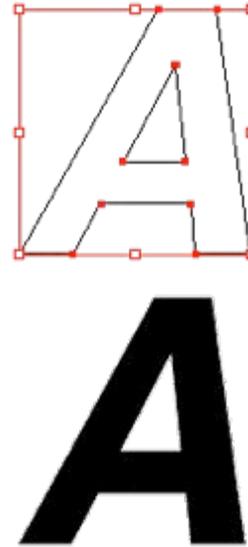


# GRAPHICS

Raster



Vector



A raster image uses a grid of individual pixels where each pixel can be a different color or shade. Raster images are composed of *pixels*.

Vector graphics use mathematical relationships between points and the paths connecting them to describe an image. Vector graphics are composed of points and paths. Additionally, vector graphics allow one to work with objects that can be manipulated.

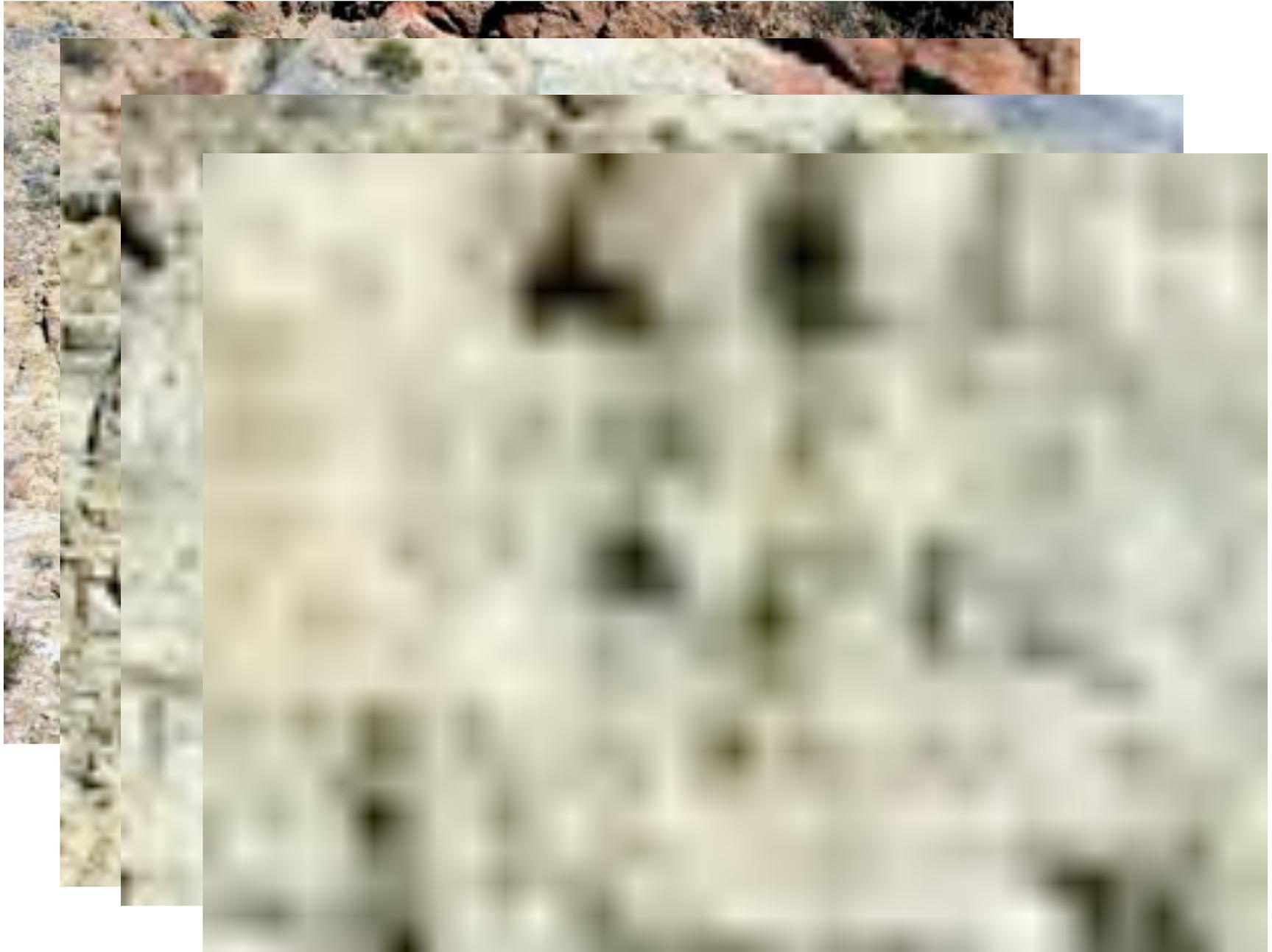
# SOME COMMON PROGRAMS

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- Raster
  - Photoshop
  - Canvas
  - Fireworks
  - Photopaint
- Vector
  - Illustrator
  - Canvas
  - Freehand
  - Fireworks
  - CorelDRAW

When you are working on graphics you should always store them in the internal format of the program you are using. Only save in other formats, such as JPEG, when you are ready to export them.

