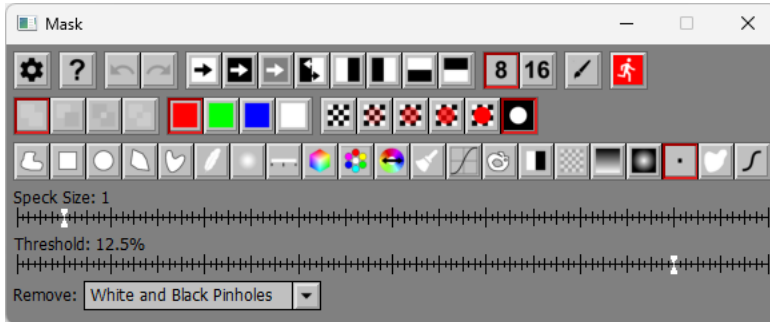


Vignette

The mask was used with the Brightness transformation to darken the corners and lighten the center of the input image.




## Remove Pinholes



Tools such as Color Range or Flood Fill can leave small areas of isolated pixels behind if they fall outside the range or threshold value. The Remove Pinholes tool can scan the current mask for these pinholes and remove them.

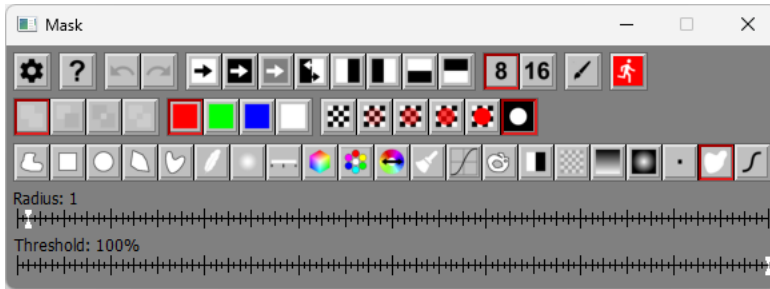
If you just have a few pinholes, it may be easier to just paint over them with the Paint tool, but if you have a lot of tiny pinholes, the Remove Pinholes tool is more efficient.

First, set the maximum size of pinholes to remove. Use as small a value as possible to avoid removing detail from the mask.

Next, select whether you want to remove white pinholes, black pinholes or both, and then click the  button to finalize the mask.



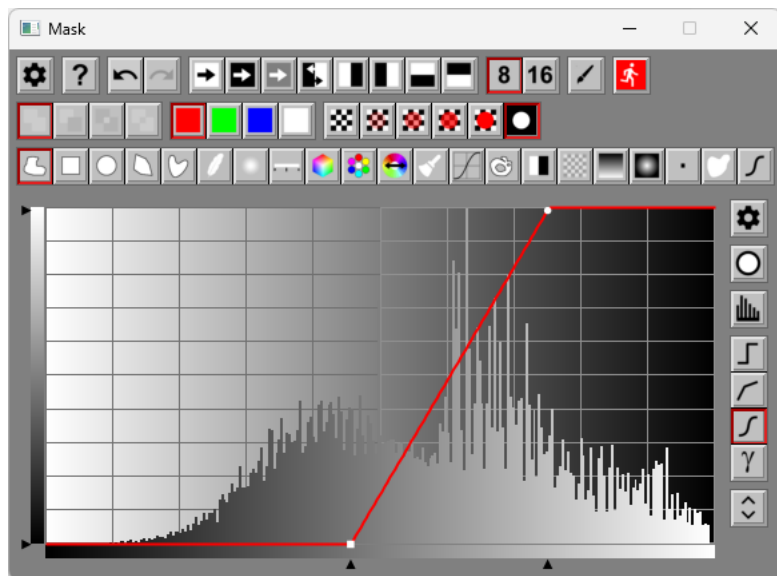
## Median



Median filtering is another way to remove noise such as isolated black or white pixels from images. By setting the radius you can control the size of the areas that will be filled in. Use the smallest radius you can that removes pinholes, as large values can cause noticeable rounding of sharp corners in the mask.



