

# Histograms, Levels, and curves

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# Purpose of the talk

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- Explain histograms and how to interpret them
- Use Histograms for contrast and luminosity corrections
- Use histograms in-camera
- Used to guide levels and curves adjustments

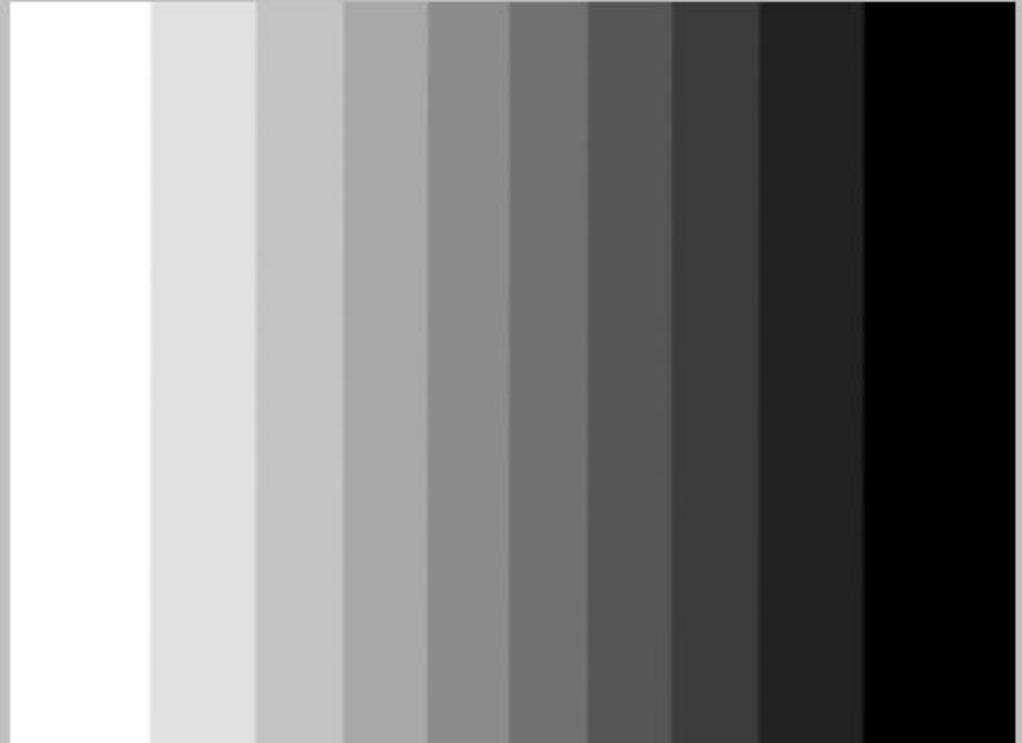
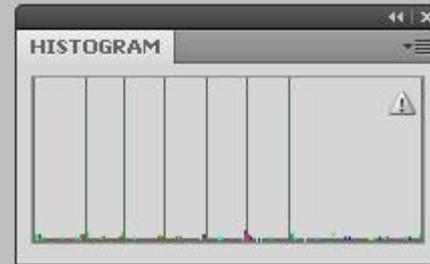
# Luminosity Scale

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- Luminosity is the brightness of a pixel
- Luminosity is always depicted in a histogram converted to an 8 bit jpeg so there are  $2$  to the  $8^{\text{th}}$  power = 256 levels of luminosity.
- Luminosity = 0 means totally black
- Luminosity = 256 means totally white
- This scale is the x (horizontal) axis of the histogram

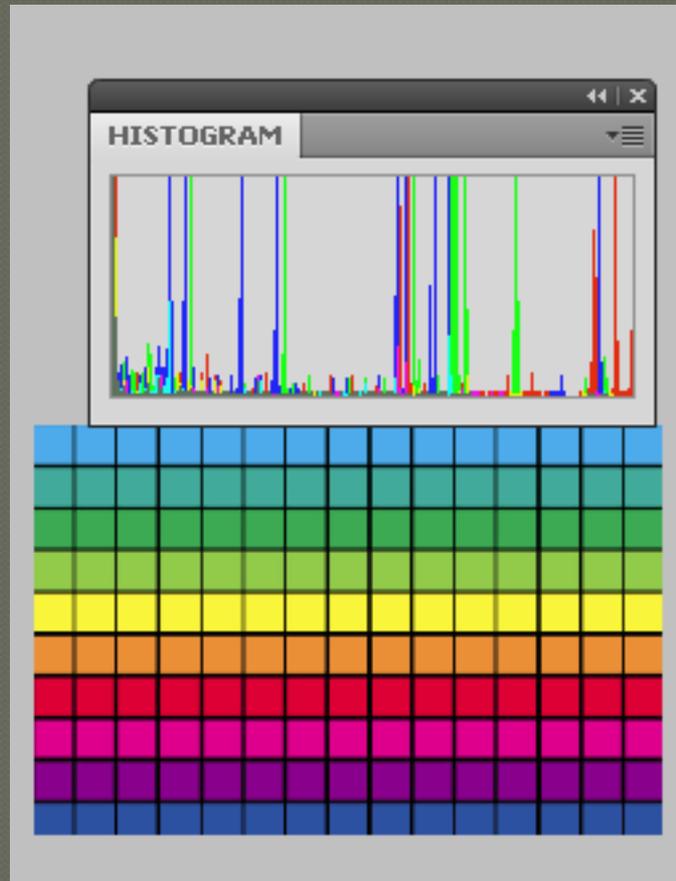
# Histogram of Gray scale stepper

Here there are only discrete Luminosity values which show up as peaks in the histogram



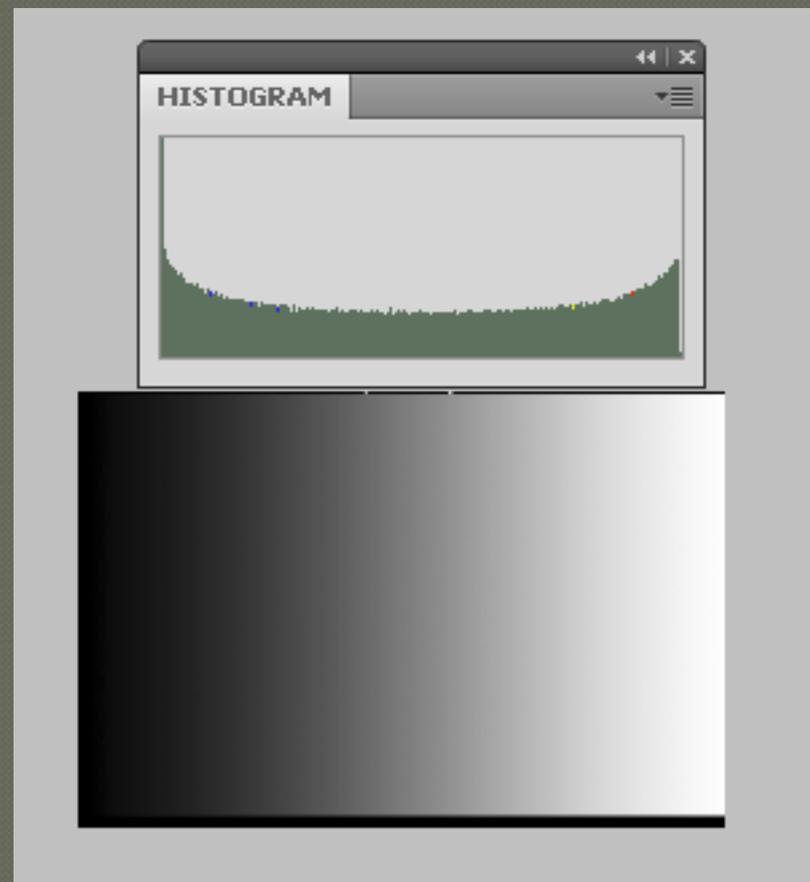
Discrete colors yield single peaks just like the gray scale stepper does

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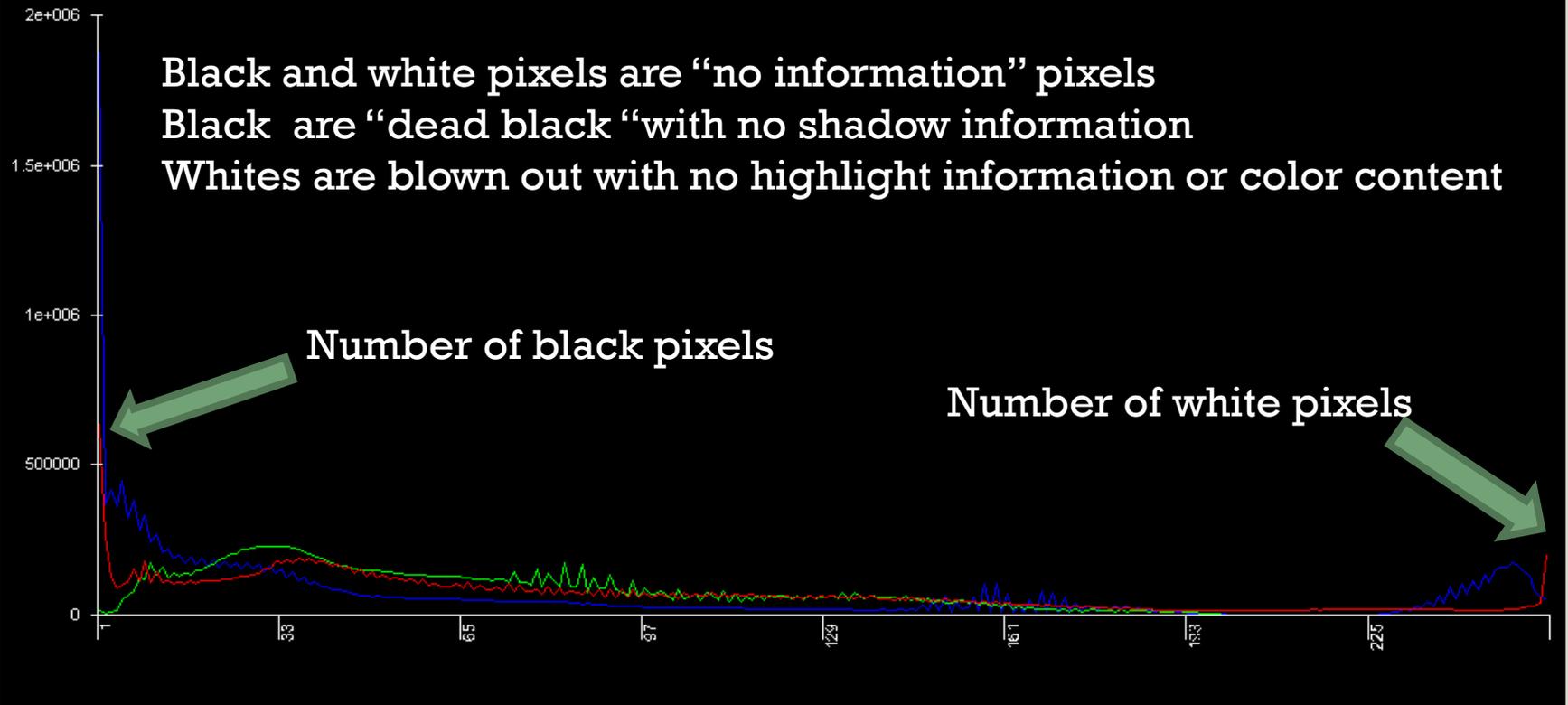
# Gradient gray scale Histogram

Here the grays form a smooth gradient  
Across all luminosities so the histogram  
Shows values across all portions of the  
Graph.

