

Soil Survey Photography

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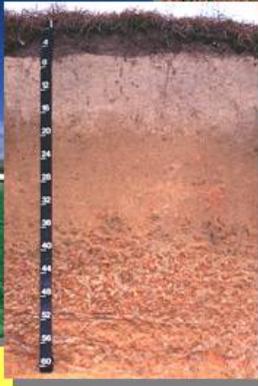
Slide 1

Animation Clicks: 5



United States Department of Agriculture
Natural Resources Conservation Service
National Soil Survey Center

Soil Survey Photography



*Principles
and
Techniques*

Slide 2

Animation Clicks: 5

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Slide 3

Animation Clicks: 5

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Slide 4

Animation Clicks: 5

The soil survey project leader and staff control the quality of soil survey illustrations!



Management...

- You need to know what you want to do-- have a plan
- Have the necessary equipment
- Develop the basic skills to carry out your plan

Suggestion:

The MOU should specify the publication format (loose-leaf or bound) and publisher (Government Printing Office—GPO or National Production Services Staff—NPSS).

What Should I Do?

- Decide early what types of photos you want in the survey report--what landscapes, crops, or soils you want to photograph.
- Keep a record of areas where there are good road cuts for soil profiles.
- Record areas with representative landscapes or cropping systems.
- Once the weather is favorable or the crops are at the proper stage, stop what you're doing and take pictures.
- If possible, carry your camera with you.

What Equipment Do I Need?

- 35-mm camera body \$150
- Wide angle lens (28) 35-70 mm \$100
- Flash \$75
- Polarizing filter
(essential for covers/landscapes) \$50
- Camera bag \$50
- Tripod \$75

...About \$500

Common Problems

- **Not using your camera enough.** Infrequent use causes you to have to relearn everything and to repeat past mistakes.
- **No, or poor, support for the camera.** For most photographic applications, good support is more important than a good camera.
- **Busy or cluttered images.** Keep compositions simple.
- **A distracting background.** The background can make or break a great photograph.
- **Photographing something from the first spot where you saw it.** Check around to see if there is a perspective you like better.

Common Problems

- **Shooting so that the subject is dead center in the picture.** You need space for implied motion.
- **Not understanding the exposure meter.** You should understand how it works or what area of an image is being metered by your camera's exposure meter (average, center, spot, or segment).
- **Always using the exposure meter's recommended exposure.** No film can record light the way our eyes perceive it, and no exposure meter can consistently calculate the exposure you want. This is why you should bracket your exposures.

Good Photography Is the Result of Several Factors Including...

- Camera body
- Speed and type of film
- Optics and focal range of lens
- Adequate support for the camera
- **Management of light**

Of these, the single most important factor to taking a good soil survey picture is...

MANAGEMENT OF LIGHT!

Types of Light

INCIDENT LIGHT. The light falling on, or striking, an object. Hand held light meters measure incident light.

REFLECTED LIGHT. The light being reflected by an object. Cameras that meter through the lens measure reflected light.

FILL LIGHT. Light that lightens, or fills in, shadows or other dark areas on the subject (flash or spot lighting).

Understanding How Your Camera Meters Light

Cameras that meter through the lens measure reflected light. Most cameras can be adjusted to meter light one of four different ways:

- **average**--The light being reflected by the entire area being metered is treated equally.
- **center weighted**--The light being reflected by the center of the area being metered accounts for 60 to 90 percent of the calculated exposure.
- **spot**--Only the light being reflected by a very narrow area will be used to calculate exposure, generally 1 to 3 percent of the area.
- **segment or matrix**--The area being metered is divided into multiple areas called segments, and a microprocessor in the camera evaluates each segment and calculates exposure.

How Can Proper Exposure Be Achieved?

The amount of light needed to achieve proper exposure may be controlled by adjusting:

- aperture (f-stop) or
- shutter speed

Let's talk photography lingo...



Aperture (f-stop)

- The main purpose of the **aperture** is to control how much light passes through the lens and into the camera.
- A **diaphragm** is a disk, or plate, inside a lens used to create an opening called the **aperture**. The diaphragm and aperture are used to control how much light passes through a lens to the camera. The relational size of the opening is called **f-stop**.
- An **f-stop**, or focal length stop, is the size of the aperture in relation to the length of the lens. It is the unit of measure of the specific amount of light passing through a lens. An f-stop is a numeric value; for example, f/2.8.

NOTE: A "stop of light" (stops) is halving or doubling the amount of light reaching the film.

- The amount of light passing through a lens will be doubled (**+1 stop**) when the **f-stop** number is decreased (a larger aperture) by one full f-stop; for example, going from f/5.6 to f/4. Conversely, the amount of light will be halved (**-1 stop**) when the f-stop number is increased (a smaller aperture) by one full f-stop; for example, going from f/16 to f/22.
- Standard f-stop settings are:
1.4, 2, 2.8, 4, 5.6, 8, 11, 16, 22, 32

Aperture & f-stop relationship...

Simply--the lower the aperture setting or f-stop number, the bigger the diaphragm opening.

Each time the aperture increases, the amount of light reaching the film is halved. This is equal to 1 stop of light.

What's the effect on the image?