## Mask Brightness Curve



The Mask Brightness Curve tool treats the current mask as a black and white image and lets you apply a brightness curve to it. This lets you alter the brightness, contrast and dynamic range of the mask or create special effects like solarization or posterization of the mask.



# A Simple Example – Creating and Using a Mask

Let's put all the pieces together and see how masking works in practice.

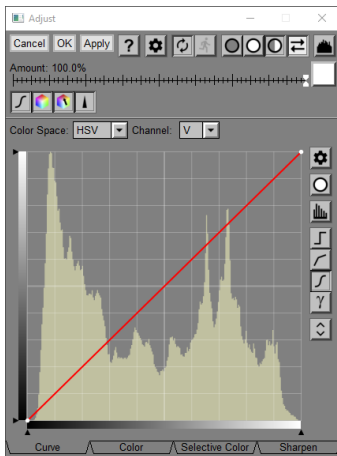


Starting with the image at the left, we will use a mask to lighten and increase the contrast of the dark area in the lower right corner of the image outlined in red.

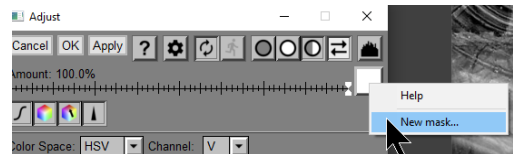


While there are several transformations we could use to lighten the image and increase its contrast, in this example we will use Adjust. The Adjust transformation has the advantage that you can adjust the brightness curve, change saturation and color balance, make selective color corrections, and sharpen or blur the masked area.

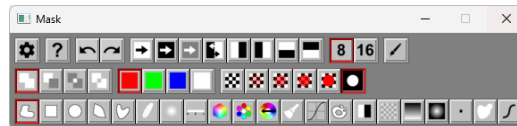
Here is what the Adjust transformation dialog box looks like:



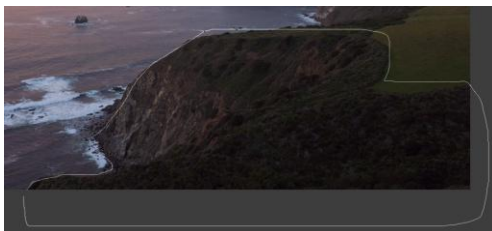
To create a mask, click on the white square in the Amount control and select New mask... from the menu.



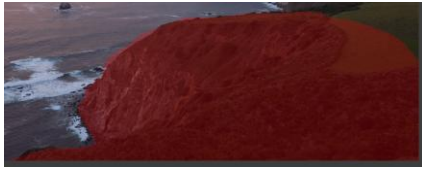
This brings up the Mask dialog box:



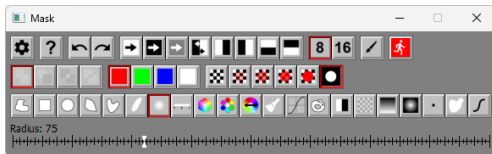
The quickest way to select the dark area is with the Freehand Outline tool. To use it, just click and drag on the input image to outline the area you want to work on:



When you release the mouse button, the endpoints of the curve are connected, and the region is filled in with a mask.




Next, we need to soften the edges of the mask to make the transition between masked and unmasked areas less obvious. First select the Blur tool, then set the radius to around 75. This immediately softens the mask – if it is too soft, you can dial back the blur radius and if it is not soft enough, you can increase it. When you are happy with the result, click the Apply button to finalize the settings:

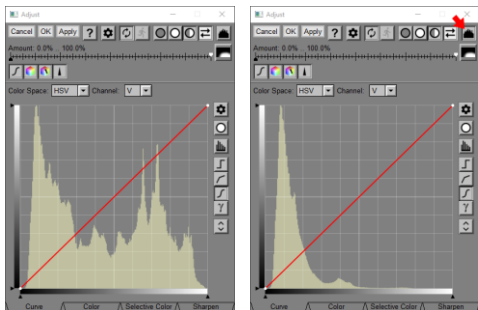


This produces a soft-edged mask we can use to bring out detail in the dark corner of the image.