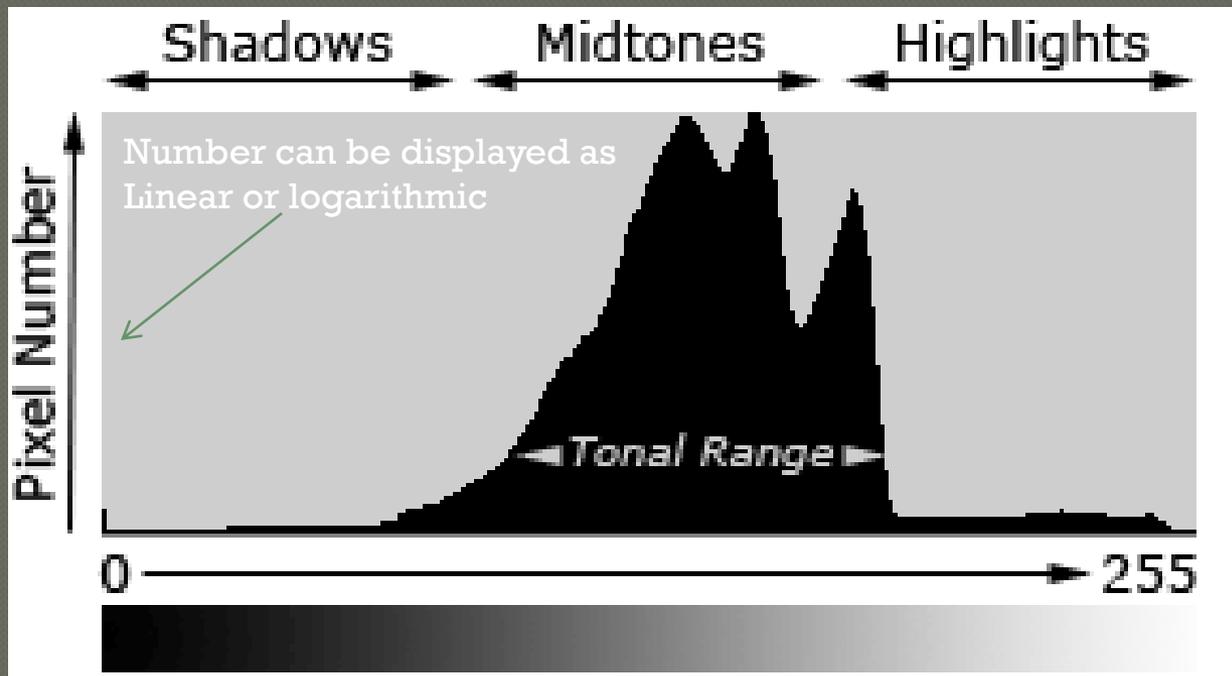


# Elements of Histogram

Black and white pixels are “no information” pixels  
Black are “dead black” with no shadow information  
Whites are blown out with no highlight information or color content



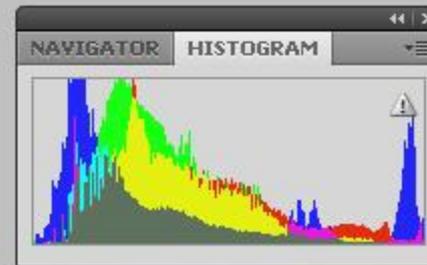
# Elements of Histogram-continued



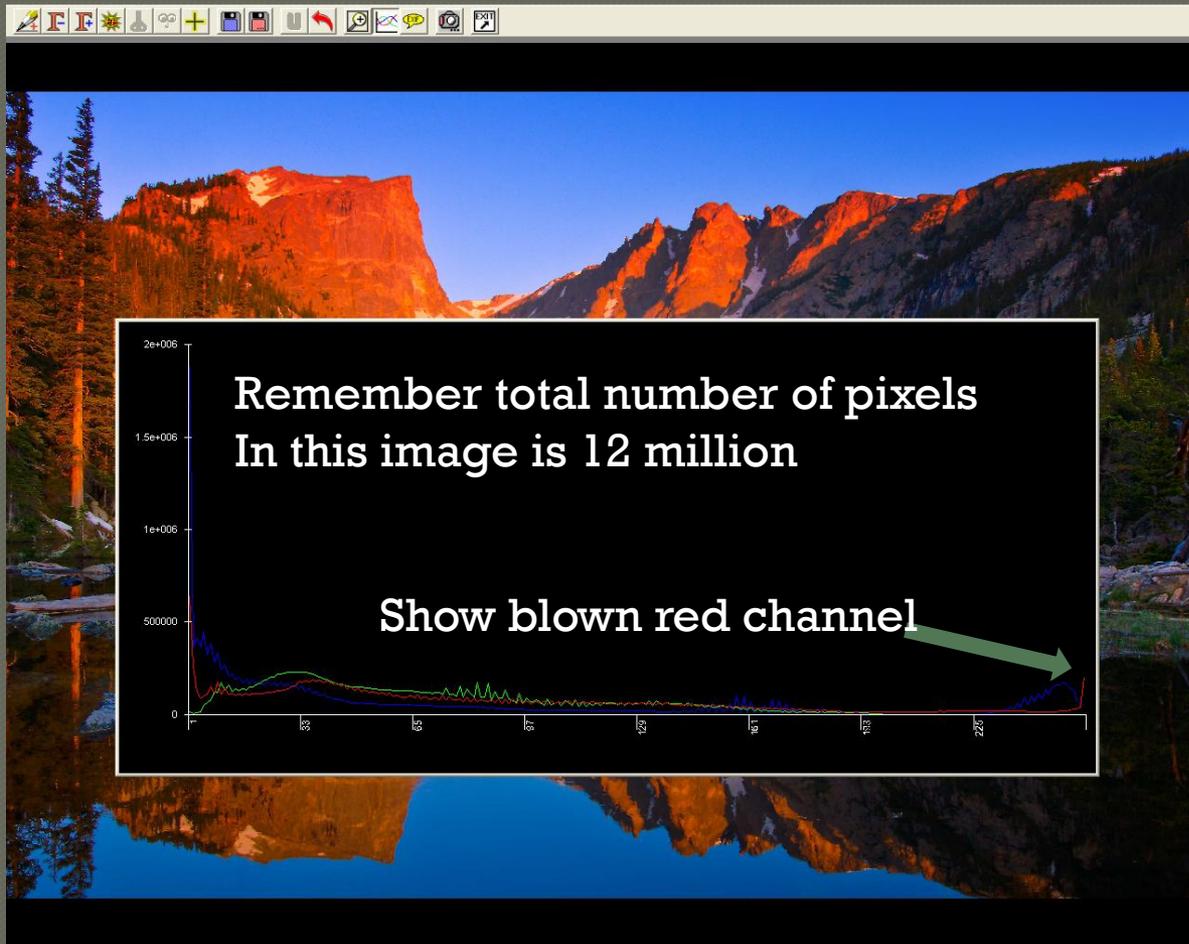
<http://www.cambridgeincolour.com/tutorials/histograms1.htm>

# RGB Histogram

- Most info
- Can tell you if a color channel is blown out.



# Same histogram just different vertical axis – This one is linear



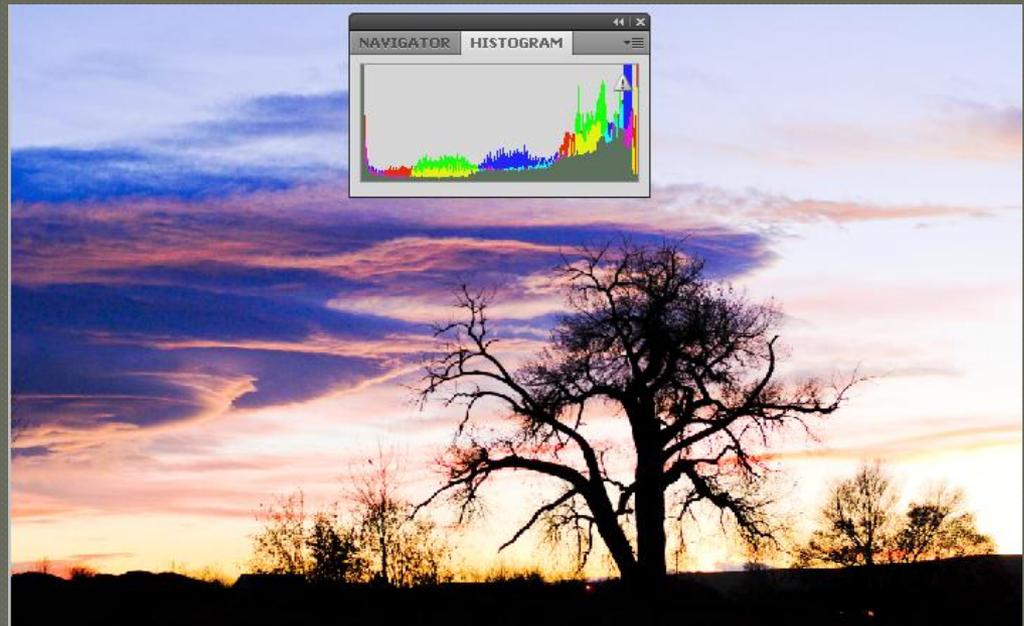
# More info on the black and white histogram end pixels

Bad image and histogram.