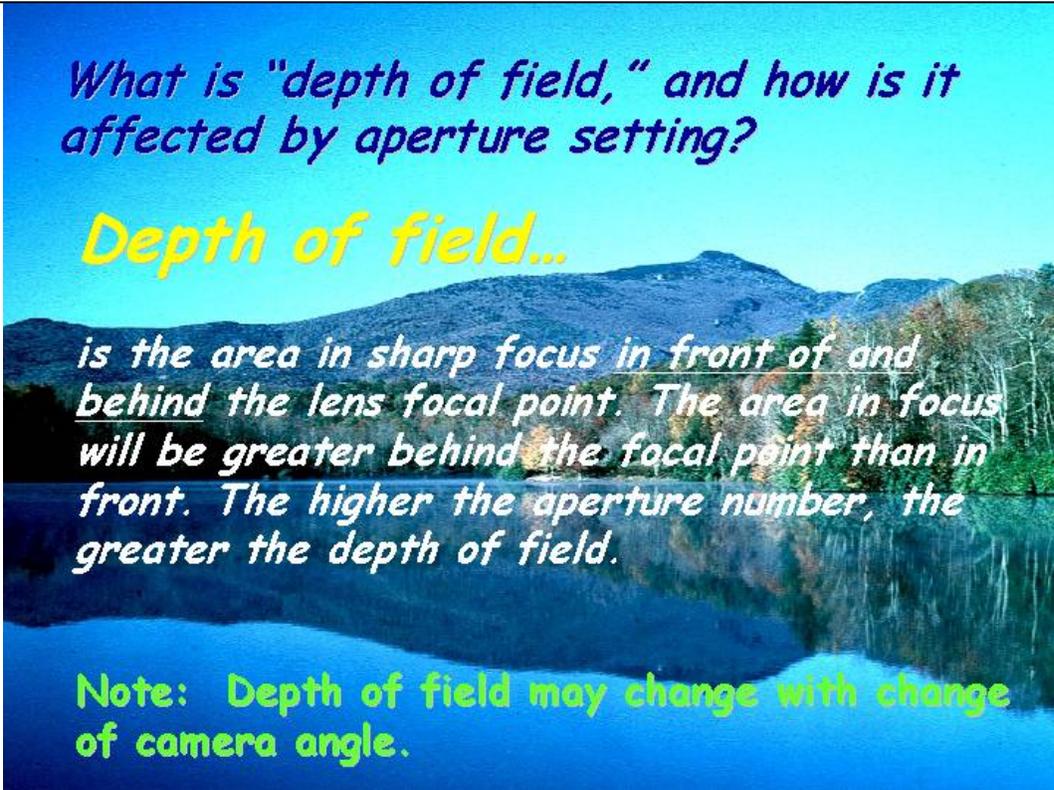
depth of field

What is "depth of field," and how is it affected by aperture setting?

Depth of field...

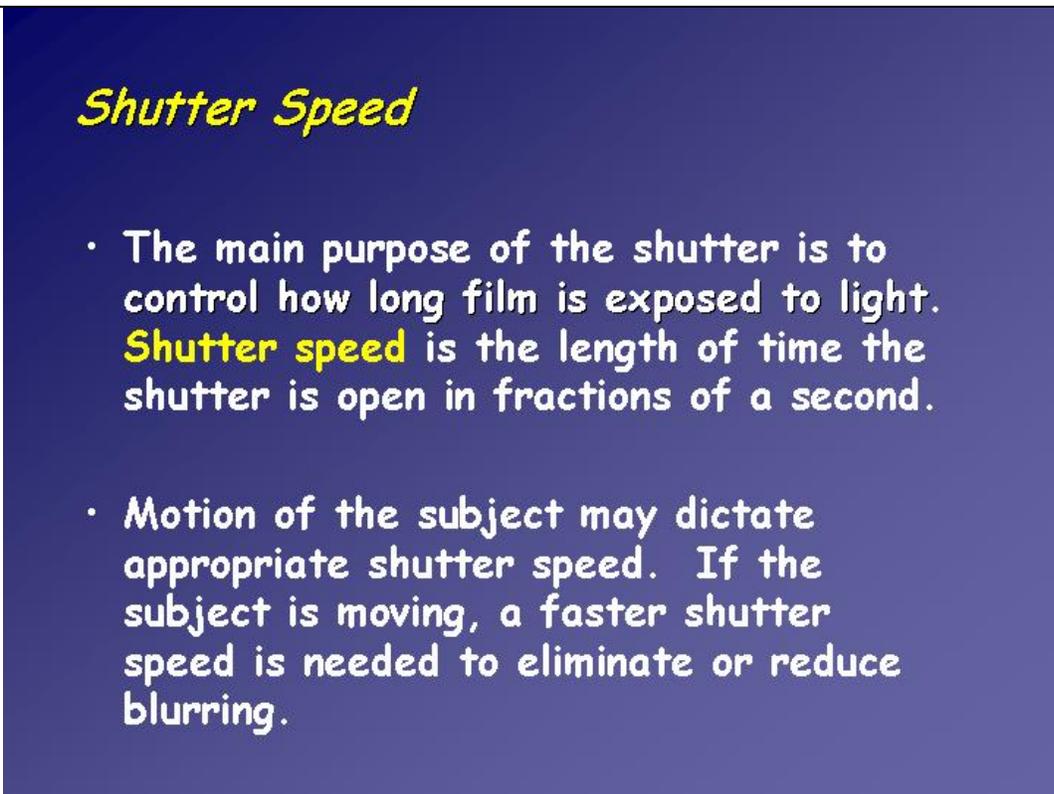
is the area in sharp focus in front of and behind the lens focal point. The area in focus will be greater behind the focal point than in front. The higher the aperture number, the greater the depth of field.

Note: Depth of field may change with change of camera angle.



Shutter Speed

- The main purpose of the shutter is to control how long film is exposed to light. **Shutter speed** is the length of time the shutter is open in fractions of a second.
- Motion of the subject may dictate appropriate shutter speed. If the subject is moving, a faster shutter speed is needed to eliminate or reduce blurring.