# **RASTER GRAPHICS**



## Color Depth

Color "depth" is defined by the number of bits per pixel that can be displayed on a computer screen. Data is stored in bits. Each bit represents two colors because it has a value of 0 or 1. The more bits per pixel, the more colors that can be displayed. Examples of color depth are shown in the following table:

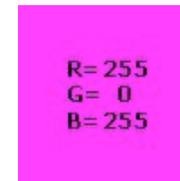
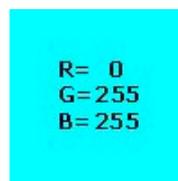
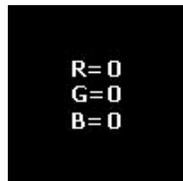
Color Depth	Num. Colors	Color Mode	Palette
1 bit	2	Indexed color	Yes
4 bit	16	Indexed color	Yes
8 bit	256	Indexed color	Yes
16 bit	32,768	Indexed color	Yes
24 bit	16,777,216	True color	No

Images are known as "True Color" where each pixel is defined in terms of its actual RGB or CMYK values. Every pixel in a true color image has 256 possible values for each of its red, green or blue components (in the RGB model) or cyan, magenta, yellow and black (in the CMYK model). Because there are 256 possible values for each RGB or CMYK component, then RGB true color would have a 24-bit color depth and CMYK true color would have a 32-bit color depth. There are millions of possible colors for each pixel in a true color image.

RGB images are derived from the 3 primary colors of red, green and blue. In 24-bit RGB color, each red, green and blue component is 8 bits long and has 256 variations in intensity. These variations are represented in a scale of values ranging from 0 to 255 with 0 having the least intensity and 255 having the greatest. When the 3 components are combined there are  $256 \times 256 \times 256$  possible combinations or 16,777,216 possible colors.

For example, white would be composed of maximum intensity of red, green and blue light (R=255 G=255 B=255) and black would be composed of zero intensity of red, green and blue light (R=0 G=0 B=0). Cyan would be composed of maximum intensity of blue and green light and zero intensity of red light (R=0 B=255 G=255). Magenta would be composed of maximum intensity of red and blue light and zero intensity of green light (R=255 G=0 B=255):

R= 255  
G= 255  
B= 255



# STANDARD EXPORT FORMATS

Only use export formats when you are exporting graphics, otherwise use a program's own internal formats to store the graphics.

- Standard Web (Display) Export Formats
  - GIF
  - JPEG
- Standard Print Export Formats
  - TIFF
  - EPS

**GIF** - Graphics Interchange Format - Images using a fixed color palette (limited to only 256 colors - not the full spectrum of colors available to your monitor). The GIF format uses compression for smaller files and faster downloads. This format is best for images with solid colors or areas of uniform color such as illustrations and logos.

**JPEG** - Joint Photographic Experts Group - Used for photographic (continuous tone) images. Unlike GIF files the JPEG format can take advantage of the full spectrum of colors available to your monitor. The JPEG format also uses compression for smaller files and faster downloads. However, unlike the compression method used in GIF files, the JPEG compression is "lossy" which means it discards data in the process. Once a file is saved in JPEG format the data is permanently lost. If you want all the image data available for future use, save the image using no compression or "lossless" compression and make JPEG copies from it.

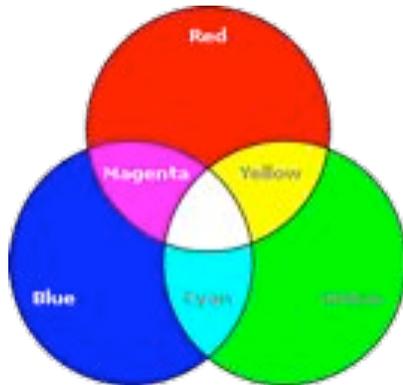
**TIFF** - Tagged-Image File Format - Used for rastermaps only. The TIFF format is supported by virtually all graphics applications. Special version for maps and map images.

**EPS** - Encapsulated PostScript® - A file format used for both vector graphics and bitmaps. EPS files contain a PostScript description of the graphic data within them. EPS files are unique in that you can use them for vector graphics, raster images, type or even entire pages.

