

Fixing Mild Coma

Ever have an otherwise great image with crappy stars at the edges, due to coma, that force you to crop more than you'd like? Here is a way to save a little more of that field of view that you worked so hard to capture. This is intended to deal with mild coma, not pincushion distortion. That can be fixed with more standard functions in programs such as Photoshop or Paint Shop Pro.

Take a look at this image of M100 captured by Scott Rosen from his dark sky backyard.

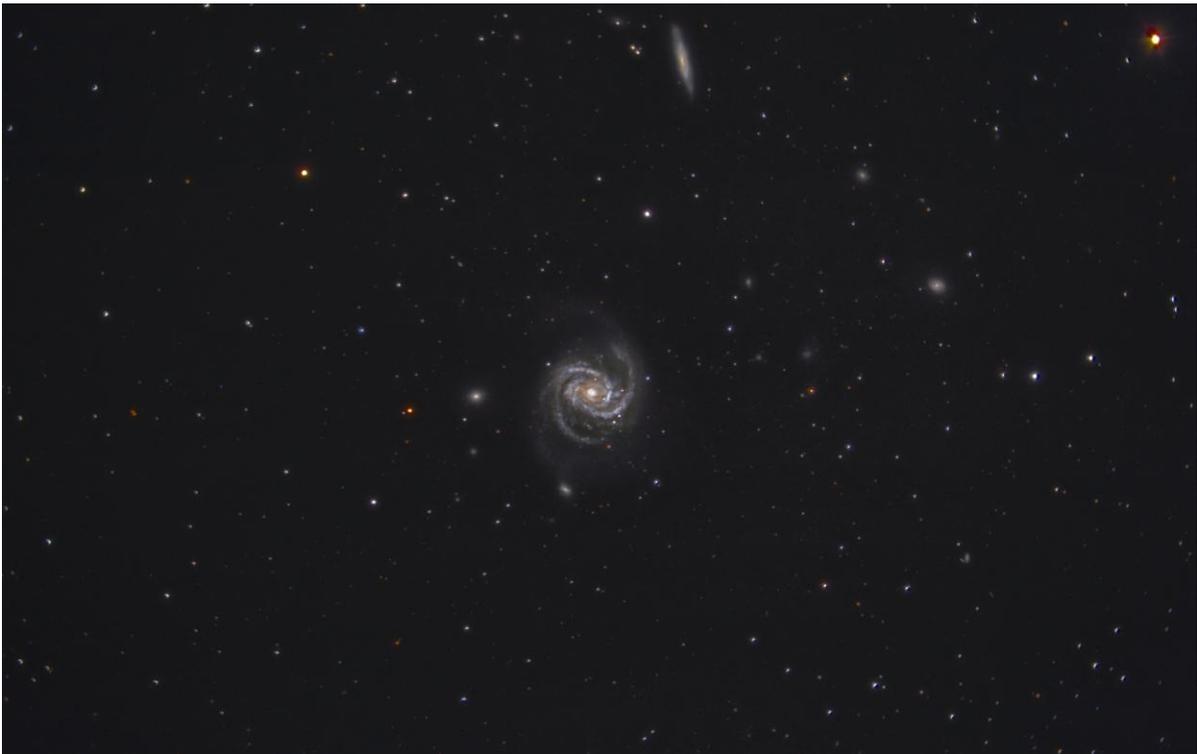


Figure 1 - M100 with coma

Zooming in on the upper left corner we can easily see what the coma from Scott's uncorrected SCT has done to the stars.



Figure 2 - Upper left corner

The stars have that crescent look that usually results in cropping to avoid spoiling the final image.

Here is a technique that helps improve the stars to the point where cropping may not be necessary. The first step is to over stretch the image to fill in some of the missing parts of the stars.