Shutter Speed

- The amount of light reaching the film plane will be halved (**-1 stop**) when the shutter speed is increased by one full speed; for example, going from 1/60" to 1/125".
- Conversely, the amount of light will be doubled (**+1 stop**) when the shutter speed is decreased by one full speed; for example, going from 1/250" to 1/125".

Shutter Speed

Standard shutter speeds in seconds:

**4, 2, 1, 1/2, 1/4, 1/8, 1/30, 1/60,
1/125, 1/250, 1/500, 1/1000**

- It should be noted that **1/60 or 1/30** second is about the slowest speed possible if the camera is hand held.

How do you overcome slow shutter speeds?

...By using a tripod!

These two factors:

- aperture (f-stop) and
 - shutter speed
- come together to create...

EXPOSURE

EXPOSURE is the amount of light that reaches the film. How much light passes through the lens is controlled by the lens' aperture. How long the film is exposed is controlled by the camera's shutter speed.

Film Speed

Although film speed does not directly influence exposure, as film speeds increase, the amount of light needed to properly expose the film is reduced.

Film consists of a photosensitive emulsion and protective compounds; it is the recording medium.

- range 24-1200
- color, recommend 50, 64, 100, or 200
- B&W, recommend 100 or 400
- remember--the higher the number, the grainier the image (less light is needed to saturate the film)

NOTE: Film speed is set by the manufacturer and cannot be changed.

One more concept... **RECIPROACITY**

Reciprocity is the relationship between shutter speed and f -stop that allows the same exposure to be achieved when one is changed to increase the amount of light and the other is changed to decrease the light by the same amount. Shutter speed and f -stop are reciprocally related.

For example, the same exposure will result if the shutter speed is changed +1 stop and the f -stop is changed -1 stop. The amount, or quantity, of light striking the film will be **identical**.

Say What!



Situation: The camera meters the soil using 100-speed film and f -stop 22 at 1/30 sec., but I can't hold the camera steady at 1/30 sec.!

WHAT ARE MY OPTIONS?

- 1) Change to 200-speed film
+1 stop = 1/60 sec
- 2) Use flash (1/60 sec)
- 3) Change the f -stop to 16
+1 stop = 1/60 sec
- 4) Use a tripod & you can shoot at any shutter speed.
What if I change the f -stop to **5.6**?
(22;16;11;8;5.6) = **+4 stops**
(1/30;1/60;1/125;1/250;1/500 sec.) = **-4 stops**



Will making these changes affect exposure?

NO!!! The same amount of light reaches the film in the four examples.

What will they affect?

DEPTH OF FIELD!!!



How can I maximize depth of field?

Hyperfocal Distance

Hyperfocal distance (HFD) is the closest a lens can be focused for a given f -stop and have objects at infinity in focus. Depth of field will range from $1/2$ the HFD to infinity.

This procedure requires complete manual camera adjustment.

To use HFD:

Focus on the object closest to the camera you want to be in focus and...

- record the feet in distance
(number opposite the focus indicator mark on the lens, for example...)

→ 5 ft.

- double that number for the HFD

→ 10 ft.

- determine the lens focal length [35mm, 50mm, etc.]

Go to the chart...

Hyperfocal Distance

Focal Length	f/5.6	f/8	f/11	f/16	f/22	f/32
28mm	19	13	10	7	5	4
→ 35mm	29	20	15	10	8	5 (2.5+)
50mm		41	30	21	15	11
75mm				46	34	23
135mm					108	74
200mm						162

Hyperfocal Distance

Focal Length	f/5.6	f/8	f/11	f/16	f/22	f/32
28mm	19	13	10	7	5	4
→ 35mm	29	20	15	→ 10	8	5 (2.5+)
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Hyperfocal Distance

Focal Length	f/5.6	f/8	f/11	f/16	f/22	f/32
28mm	19	13	10	7	5	4
→ 35mm	29	20	15	10	8	5 (2.5+)
50mm		41	30	21	15	11
75mm				46	34	23
135mm					108	74
200mm						162

To adjust your camera to take the shot:

- *move the aperture ring to the correct setting...*
f/16

- *move the focusing ring to the HFD...*
10 ft.

*Note: The image may not be in sharp focus...
in the viewfinder.*

- *adjust shutter speed for the correct metered setting...*
??

*You will most likely need a tripod.
You're good to go!!!*

Filters

CAUTION!! When using filters be sure to use only one filter at a time. If filters are stacked, "vignetting," or unwanted darkening of the corners, may occur.



Filters

UV FILTER. A filter that **absorbs ultraviolet radiation**.

HAZE FILTER. The haze filter is a UV filter. The most common purposes for haze filters are to "cut through the haze" and **protect the lens**. "Haze" is a lack of clarity. In a photographic image, haze can be caused by several things. If UV radiation is strong when the picture is taken, it can cause the image to appear hazy. The haze filter absorbs UV radiation that can cause this form of haze in an image.

SKYLIGHT FILTER. The skylight filter is a UV filter and a **mild warming filter** rolled into one package. Not as strong as a warming filter, but like it, the skylight filter absorbs some of the blue wavelengths without affecting the other colors. Thus it gives a warmer appearance to the image.

POLARIZING FILTER. This filter reduces, and sometimes eliminates, reflections and **glare** on water, vegetation, glass, and other nonmetallic surfaces by changing the light's polarization. It also **increases color saturation** and acts as a UV filter.

***NOTE:** A polarizing filter will reduce the amount of light by 1 or 2 stops. A manual adjustment must be made if your camera does not have "through the lens" metering.*

The polarizing effect is greatest when the light being photographed is perpendicular to the light source and is least when it is parallel to the light source.