Piled up on left side indicates black area with no information

Piled up on right indicates blocked whites with no information

Large areas of white and black tend to be distracting and usually show washed out color contribute to low contrast in areas on interest

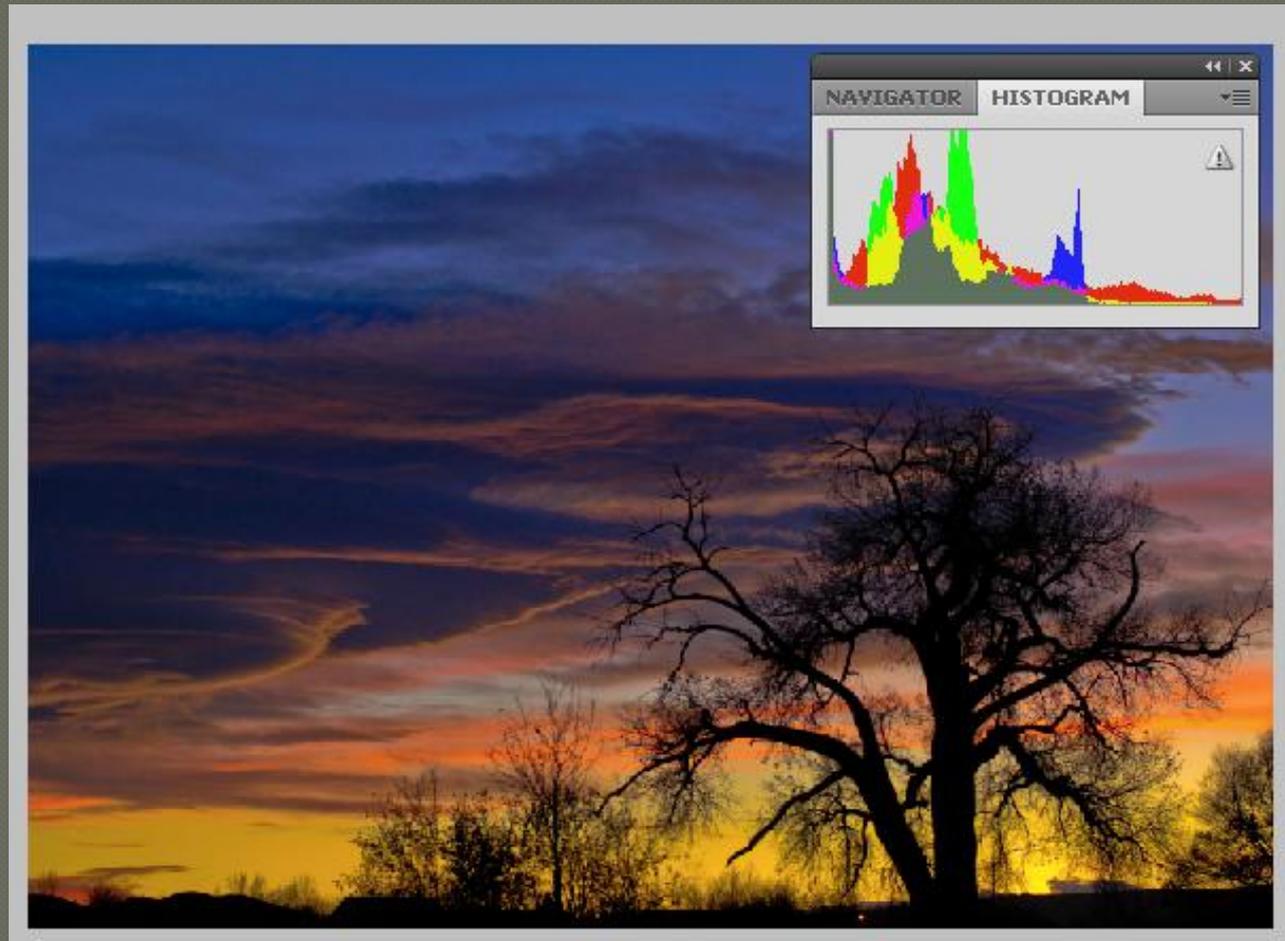


Same image but processed to remove blown whites and cropped to remove some blacks

Remember removing  
Blacks and whites is  
Equivalent to  
removing  
Totally washed out  
Colors...

The RGB colors each  
Go from white to  
black  
Independently with  
The vibrant colors in  
The middle of the  
Histogram

Note: this image was  
taken in raw. If it had  
been a jpg image it  
could not have been  
fixed

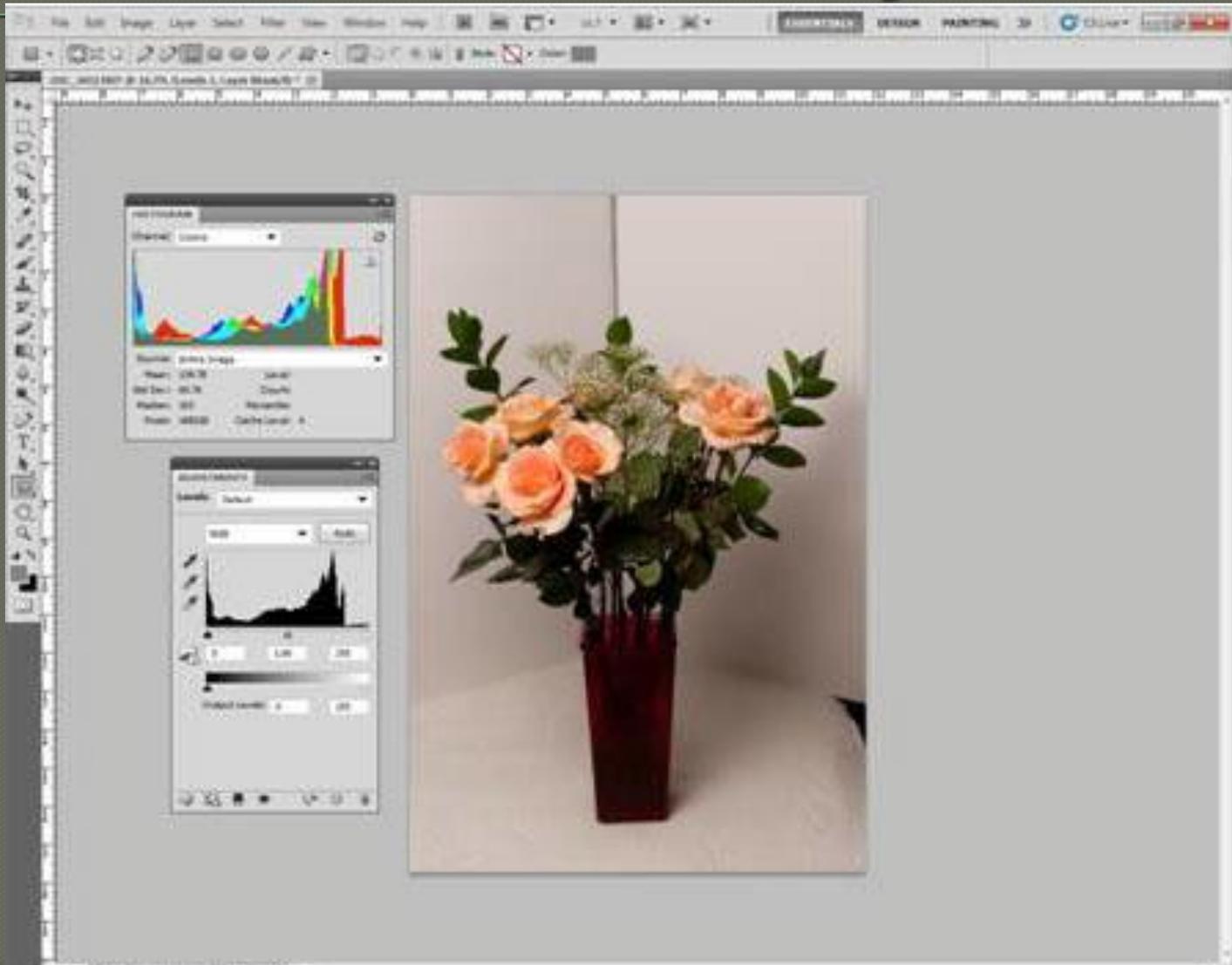


# Level Adjustments

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- ◉ Normally there are 3 sliders below the histogram to adjust the white and black points in the image. Center slider adjusts the mid tone's luminosity

# Levels Adjustment





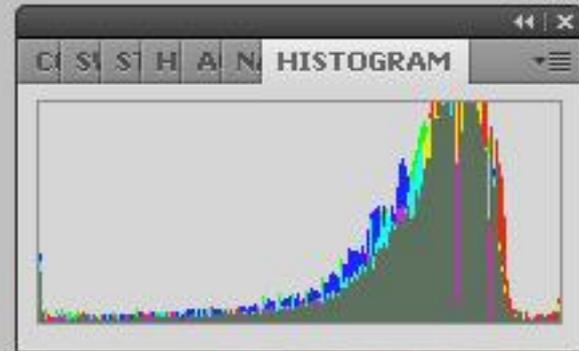
Run PS

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# High Key Image

Blacks only in dog's spots and ears

Histogram shows dominance of light end of the luminosity scale



# Ansel Adams in developing his Zone system said

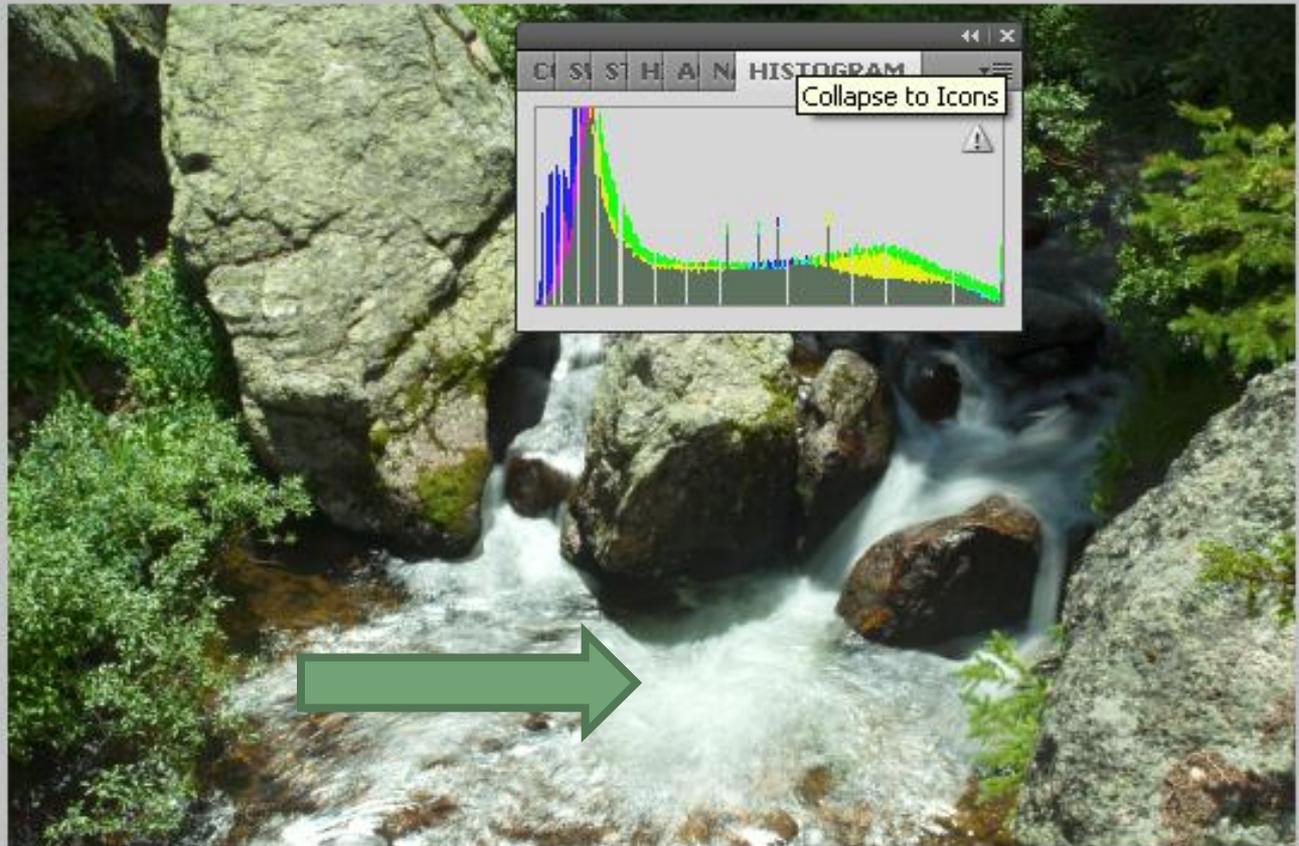
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- Small amount of black and white adds vibrance (we call that snap today) to an image.
- Black in deep shadows is OK
- White in specular reflections like water sparkling in the sun or reflections off of chrome OK

# Specular Reflections

Secular  
reflection  
OK if just a  
small  
Amount of the  
Image.