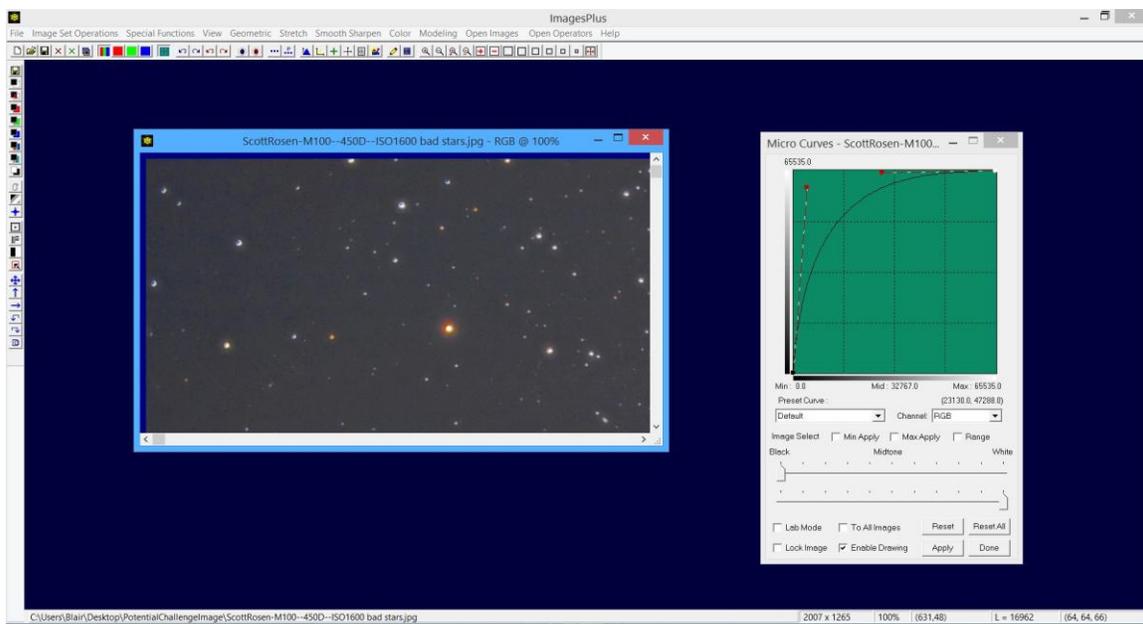


Figure 3 - Stretching the image

Once the stretch has been applied it is time to use the stretched image to make a star mask. You can use your favorite tool or technique; here I'm using the feature mask tool in Images Plus to produce a star mask with a few clicks.

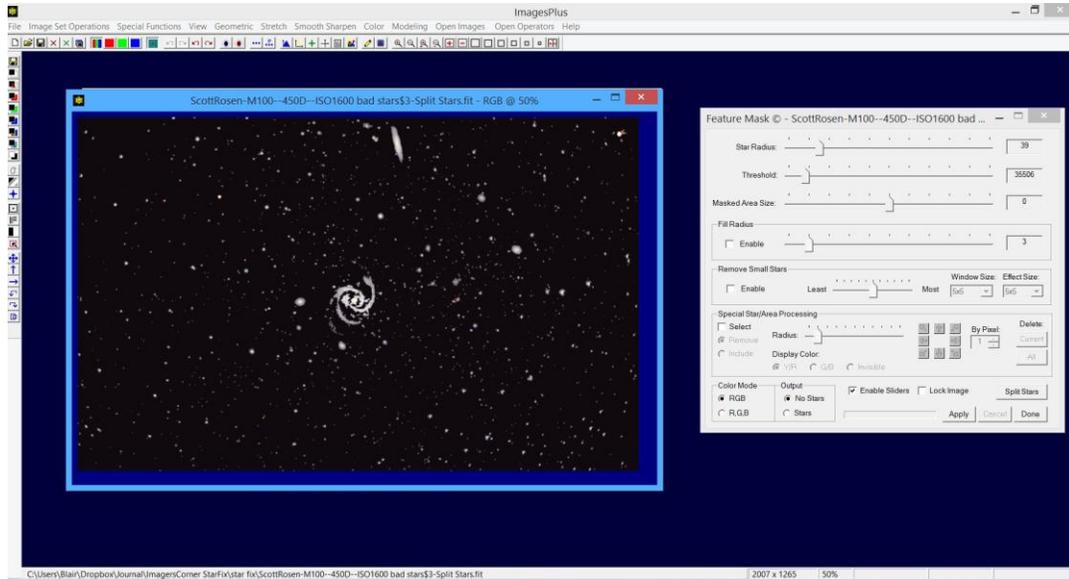


Figure 4 - Making the star mask

Now it's time to do a little creative painting to remove anything that is not a star as the feature mask leaves a few details from the galaxy given the setting used. After a little painting we have the star mask with most of the middle painted black. This is not really an issue as the final mask needs the center removed anyway.



Figure 5 - Star mask after painting

The star correction needs to be applied to the outer edges of the image while leaving the central regions untouched. This can be accomplished simply by painting the central area black, but the technique I like to use is to reduce the brightness using levels with a control point mask in Images Plus.