Its effect can be uneven when used on a wide angle lens due to the lens' angle of view covering areas that are perpendicular and parallel.

Polarizing filter effects

Uneven sky color due to polarizing effect across too wide an area.

Without polarizer...

With polarizer...

Caution...

You can overdo the polarizing effect and create unnatural colors or unbalanced color.



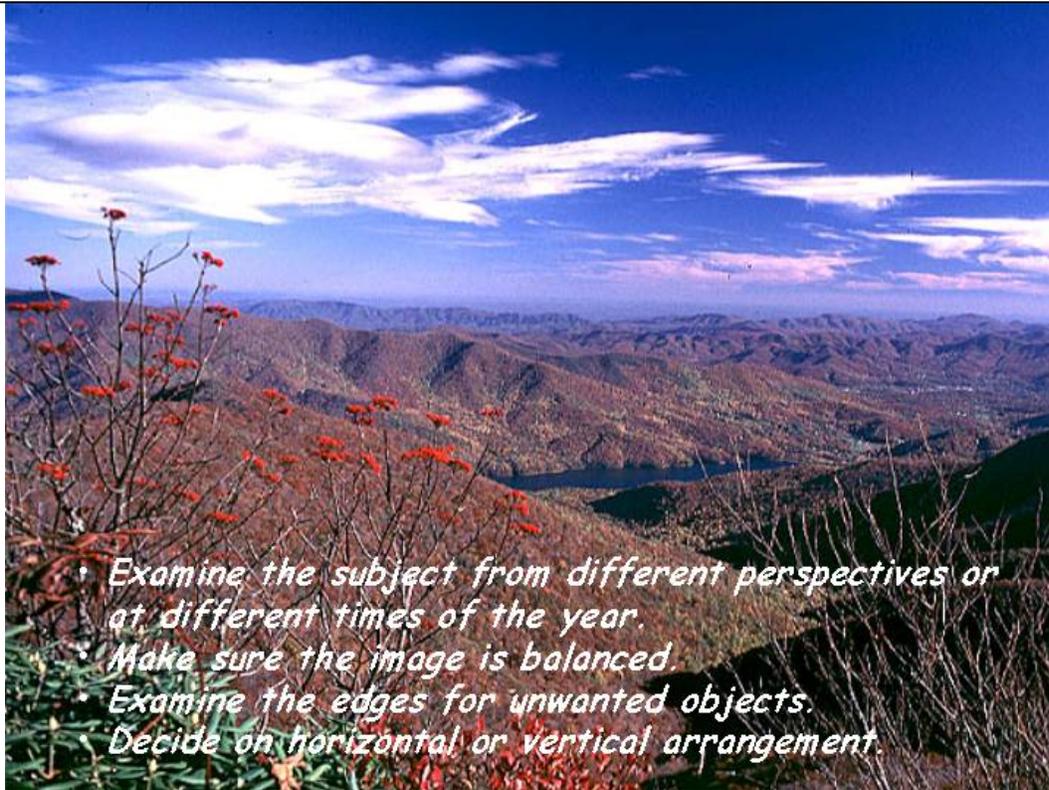
Generally Accepted Principles of Composition

- Have one subject and only one subject.*
- Keep compositions simple. No visual clutter.*
- Give room for implied motion and line of sight.*
- Fill the frame with the subject and its environment.*



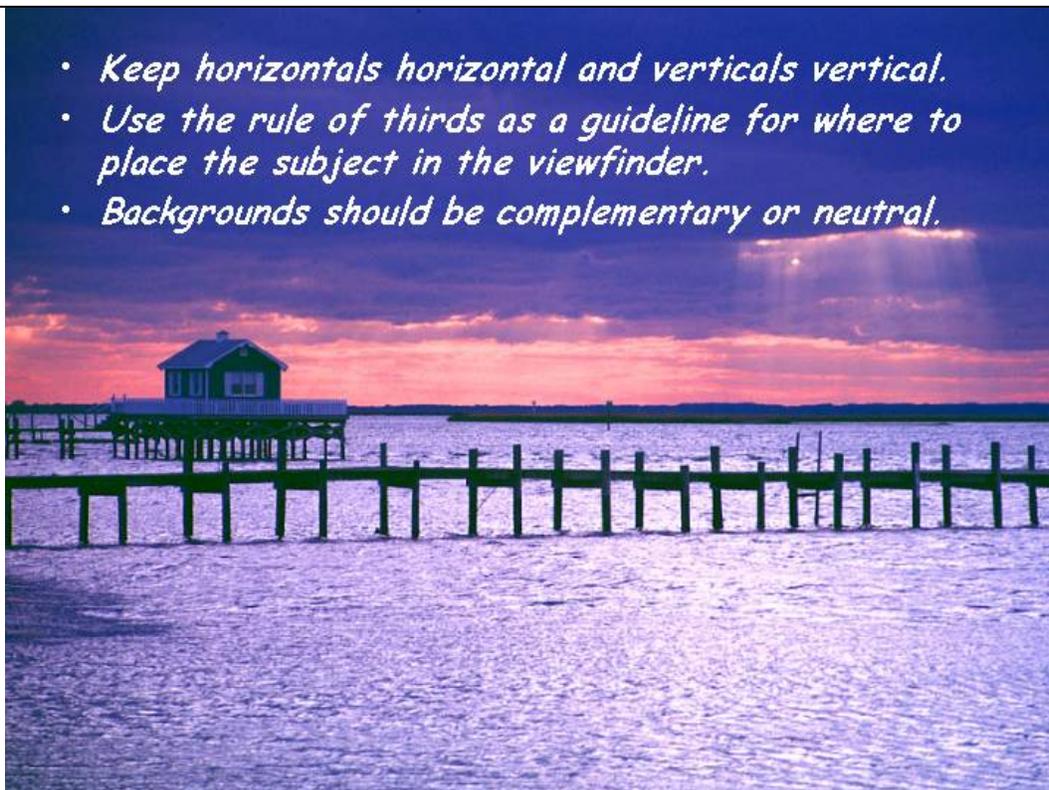
Slide 37

Animation Clicks: 9



Slide 38

Animation Clicks: 8



Wysinwyg!!!