This is too much  
area at 255



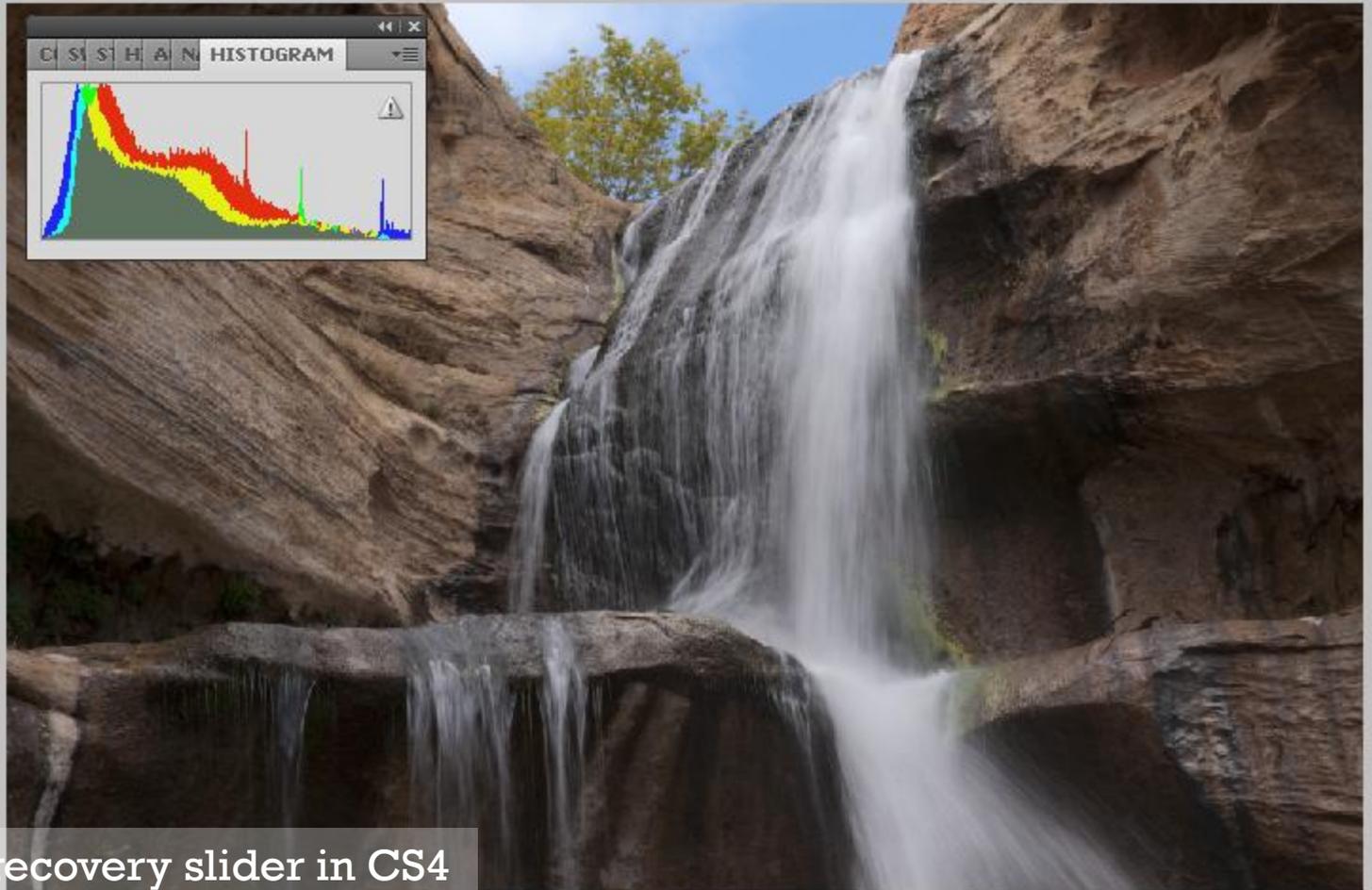
# Blown highlights



Blocky looking  
water

draws you eye to  
areas of no  
information

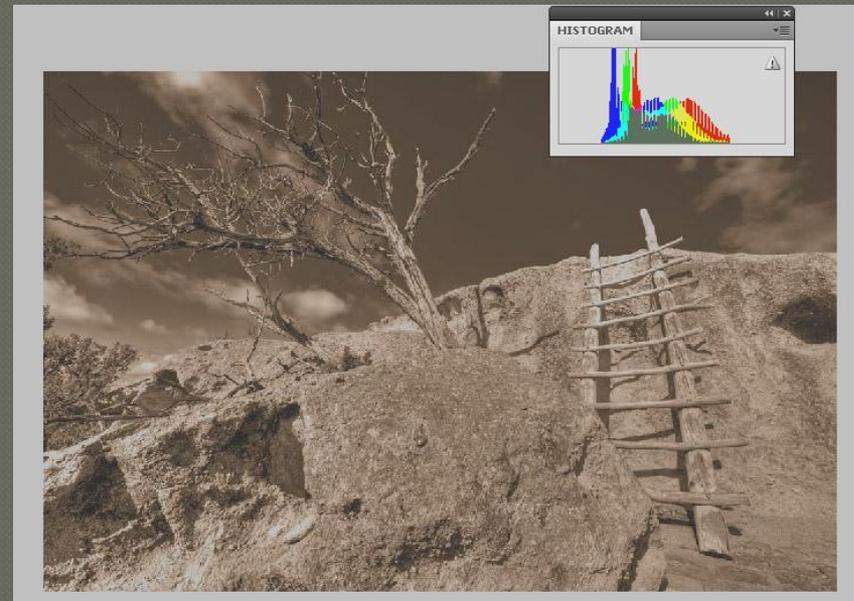
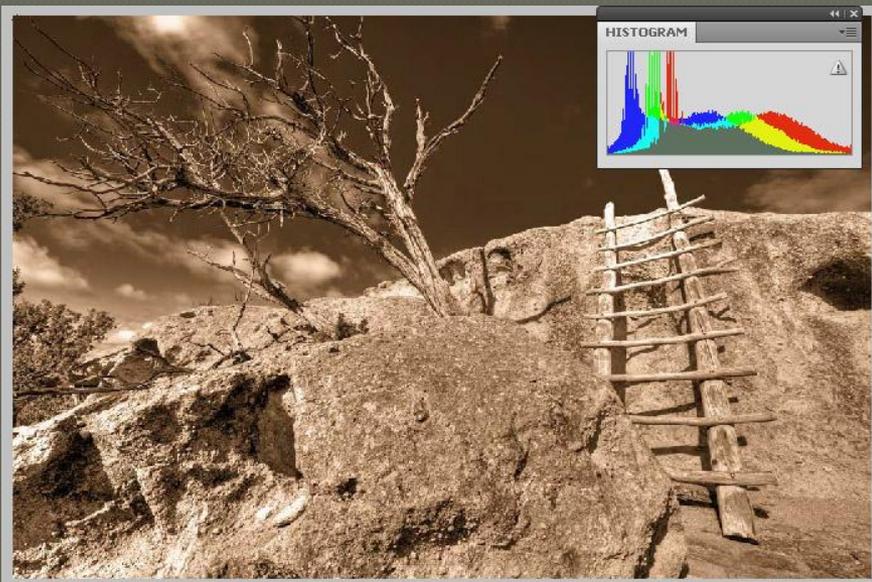
# blown water corrected



Corrected with recovery slider in CS4  
You now to see the details in  
The water falls patterns

# Histogram tells how much information is in the image

- Histogram with dead left or right
  - May be correctly exposed for the intent of the photographer
  - Will have less information



# Most common problem in digital photography...

Blown clouds



# When to use histograms

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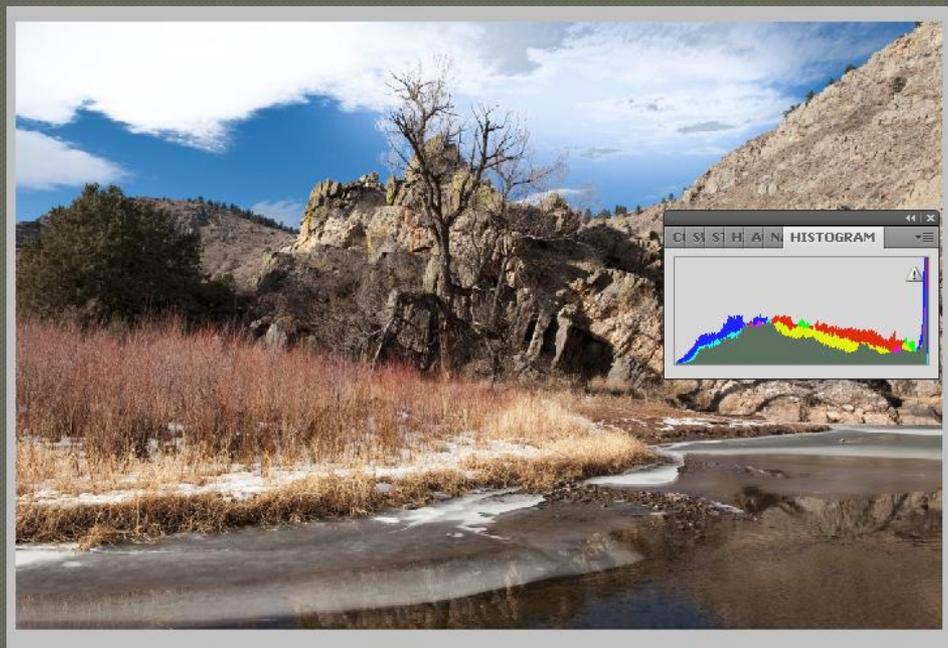
- ⦿ All the time... in shooting and post processing
- ⦿ Shooting-it's the best exposure meter. That's why you see professional photographers "chimping" looking at their LCDs after they shoot. They are looking at their histogram.

# How to use the histogram for perfect exposure

Take a shot and look at the histogram

Now adjust your EV to negative values

-.5ev, -1.0ev, -1.5ev etc till you get the right side of the histogram un-pegged.