# COLOR MODELS

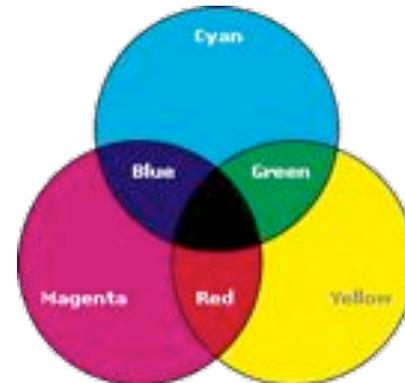
## RGB Color Model

Additive color model  
For computer displays  
Uses light to display color  
Colors result from transmitted light  
Red+Green+Blue=White



## CMYK Color Model

Subtractive color model  
For printed material  
Uses ink to display color  
Colors result from reflected light  
Cyan+Magenta+Yellow=Black



## RGB Color

The RGB model forms its gamut from the primary additive colors of red, green and blue. When red, green and blue light are combined it forms white. Computers generally display RGB using 24-bit color. In the 24-bit RGB color model there are 256 variations for each of the additive colors of red, green and blue. Therefore there are 16,777,216 possible colors (256 reds x 256 greens x 256 blues) in the 24-bit RGB color model.

In the RGB color model, colors are represented by varying intensities of red, green and blue light. The intensity of each of the red, green and blue components are represented on a scale from 0 to 255 with 0 being the least intensity (no light emitted) to 255 (maximum intensity). For example in the above RGB chart the magenta color would be R=255 G=0 B=255. Black would be R=0 G=0 B=0 (a total absence of light).

## **CMYK or "Process Color"**

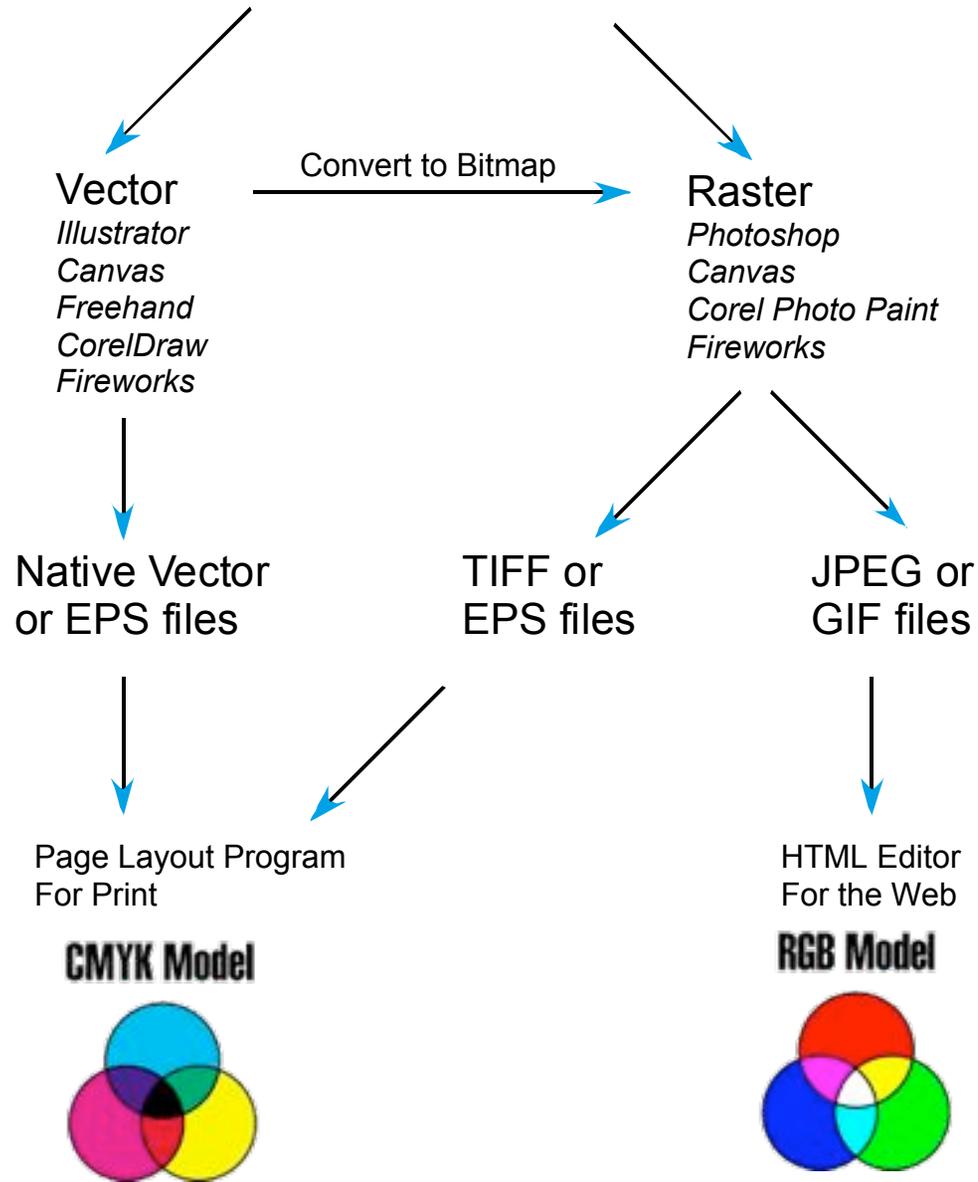
The CMYK printing method is also known as "four-color process" or simply "process" color. All of the colors in the printable portion of the color spectrum can be achieved by overlapping "tints" of cyan, magenta, yellow and black inks. A tint is a screen of tiny dots appearing as a percentage of a solid color. When various tints of the four colors are printed in overlapping patterns it gives the illusion of continuous tones - like a photograph.