What you see is not what you get.

What you see in the viewfinder is not what is captured on film.

This is because:

- the viewfinder shows 92% of frame
- film has limited tonal range (varies among film type)
- film cannot capture all the subtleties seen by the human eye

Tonal Range...

The range of light intensity from the lightest to the darkest areas of a subject or image. An indication of a film's **ability to record details in both the lightest and darkest areas** in a simple image. Tonal range is usually expressed in stops of light.

For example, color transparency film has an approximate tonal range of 4 or 5 stops. B&W film has a tonal range of 10 or 11 stops.

COLOR PHOTOGRAPHY

Color photos are used primarily for covers of soil surveys reports and for soil profiles.

In non-GPO printed surveys, color images may also be used throughout the survey report if they add to the reader's understanding.



Soil Survey Covers...

The cover represents the survey area and the NCSS program.

It's the first impression the reader has of the product.

It should have soil-related value and be typical of the survey area.



United States
Department of
Agriculture



Natural
Resources
Conservation
Service

In cooperation with
North Carolina Department
of Environment, Health,
and Natural Resources;
North Carolina Agricultural
Research Service; North
Carolina Cooperative
Extension Service;
Franklin Soil and Water
Conservation District; and
Franklin County Board of
Commissioners

Soil Survey of Franklin County, North Carolina



Slide 43
Animation Clicks: 6

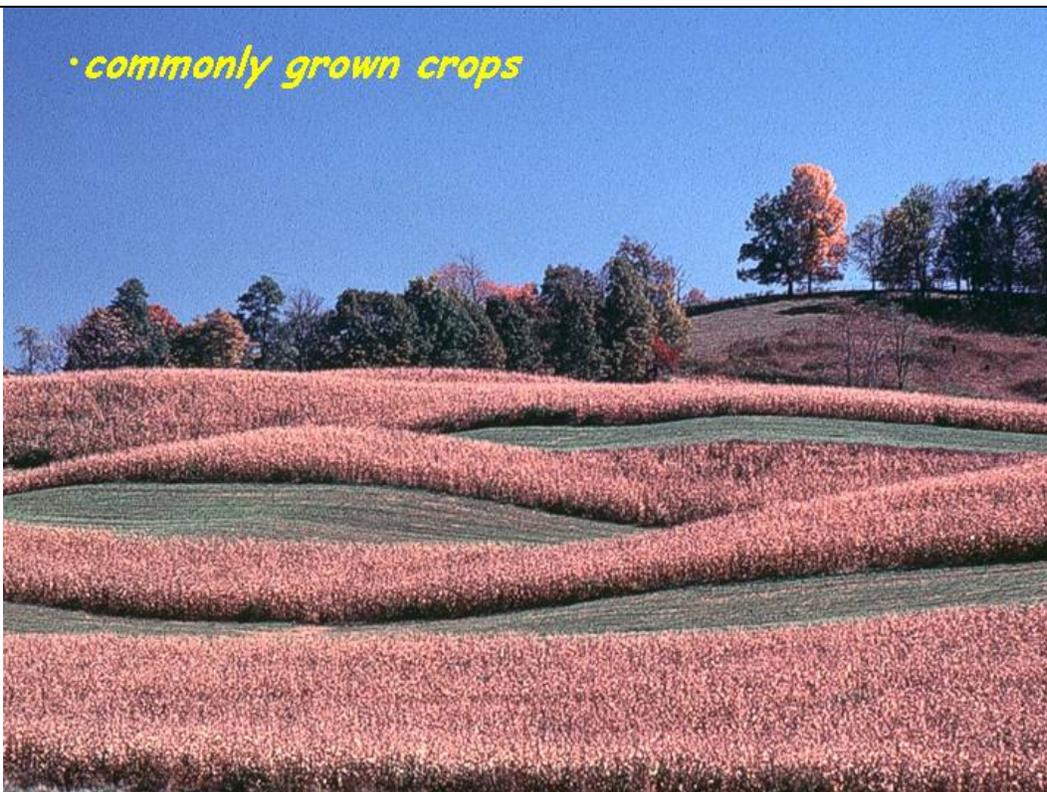
Appropriate soil survey covers include...



• landscapes showing the general lay of the county

Slide 44
Animation Clicks: 6

• commonly grown crops

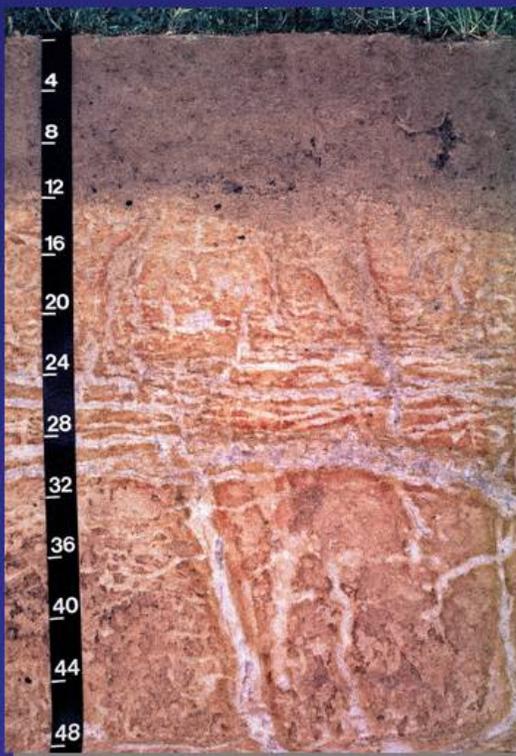




Soil Profiles...