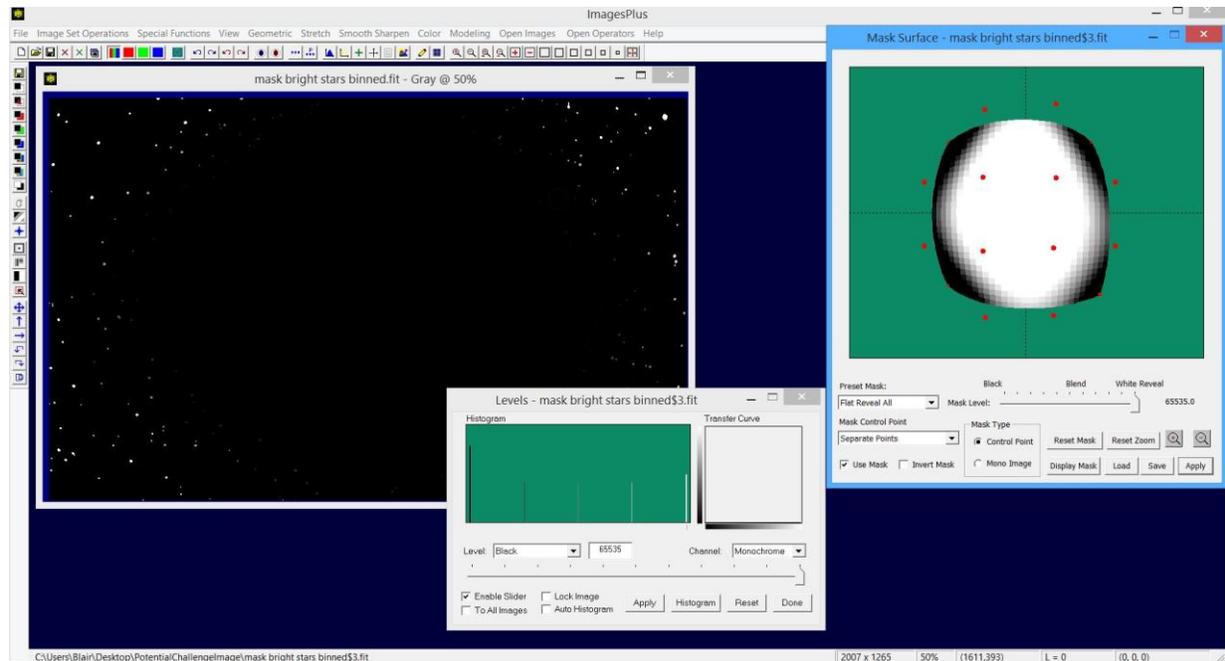


Figure 6 - Making the final mask

This has the advantage of blending the effect from full at the edges to none in the central part of the image.

With the mask complete it is time to fix those stars. One method to do this is to increase the brightness until the whole star appears white. With the mask applied the effect will be limited to the edges producing almost round stars. The problem with this is that the star colour is removed. A better technique is to use some function that fills in the dim parts of the star while preserving the star colour. It turns out that there is just such a function available on most image processors, it's called dilation. Dilation fills dimmer pixels with the value of brighter surrounding pixels. When this is applied to the stars the bright area is blended into the dim area and the mask limits the effect to stars at the edges of the image.

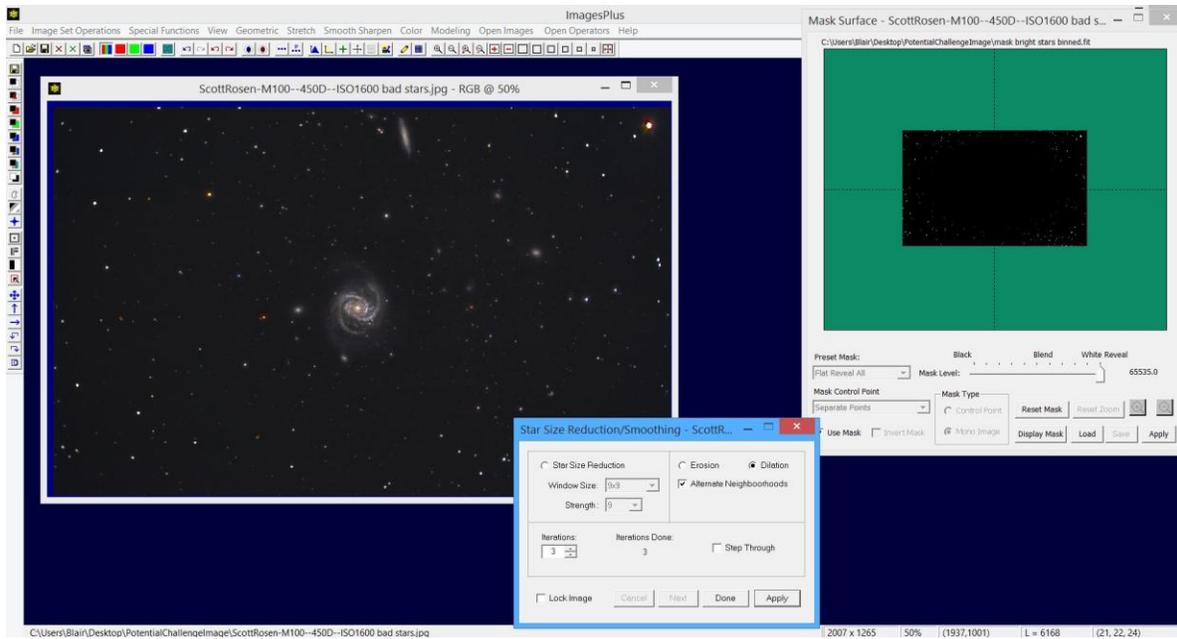


Figure 7 - Masked dilation

This leaves an image with round, but somewhat large and abrupt stars at the edges as shown below.



Figure 8 - Corrected but large stars

To fix this apply a star reduction or erosion with the same mask used for the dilation. To fix the abrupt edge left on the stars use a simple small radius Gaussian blur, again with the mask to limit the effect to the edge stars producing the image below.



Figure 9 - Final image

Zooming into the same upper left corner we can clearly see the improvement.



Figure 10 - Zoom of final image

Compare this with the same corner of the original.



Figure 11 - Zoom of original image

While not perfect, the image is now good enough to avoid any extreme cropping and preserves star colour across the full field of view.