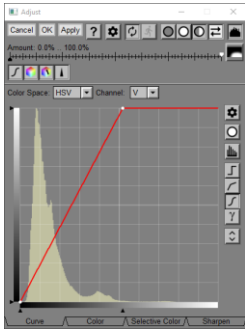
At this point, you can close the mask dialog box – this removes the colored mask overlay and lets you see in underlying input image, and also reduces screen clutter. You can always get the mask dialog back, by clicking on the Amount square and selecting Re-open Mask Dialog Box from the menu. Or, you can leave the mask dialog in place if you want to experiment with mask variations and see how they affect the transformation.

Returning to the Adjust transformation we can use the Curve to lighten the image. The histogram displayed in the curve control is based on the entire input image.

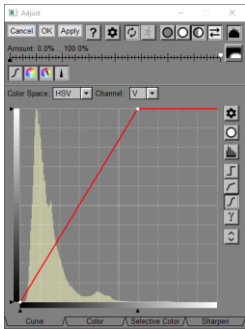
To see a histogram of just the masked part of the input image, click the  button in the upper right corner of the Adjust dialog box.



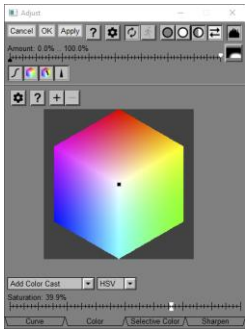
Now, we have a good idea what part of the brightness scale we need to stretch, so let's try something simple:



Maybe a bit too much, so perhaps a slightly less drastic curve would work better:



At this point we could also boost the saturation of the masked area a little using the Color tab:



For comparison, here is the image we started with:



# Tips

## Masks recalculate like transformations

Masks are represented internally as a sequence of mask tool operations applied to an input image – usually the input image for a transformation. The mask is recalculated each time the transformation is recalculated. For example, say you use the Mask Curve tool to create a mask based on the brightness of the input image. If you subsequently adjust the brightness of the input image using some upstream transformation, the mask will update based on the new input image. If you do something upstream that changes the dimensions in pixels of the base image such as cropping or warping it, the mask is also recalculated based on the updated image. Depending on the mask tools you are using, this may or may not render the mask useless.

To freeze a mask so it does not update with changes to the input image, use the Save mask as image file... command from the Settings Menu to make a copy of the current mask as a black and white image file. Then open the saved mask image, reset the amount mask, and load the mask image as the initial amount mask. Now the mask will no longer change if the input image changes. If you crop or warp the input image and want to continue to use the same mask, crop or warp the mask image the same way.

## Copying masks between transformations

There are several different ways to copy a mask from one transformation to another.

### 1) Copying or cloning a transformation

When you copy or clone a transformation, you not only copy the transformation settings, but you also copy the mask settings, including all the mask operations used to create the original mask. If you subsequently change one mask the other is unaffected. This method can be used even if the two images have different sizes.



### 2) Saving the mask settings from one transformation and loading them into another

You can use the settings menu in the first transformation's mask dialog box to save its mask settings in a mask settings file, and then use the second transformation's mask settings menu to load the saved mask settings. This transfers all the mask operations from the first transformation to the second. As with the previous method, subsequent changes to one mask do not affect the other. This method can be used even if the two images have different sizes.


### 3) Referencing a mask in one transformation from another transformation

When you create the second mask, you can select the name of the first mask from the Amount menu (assuming both images have the same dimensions in pixels). This takes a snapshot of the first mask image and uses it as the initial mask for the second transformation -- the mask operations are not copied, just the end result. Subsequent changes to the first mask are propagated to the second mask which is recalculated, and which then triggers a recalculation of the second transformation. If you close the first transformation, the first mask is no longer available, so the second mask is reset.

## Refining masks

If you click the  button for a mask tool and then decide you need to adjust its settings, click the Undo button to reverse the effect of the tool and then re-select the tool. This restores the previous settings and lets you make any necessary changes. Finally, click  again to see the effects of your changes.