Requirements for **GPO**
Printed reports:

- 8 to 10 profiles should be submitted (maximum of 12 to 16)*
- minimum of four approved profiles for publication is required*
- two original slides per setting should be submitted (one slide for the editor and one for NSSC)*
- not limited to soil profiles; diagnostic features may be used*



When Photographing Soil Profiles...

Take slides:

- Without a tape
- With a tape marked in inches
- With a tape marked in centimeters
- In landscape format (left-to-right) or portrait format (up-and-down), depending on soil depth
- Of surrounding landscapes (if appropriate)

When Photographing Soil Profiles...

Take *all* of the slides you might need (it is very costly to reshoot or redo the profile compared to film processing). If additional slides are available, the profile may also be used for publication in adjoining survey areas or areas with the same soils.

PLEASE...

- ▶ *Do not put the tape in the center of the profile!! You're taking a picture of the soil, not the tape.*
- ▶ *Use the black photo tape issued by the National Soil Survey Center.*
- ▶ *Follow these guidelines, which will make it possible to use the profile in soil survey reports, scientific journals, and other soil-related publications.*

Tools You Might Need...

- Spray bottle
- Photo tape
- Root pruner
- Trowel
- Pick
- Brushes
- Straight blade shovel, or
- Whatever you have found to be effective



Profile Preparation

Carefully prepare the profile face by:

- Preparing a smooth, planar surface perpendicular to the camera angle
- trimming excess roots
- picking the surface to expose structure (the entire face may be smooth, 1/2 picked, or completely picked or have individual horizons picked)



To pick...



or not to pick



Profile Preparation

Carefully prepare the profile face by:

- preparing any special feature and removing pick marks
- wetting both the profile face and the tape with a spray bottle (**moist soils photograph best**)
- using a tripod to ensure the sharpest image possible
- brushing or blowing away dust or loose particles



Composing Soil Profiles

- locate the standard black tape on the left side of the profile, 3 to 6 inches from the margin
- numbers on the tape must be clearly legible
- scale may be metric; however, metric is not recommended for soil survey reports
- hang tape by nail, parallel to the margin (nail should not be visible)
- ROAD CUTS
PHOTOGRAPH BEST!!

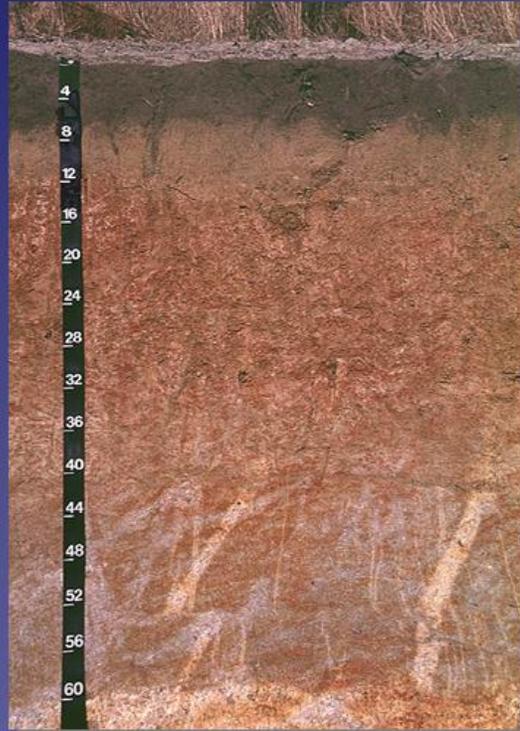


Composing Soil Profiles

- The surface mark of the tape (-0-) must be at the soil surface
- Do not use a rock or some other item that will show in the slide to hold the tape
- A 4- to 6-inch margin above the top of the pit should be visible
- Pit sidewalls should not be visible
- Exposed piles of soil from the excavated pit should not be visible
- Use of nails, shovels, knives, or any other tools to mark soil boundaries or as a scale is discouraged

A well composed and prepared soil profile...