# Result of EV= -1.5

Notice there is  
Texture in clouds

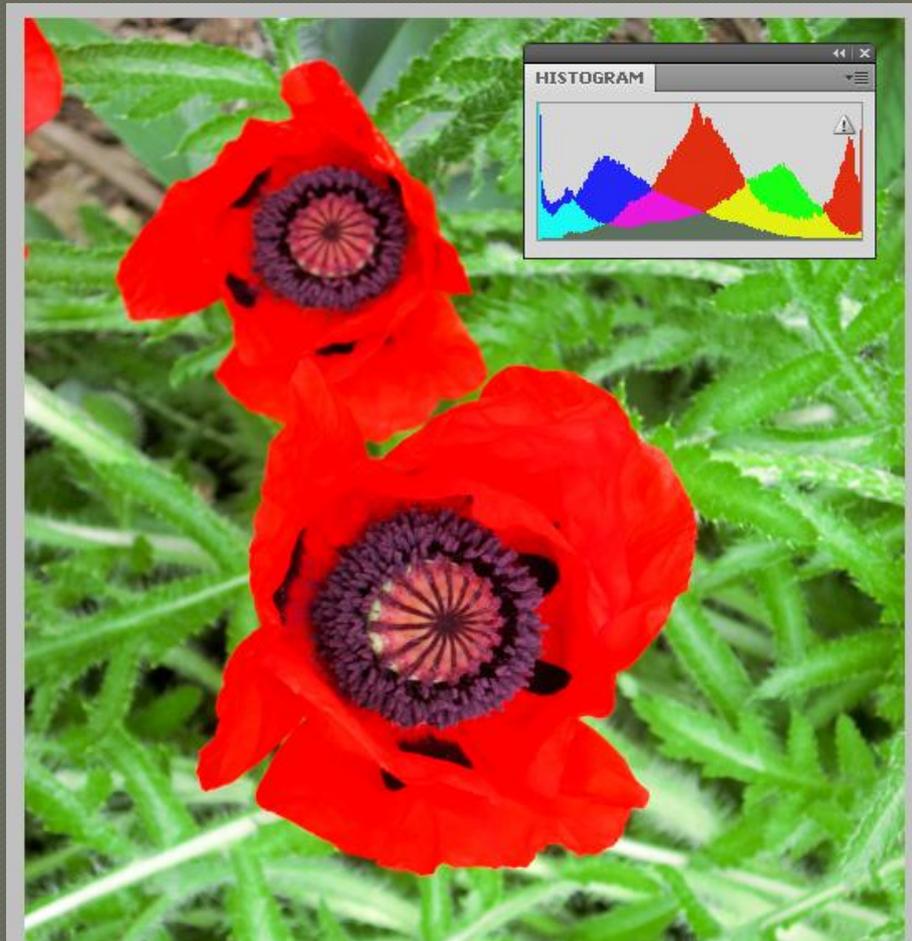
Histogram is classic  
“good histogram”



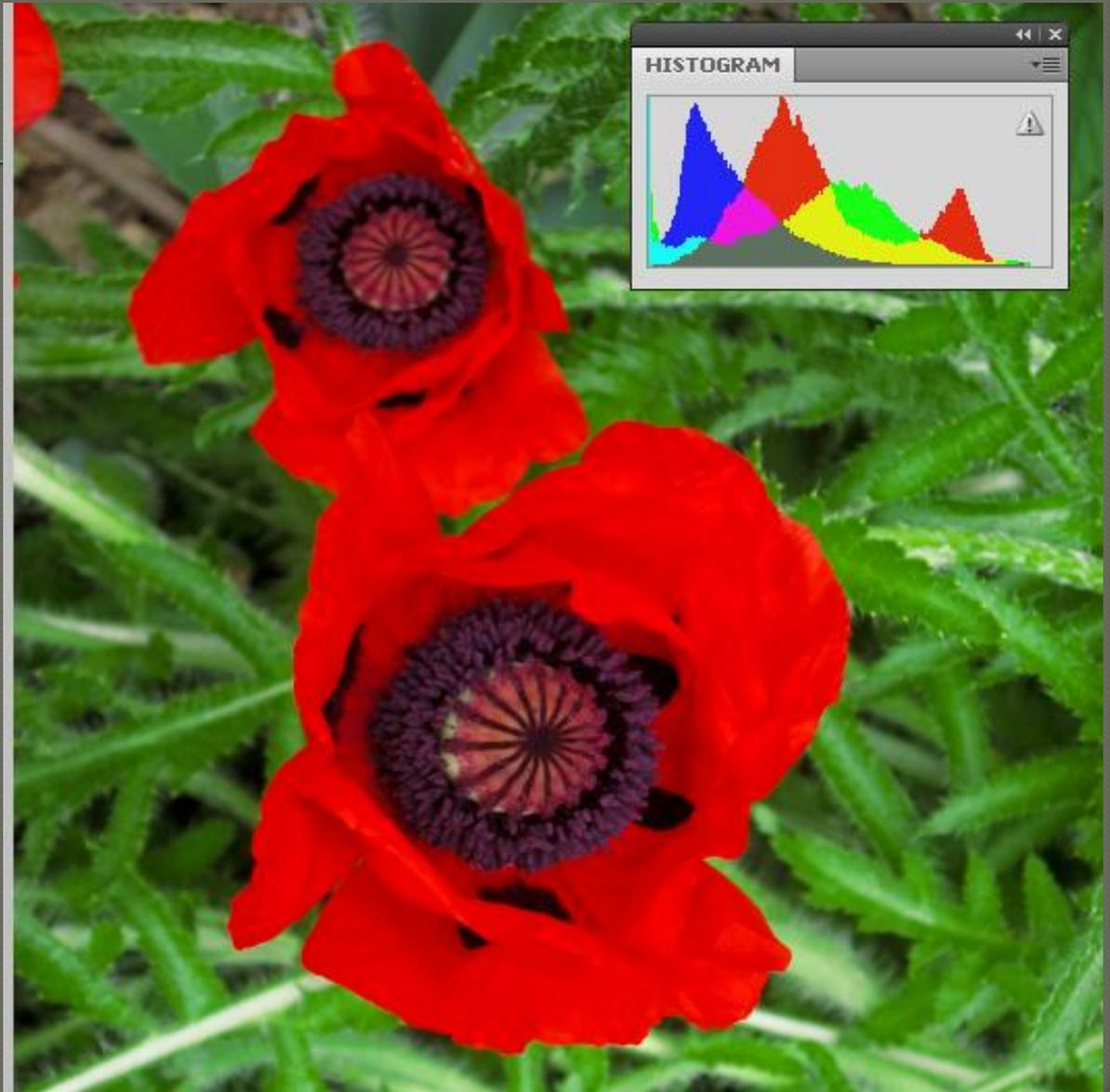
# Another Common Problem

## Blown out primary color in flowers

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Now detail in red flower  
Are apparent



# What if your using a point and shoot without EV compensation?

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- Most P&S cameras have a half press function where focus and exposure can be locked. So...
- Point your camera at the brightest part of the image...in this case the sky and clouds.
- Half press and hold
- Move your camera back to the picture composition you want to shoot and full press..Now look at the histogram again.

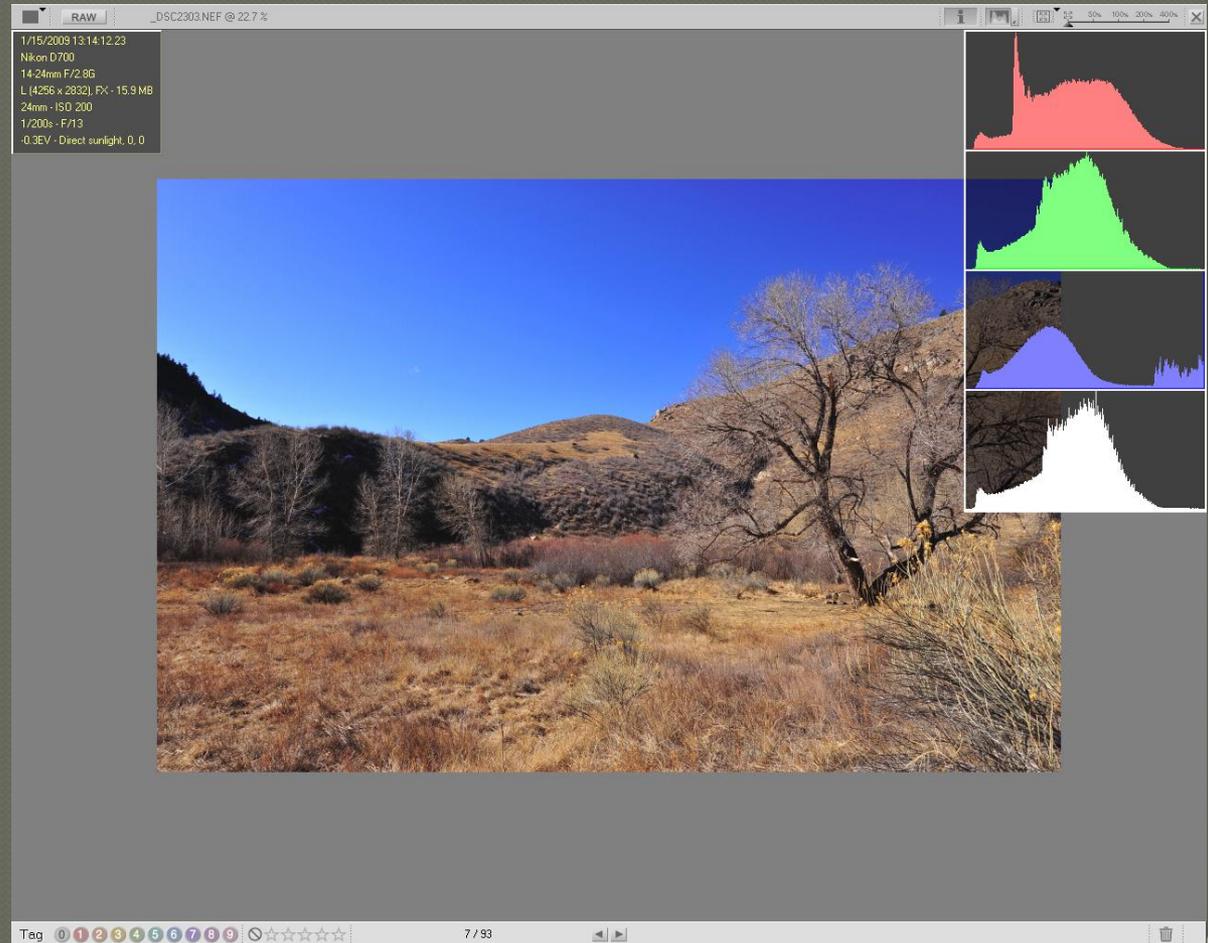
# Other ways of adjusting with the Histogram

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- Zoom in or walk in closer to your scene to exclude bright or dark areas.
- Ansel Adams advice was, "remove sky from your images unless the sky is the point of interest. Sky has little informational content and expands the dynamic range of the image beyond what can be handled by processing or the camera when clouds or haze are present."