The CMYK model forms its gamut from the primary subtractive colors of cyan, magenta and yellow. When cyan, magenta and yellow inks are combined it forms black - in theory. However, because of the impurities in ink, when cyan, magenta and yellow inks are combined it produces a muddy brown color. Black ink is added to this system to compensate for these impurities.

In the CMYK color model, colors are represented as percentages of cyan, magenta, yellow and black. For example in a CMYK chart the color red is composed of 14% cyan, 100% magenta, 99% yellow and 3% black. White would be 0% cyan, 0% magenta, 0% yellow and 0% black (a total absence of ink on white paper).

Use RGB For Screen Displays and CMYK For Print. It is important to choose the right color model for the job. If your images will be printed, then convert them to CMYK and manually bring them into gamut before printing. If your images are to be displayed on a computer, then make sure you use RGB color so the full gamut will be available for display. Because both models can be available at the same time while using an application, it is easy to make a mistake and choose the wrong palette or set of color swatches.

# Computer Graphics



# PROGRAMS AVAILABLE IN THE HOLME LAB

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- Appleworks (Paint Layer)
- Canvas (Raster object)
- Graphic Converter

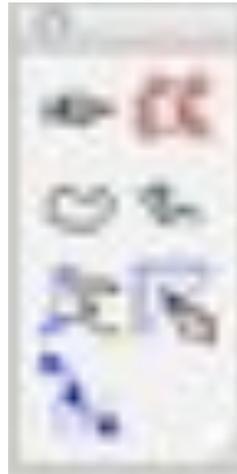
# CANVAS

Canvas is a cross-platform, combination raster and vector graphics program that also has facilities for doing web pages, desktop publishing, presentations and animations.

The version we use in Geology also has a GIS module that allows us to import and use various sorts of georeferenced data for making maps.