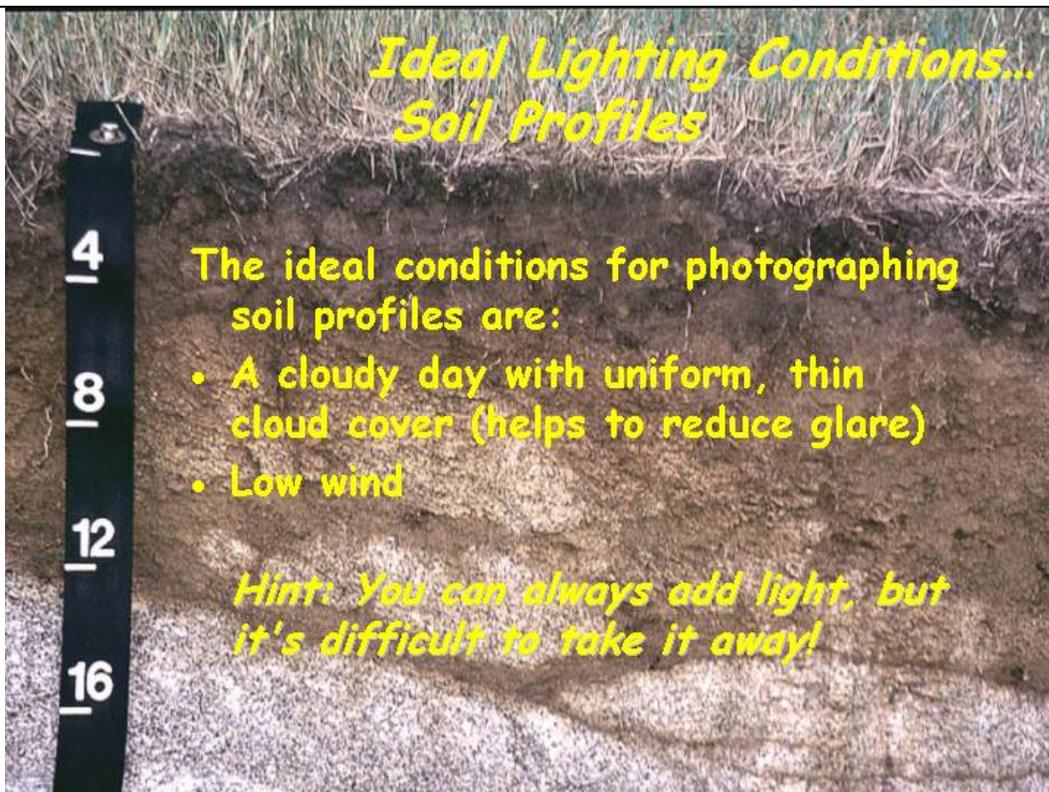
- If you have a wide-angle lens (28 to 35 mm), the profile should not exceed 6 to 8 feet (horizontally or vertically) if the numbers on the tape are to remain legible.
- If you are using a standard 50-mm lens, the profile should not exceed 4 to 6 feet.



*Ideal Lighting Conditions...
Soil Profiles*

- The ideal conditions for photographing soil profiles are:
- A cloudy day with uniform, thin cloud cover (helps to reduce glare)
 - Low wind

Hint: You can always add light, but it's difficult to take it away!



The standard for soil profiles...

Note the light condition.

Was it a cloudy day with uniform, thin cloud cover?



How to Improve Lighting Conditions

Consider using a flash, which will help to:

- Overcome low light conditions
- Remove shadows or false colors cast by overhanging trees
- Make light uniform, even on a sunny day

HINT: In daylight, use a flash with only 100-speed film; 200-speed film is often too bright, especially if you are within 3 to 5 feet of the profile.

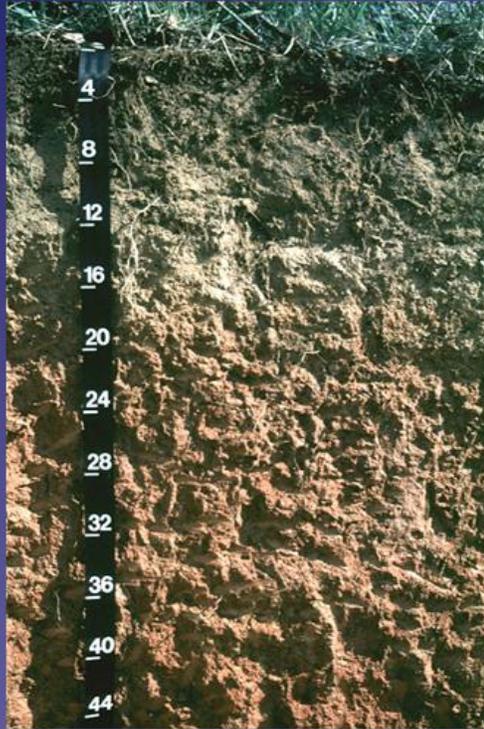
Light Conditions to Avoid...

- **High-noon light**, which creates a harsh contrast (hot spots) and may change natural soil color
- **Late-day light**, which creates a yellow appearance
- **Extreme light** conditions on the same profile face

NOTE: A cloth, such as a white sheet, may be used to diffuse bright sunlight.

High noon...

Spotchy appearance caused by glancing sun angle, common during midday.



High noon...

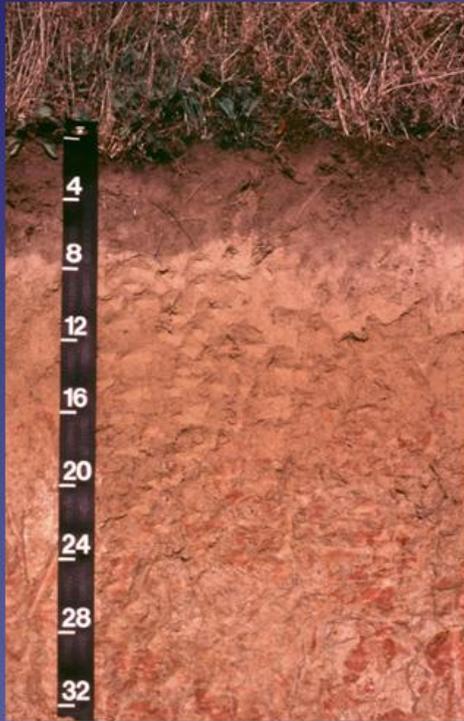
Spotchy appearance caused by a glancing sun angle, common during midday.

How will the same site photograph with indirect morning sunlight...



Late-day sun...