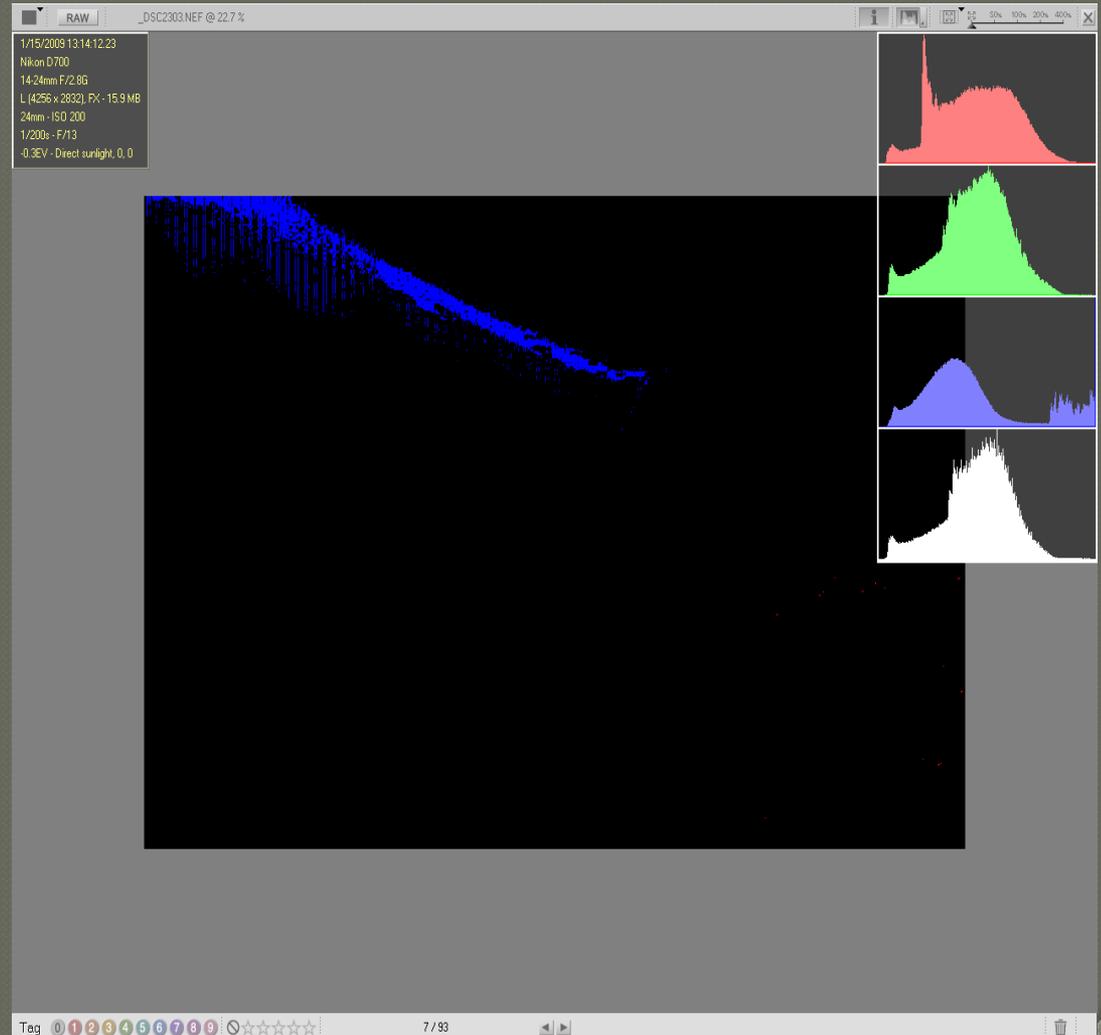
# Gray scale histogram can miss blown channels

Blue channel is “blown”  
but the luminosity  
histogram doesn’t show it.