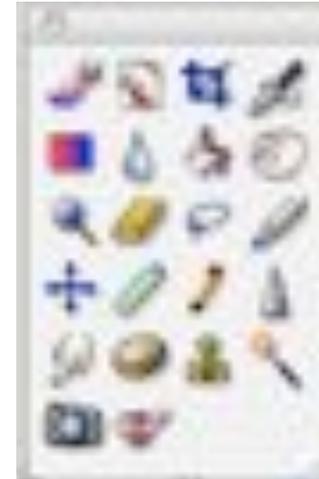
Common  
Tool Palette



Pen  
Tool Palette



Text  
Tool Palette



Raster  
Tool Palette



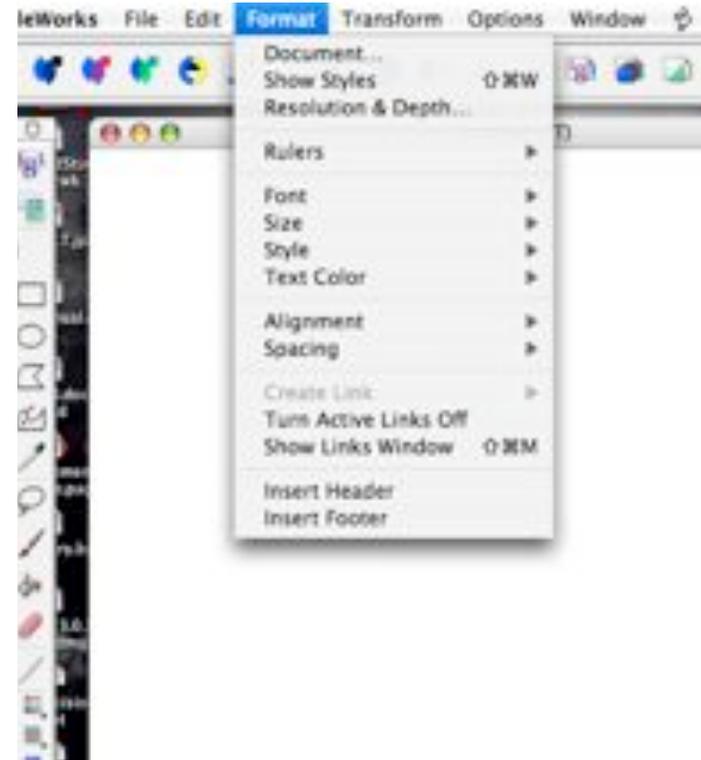
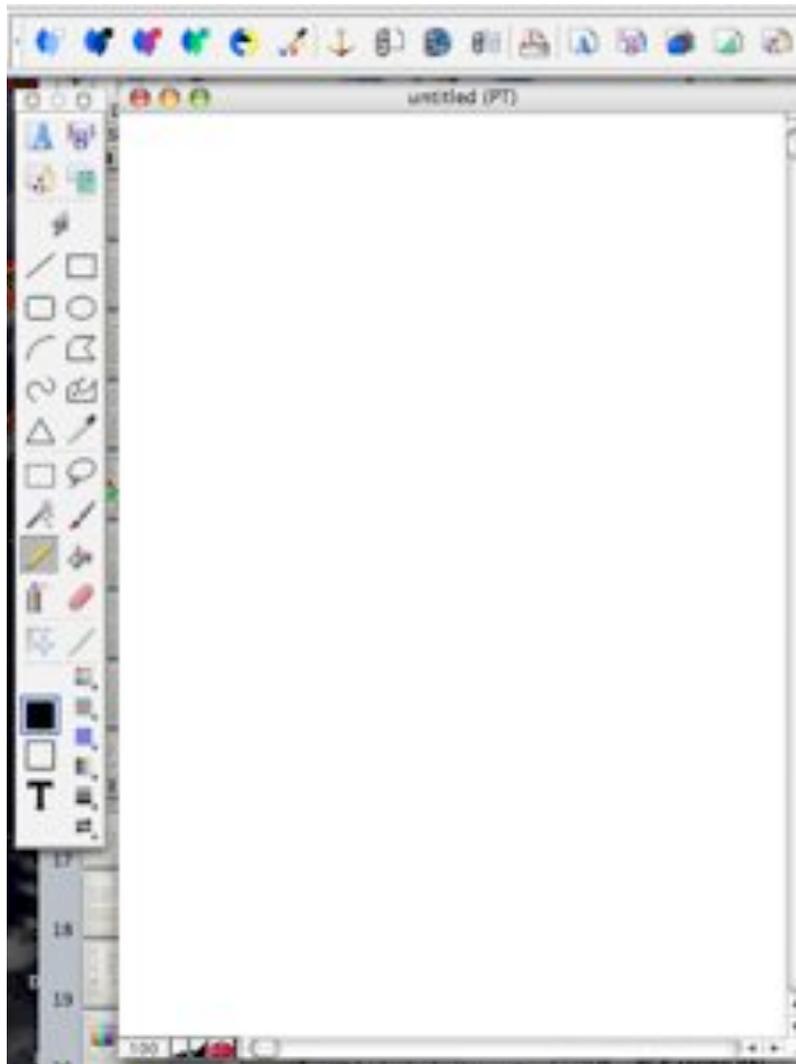
Fill & Stroke Palette  
(color inks)

The small buttons select different sorts of inks. They are colors, gradients, hatch patterns, raster patterns, vector patterns (symbols) and old-fashioned bit-mapped patterns. The star button allows you to store various favorite inks.



Each type of ink has various preset selections. This shows color inks that are available. Note that you can load RGB or CMKY colors, depending on the final use of the color you are using.

# APPLEWORKS PAINT



# RASTER ASSIGNMENT

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- Make up a fictional map that fits a single page of paper.
- The map should have:
  - Map name and your name
  - Date
  - Bar scale
  - Legend
  - Appropriate labels
- At the least the map should contain:
  - At least 4 roads (no more than 2 of the same rank)
  - Mountains
  - At least 4 rivers/streams and a body of water
  - At least 2 cities/villages/urban areas
  - At least 1 pipeline
- Feel free to be imaginative, but this should look like a map and not a cartoon.