## Seeing the mask

In the process of creating a mask, you may find it useful to reverse the masked and unmasked regions with the  button to help visualize the edges of the masked region. It may also be useful to vary the color of the mask overlay and the mask transparency controls. Sometimes making the mask opaque or displaying only the mask helps you see exactly what part of the image the mask covers or to detect pinholes or other fine details in the mask. Zooming in on the mask is also a useful technique for detecting pinholes too small to show up at lower magnification factors.

## Seeing the underlying image

To temporarily remove the mask overlay so you can see the underlying image, you can toggle the Mask Transparency setting to turn the overlay on and off. Another way to turn off the mask overlay is to close the Mask dialog box. If you need to get it back, you can click the Amount box and select Re-open Mask Dialog Box from the menu. If you have a complex mask, toggling Mask Transparency is more efficient because closing and re-opening the Mask dialog box requires rebuilding the mask each time.

## If the mask overlay is missing...

Check the Mask Transparency tool bar to make sure you have not selected a transparent mask. Also check that the Mask dialog box is selected.

## Working from rough outline to fine detail

To mask a complex region, start by making a crude mask of the entire region with the freehand outline tool, then zoom in and refine the mask by adding or removing small amounts at a time around the edges.

## Sub-Pixel mask resolution

By zooming in on the base image window, you can adjust the location of the edge of the masked region by fractions of a pixel. This lets you make very fine adjustments when using the freehand, rectangle, oval, polygon, and spline tools as Picture Window records the location of each vertex or control point to sub-pixel accuracy and computes and anti-aliases the mask with great precision.

## Creating soft masks

Here is a quick way to create a soft-edged mask for dodging and burning or making similar adjustments that need to blend in smoothly.

First use the Freehand Outline tool to encircle the region you want to mask, leaving extra room around the boundary. You don't have to be particularly accurate since the details of the edge of the region will be smoothed out.

Next use the Mask Blur tool to blur the mask – the larger the radius, the smoother the blend. The blur tool shrinks the masked region by the blur radius, so this is why you need to be generous when marking it with the freehand outline tool. If you over- or under-blurred, click the Undo button and try again.

## **The range tool**

The range tool is very useful for creating a mask based on the color of a region of the input image.

### **Filling pinholes in a range mask**

When you create a mask with the range tool, it may leave small pinholes unselected. You can fill these quickly by painting over them with the mask paint tool using an opaque, hard-edged brush. Or you can use the Pinhole tool or the Median Blur tool.

### **Creating a mask that isolates shadow, mid-tone, or highlight areas**

To create a mask that isolates the parts of an image with a certain range of gray levels, use HSV or HSL color space and use the white sliders to bracket the main part of the gray scale you want to select. Then pull the black sliders out to feather the effects of the mask over adjacent gray levels. You can use the resulting mask with various transformations to alter the color or brightness of the shadows, mid-tones, or highlights of an image.

## **Feathering**

If you don't feather the edges of a mask, the boundary between the transformed and unmodified regions of the input image will often be disturbingly obvious. Feathering blends the effects of the transformation around the edges and creates a more natural result. The larger the feather radius, the more the edges of the mask are feathered.

For most transformations that adjust brightness and color of an image, gradual feathering that falls off out from the regions you are modifying usually creates the best results (4-10 pixel radius).

When using the composite transformation, a smaller feather radius (1 to 4 pixels) usually works better.

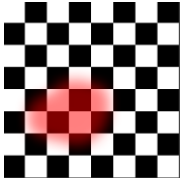
When using the blur transformation to remove grain from the sky without blurring the rest of the image, try using the range tool to select the sky region and then feather with a negative radius and sudden falloff to avoid blurring the horizon line or any foreground elements silhouetted against the sky.

To feather a mask more than is possible using the feathering tool, you can use the Blur tool with a large radius.