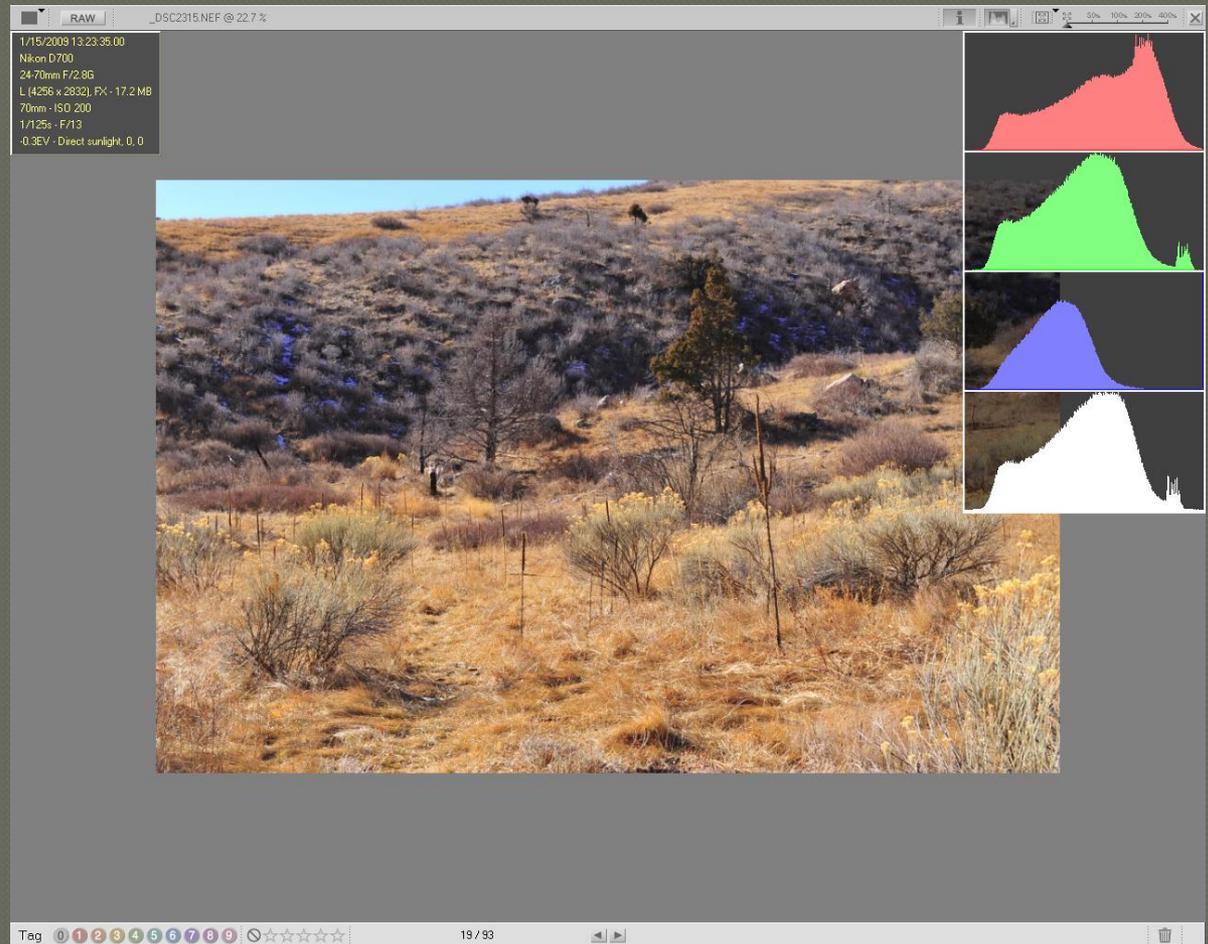
# Previous image blown areas

Blue shows blown area  
On previous picture



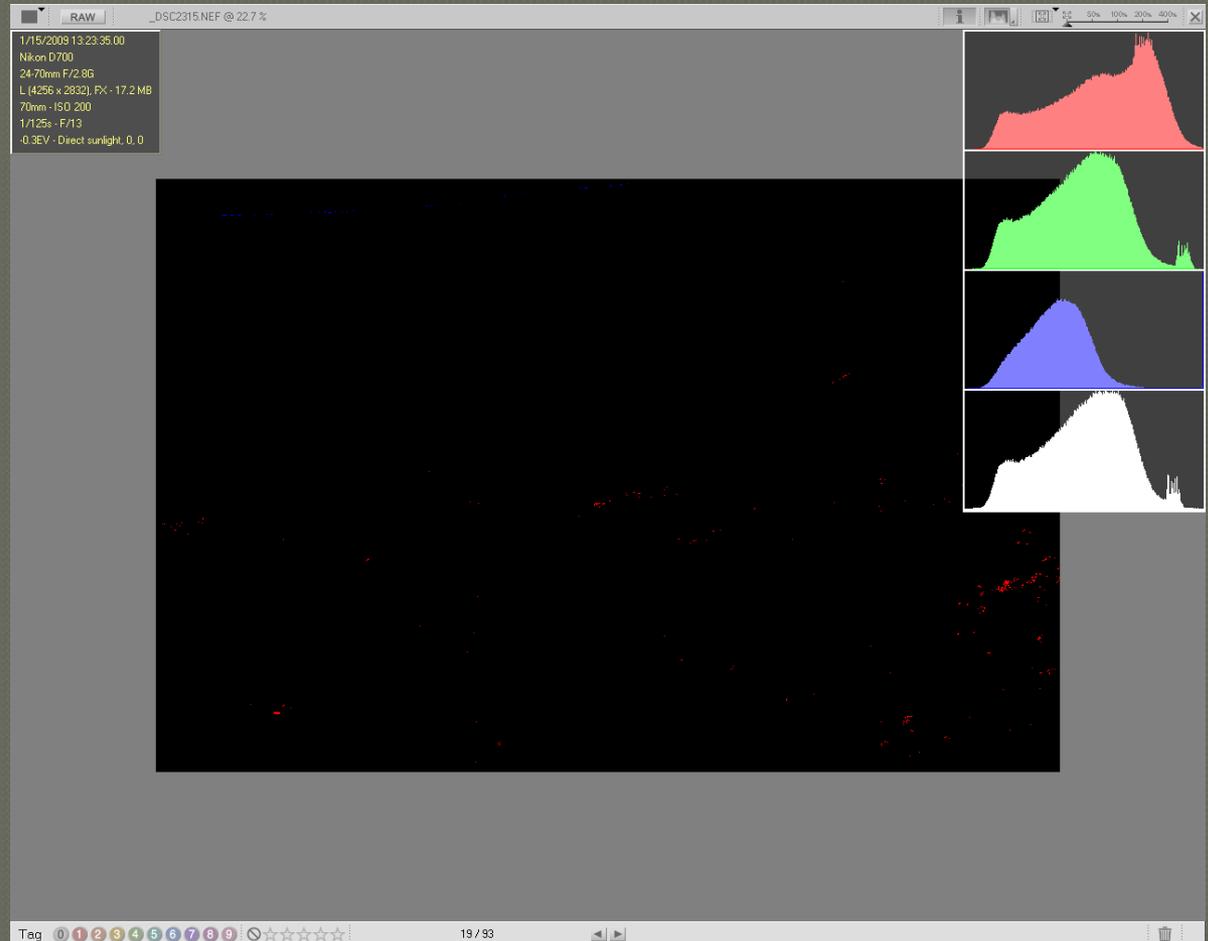
# Some blown areas are acceptable

Notice red histogram  
Just touching the white  
Right margin

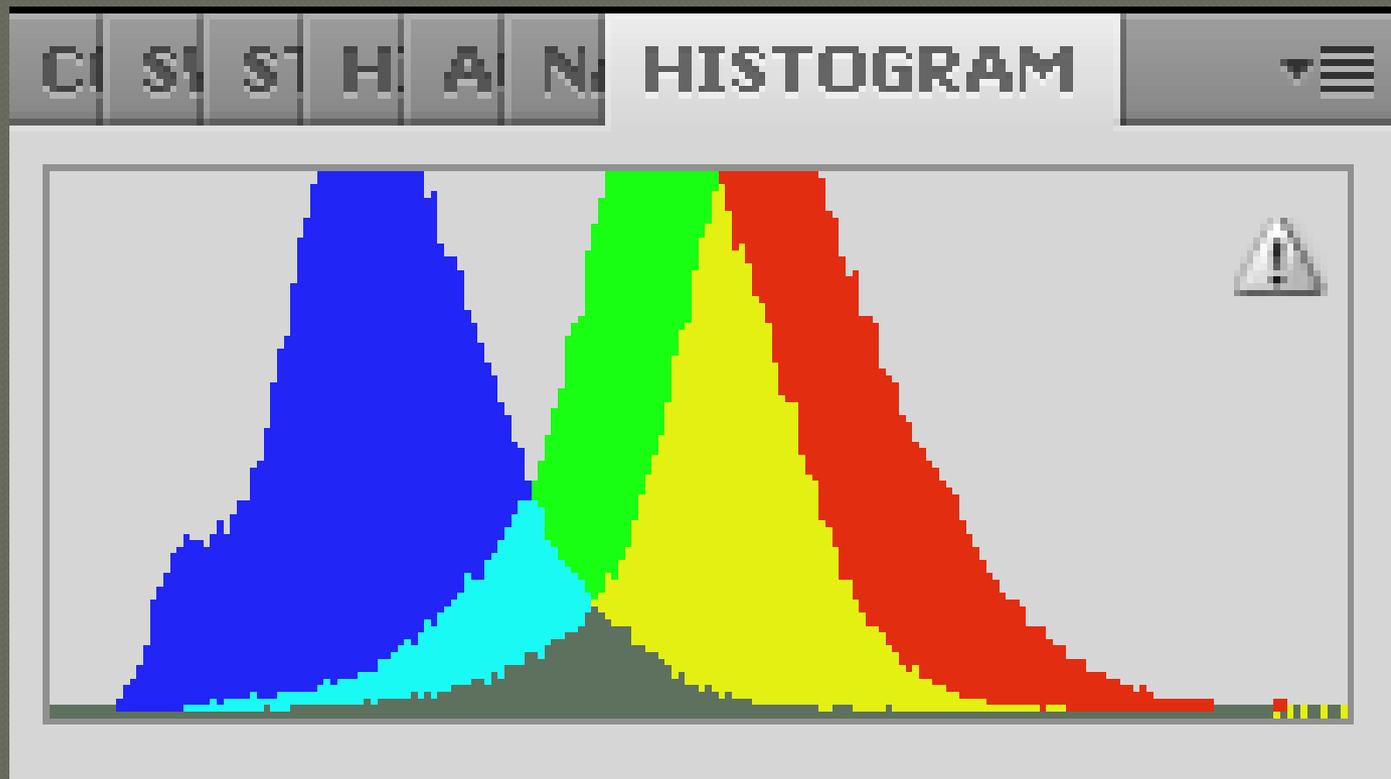


# Red channel blow

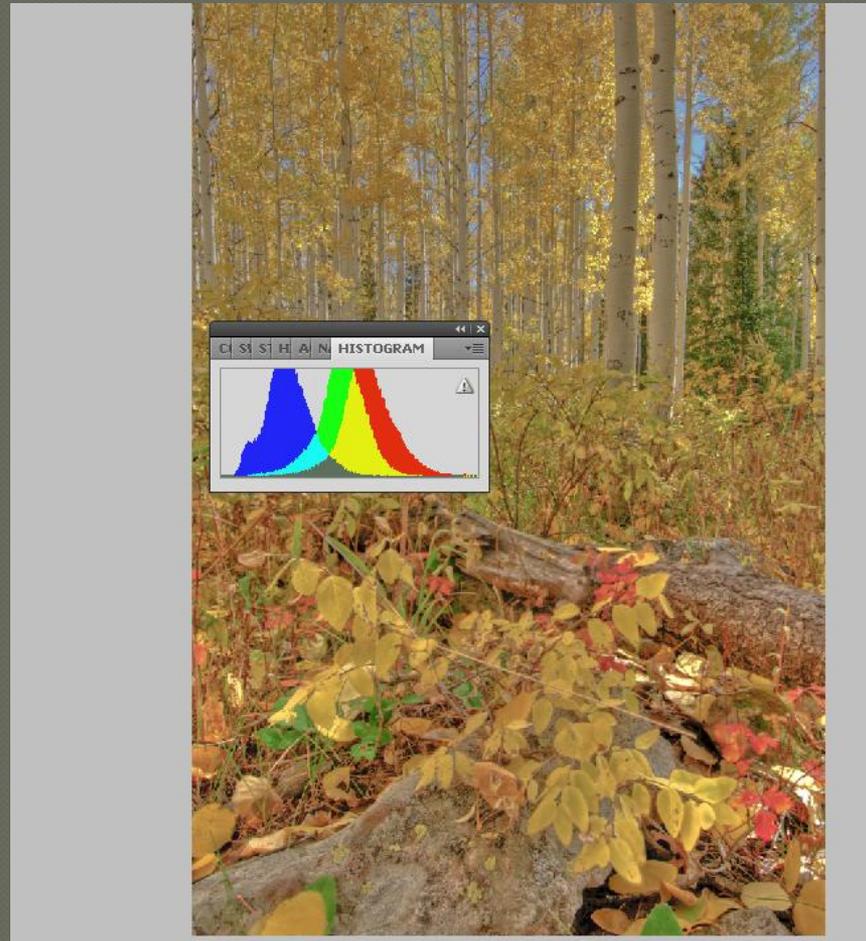
Here blown areas in red are acceptable because they don't show large contiguous areas in the image.



# Good or Bad Histogram?



# Bad Histogram...Washed out color



# Good Histogram

Lack of white end of histogram is OK if the scene is of a deep shades with rich saturated colors. If you attempted to move the histogram to the right you would lose the mood of the shot.

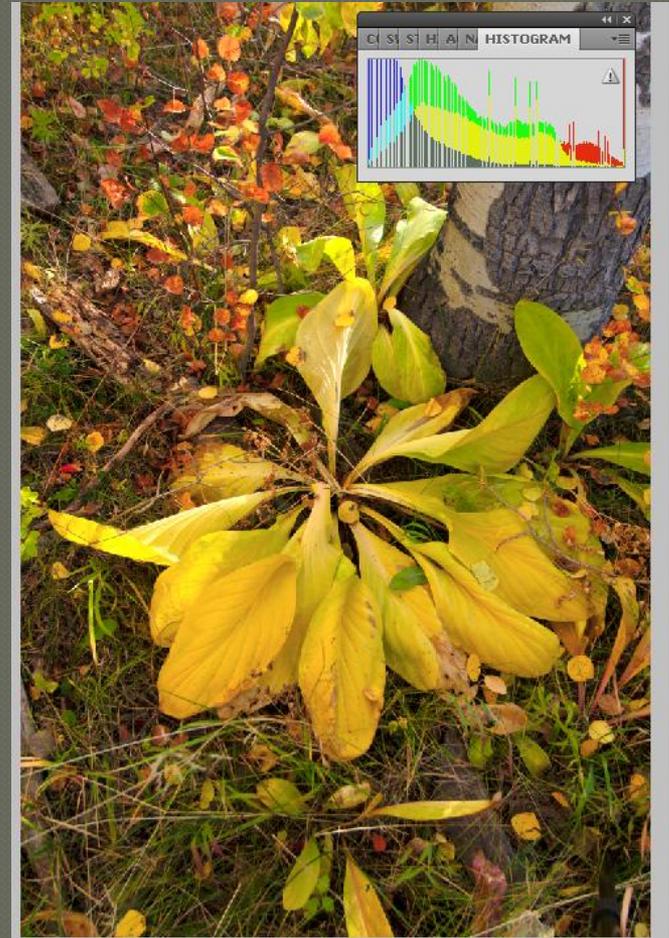


# Post processing move the the right

Colors are still rich but it now looks like the image was taken in open shade. The mood of the first image is missing.

This image may print better then the more moody shot.

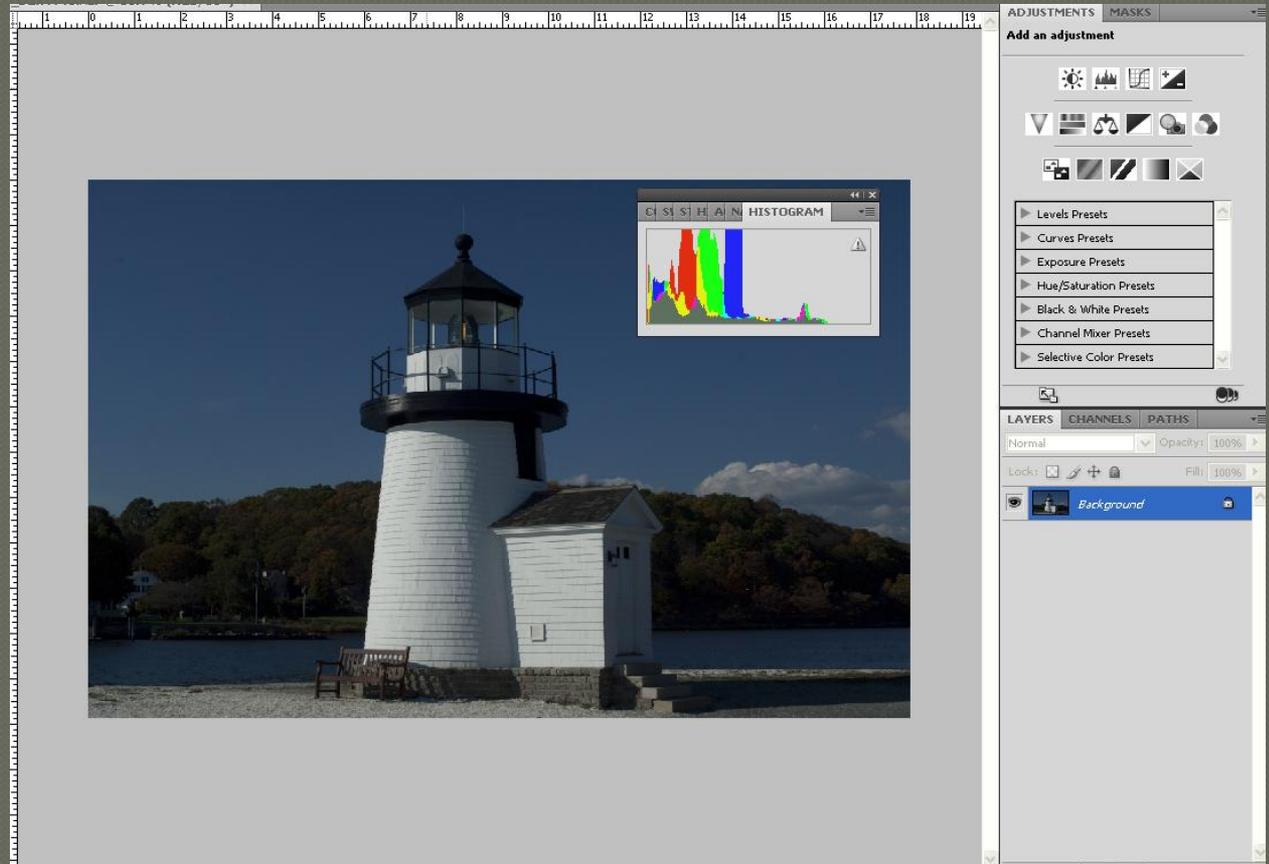
Also note the comb effect in the histogram. This is due to post processing stretching of the image to the right so gaps in certain luminosities occur. This may or may not be apparent in viewing or printing the image.