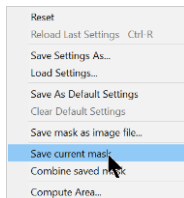
## Building complex masks using Save/Combine

The two commands in the settings menu: Save Current Mask and Combine Saved Mask work in tandem to let you perform complex masking operations. For example, say you draw an area with the freehand tool and then blur it. Next you want to draw another area with the freehand tool and blur that, possibly with a different radius, and then you want to combine the two blurred regions. Here is how it works:

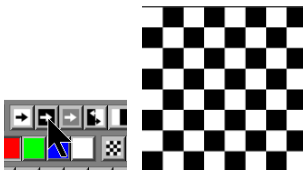
- 1) Draw and blur the first region



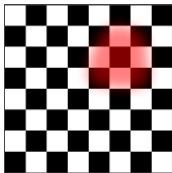
- 2) Save it



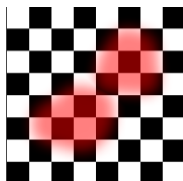
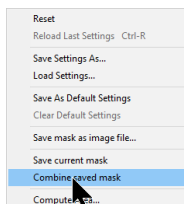
- 3) Set the entire mask to black



- 4) Draw and blur the second region



- 5) Combine the saved mask



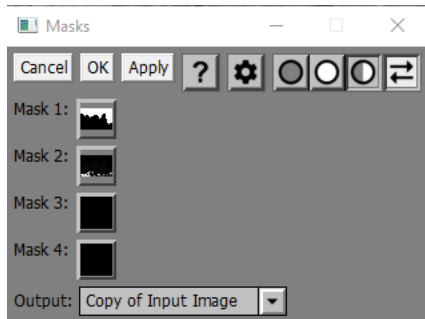
## The Masks transformation

Using the Mask dialog box, the only way you can save a mask as an image is to save it as an image file and then reload it. This effectively freezes the mask in the state it was in when you saved it and it will not update if the base image changes.

There are also some complex masks you cannot create using the Save/Combine mask tools.

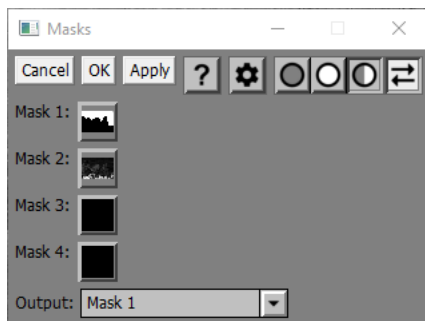
The Masks transformation lets you overcome both of these limitations, and also lets you create up to four different masks from the same input image.

### Using the Masks transformation to create multiple masks from an input image



Mask 1 .. Mask 4 are Amount controls – click on them and select New Mask... to create up to four masks from the same input image. With this setting, the output image is a copy of the input image so you can proceed to use any of the masks you have created on the image without having to create a side branch.

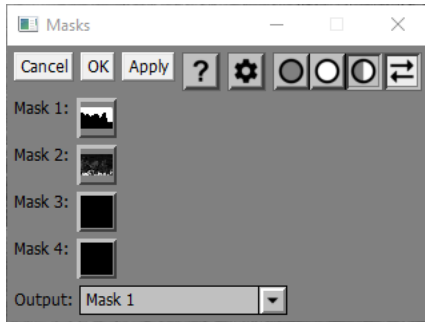
### Using the Masks transformation to convert a mask to an image



By setting Output to one of the four masks, the output image of the Masks transformation will be a copy of the selected mask. You can then use any of Picture Window's transformations to operate on the mask as an image.



## Using the Masks transformation to combine two masks



By setting Output to one of three possible operations (Mask 1 + Mask 2, Mask 1 – Mask 2 or Mask 1 & Mask 2), you can combine masks 1 and 2 to create a new composite mask.



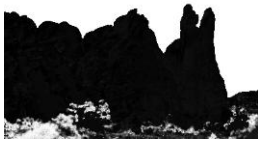
Input Image



Mask 1



Mask 2



Mask 1 + Mask 2

Mask 1 + Mask 2 produces a mask that combines the lightest parts of the two masks – this adds together the two masked areas.

Mask 1 – Mask 2 subtracts mask 2 from mask 1 – this removes the masked areas of mask 2 from mask 1.

Mask 1 & Mask 2 produces a mask that combines the darkest parts of the two masks – this isolates the overlap between the two masked areas.