# Post Processing using Histogram

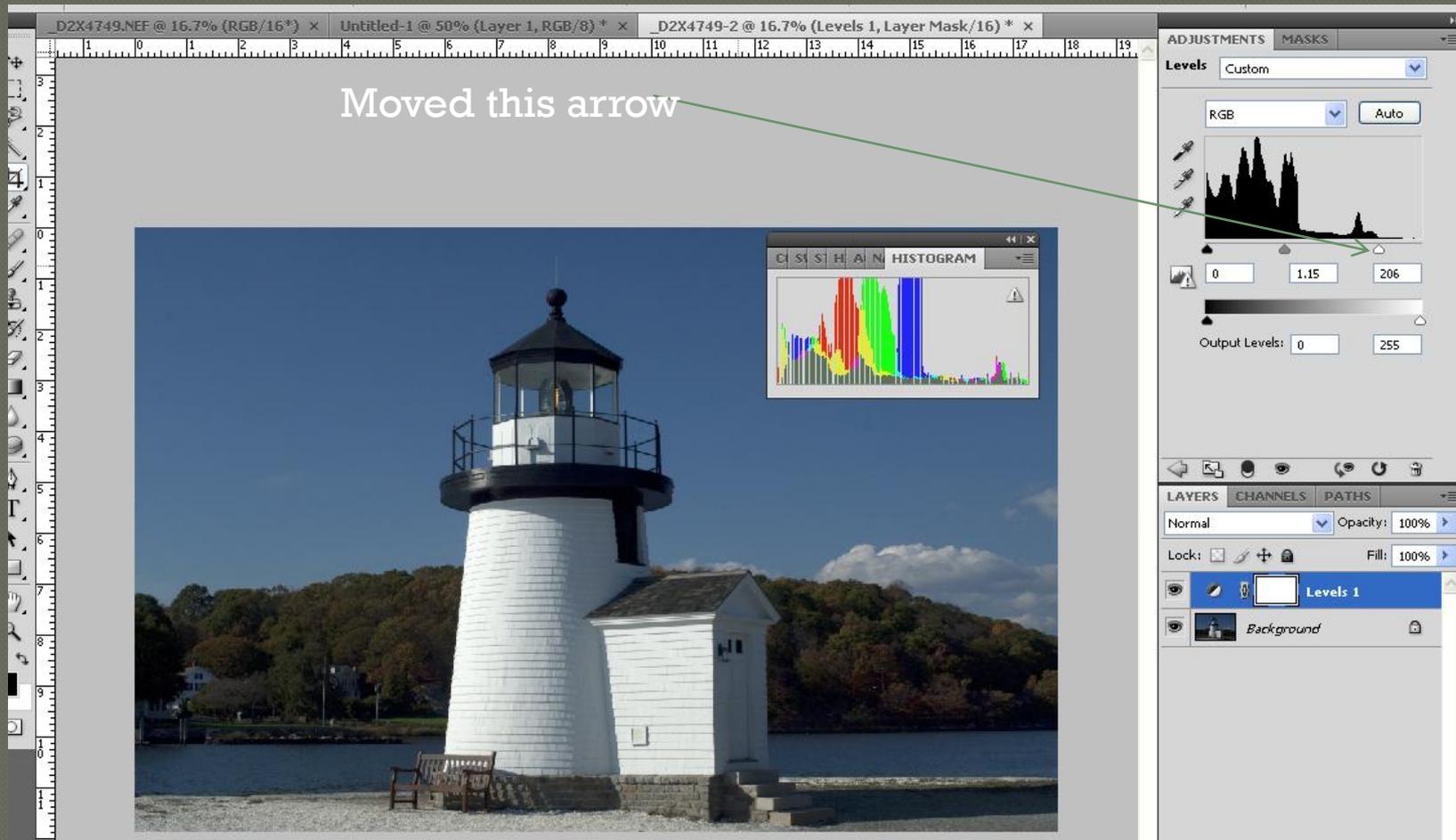
Image seems muddy with no snap.  
Histogram shows no high luminosities

Image needs the white paint and the cloud to be brighter.



# Levels Adjustment Move right arrow to left to beginning of image

Moved this arrow



The screenshot displays the Photoshop interface with a lighthouse image. The Levels adjustment panel is open, showing a histogram with a peak on the right side. A green arrow points from the text "Moved this arrow" to the right arrow on the histogram. The Levels panel shows the histogram with the right arrow moved towards the left, and the "Output Levels" are set to 0 and 255. The Layers panel shows a "Levels 1" layer selected.

ADJUSTMENTS MASKS

Levels Custom

RGB Auto

0 1.15 206

Output Levels: 0 255

LAYERS CHANNELS PATHS

Normal Opacity: 100%

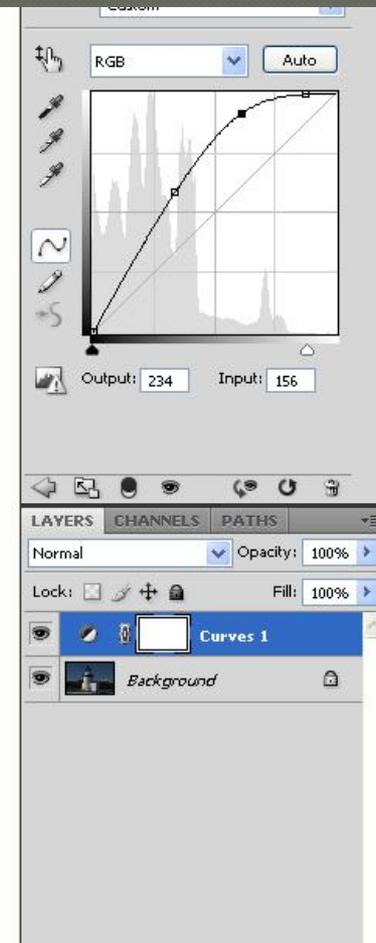
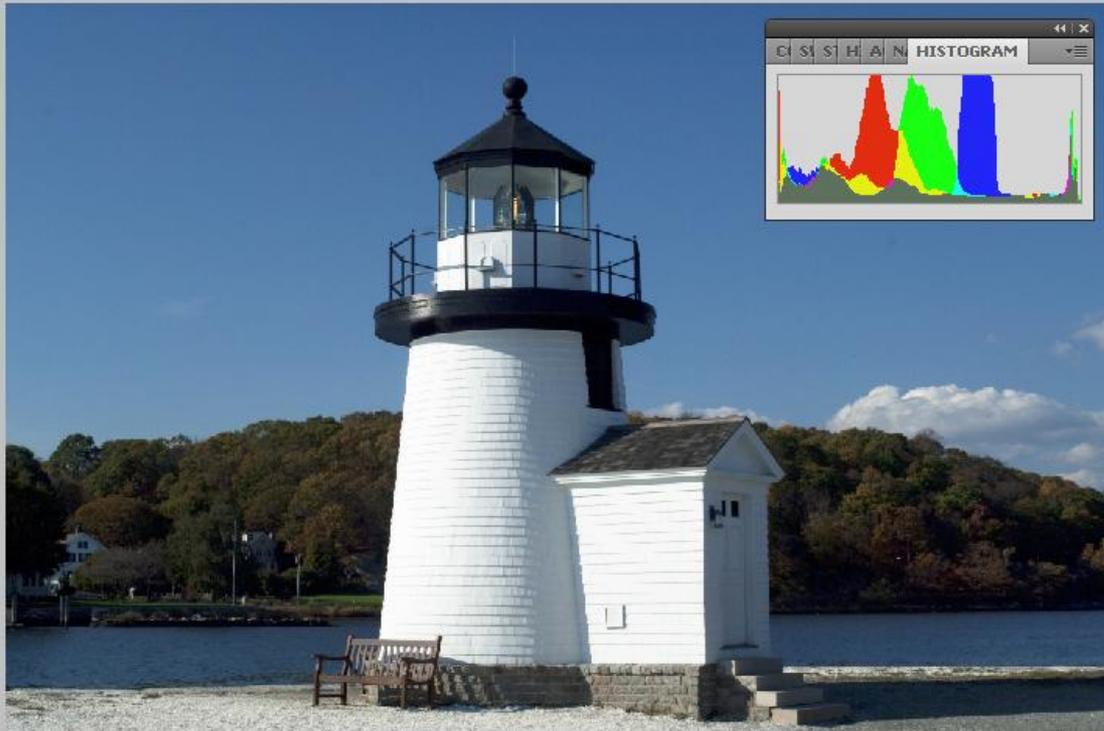
Lock: Fill: 100%

Levels 1

Background

# Curves adjusted to fill in Histogram

Note dead area in bright end of histogram

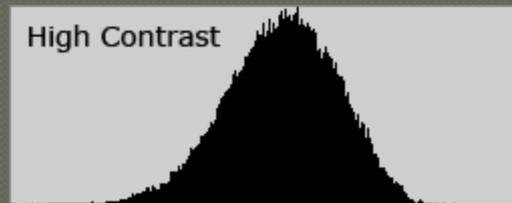
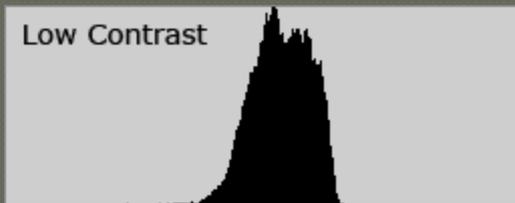


# Histogram also shows Contrast

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The broader the base of the histogram the more contrast the image has.

Also note that the areas left and right of the histogram curve represent areas of no data. In the low contrast curve there are no shadows or high lights in the image.



# Conclusion

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- Histograms should be used in combination with your exposure meter to get perfect exposures
- Allow you to fine-tune exposures using EV compensation
- Can guide you while post-processing (levels and curves) to find over and under exposed or “blown” areas of you images. Blinkies also show blown areas.