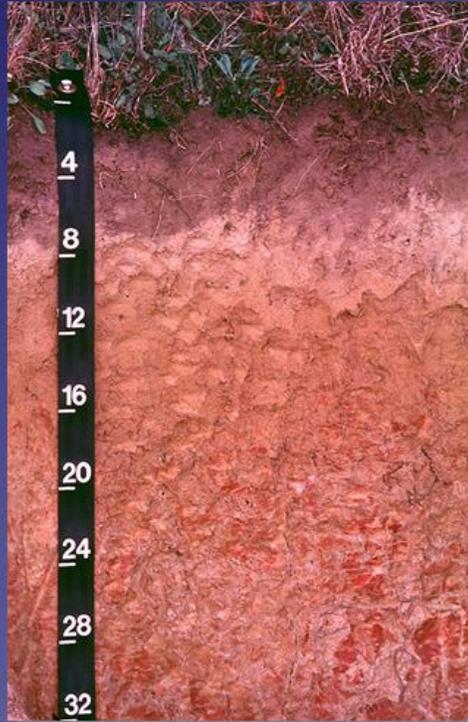
"Yellowing" of soil color caused by late-day sun.



Late-day sun...

"Yellowing" of soil color caused by late-day sun.

What effect will using a flash have on natural color...



Extreme light conditions...

"Hot spots" on the profile face caused by openings in the overhead forest canopy.



Extreme light conditions...

"Hot spots" on the profile face caused by openings in the overhead forest canopy.

Using a *flash* helps to overcome bright spots on the profile face and gives a balanced soil color...

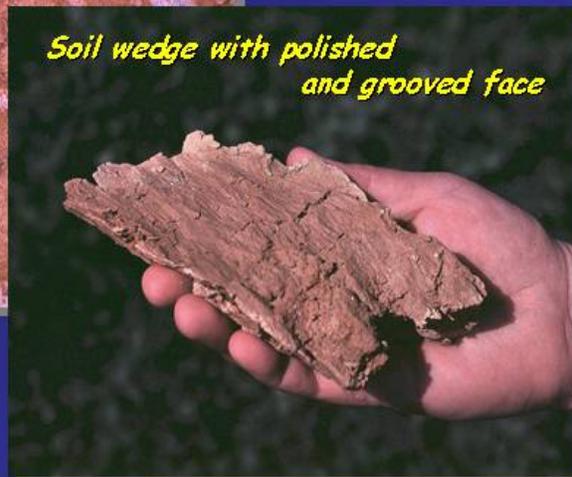


Nonprofile soil features...



Horizontal cross section of prisms in a fragipan layer

Pictures of diagnostic horizons or features may be used in the survey report.



Soil wedge with polished and grooved face

What went wrong?



*Photographing
soil profiles
is an ongoing
learning
experience...*



- *poor light conditions*
- *too far away*
- *poorly composed*
- *poorly prepared*

What went wrong?



- *too dark at the base*
- *pit face not evenly prepared*
- *exposed roots not trimmed*
- *too cluttered (wire fence)*
- *tape improperly hung by pick*
- *did not use standard tape*



What went wrong?

- *too dark*
- *hot spots*
- *nonstandard tape*

What went wrong?

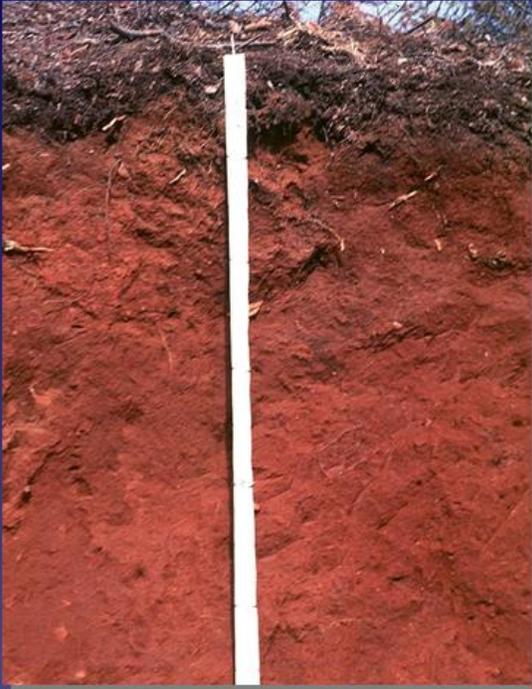


- *no tape
or scale*

*Shallow
soils are
difficult to
photograph!*

Slide 71

Animation Clicks: 7



What went wrong?

- can't read tape*
- tape in the center*

Slide 72

Animation Clicks: 11



What went wrong?

- can't read tape*
- tape in the center*

What if the slide was digitally enhanced?

Could it then be used? YES!!!

Color Film Processing

COLOR processing--locally processed if Fujichrome or Ektachrome; Kodachrome must be processed by Kodak (about 2 weeks turnaround)

Remember...

Film and film processing are relatively inexpensive in comparison to the cost of locating a good cover site and taking the time to properly prepare a soil site for soil profiles.

Once the Hard Work Has Been Done... Take As Many Photos As You Need.

Be sure to:

- **Bracket**--shooting 1/3 to 1 stop underexposed and 1/3 to 1 stop overexposed
- **Take duplicates**--once you have set your exposure, take a series of at least six frames

Effects of Selected Color Films

- **Fujichrome Sensia (100 or 200* speed)**
maximum color contrast and brightness
- **Ektachrome Elite (100 or 200* speed)**
emphasizes blue & green (cool appearance)
- **Kodachrome (64 speed)**
emphasizes red & brown (warm appearance)

** Be careful when using a flash with 200-speed film. It's easy to overexpose photographs in full sunlight conditions.*



Fujichrome...



Ektachrome...



Kodachrome...



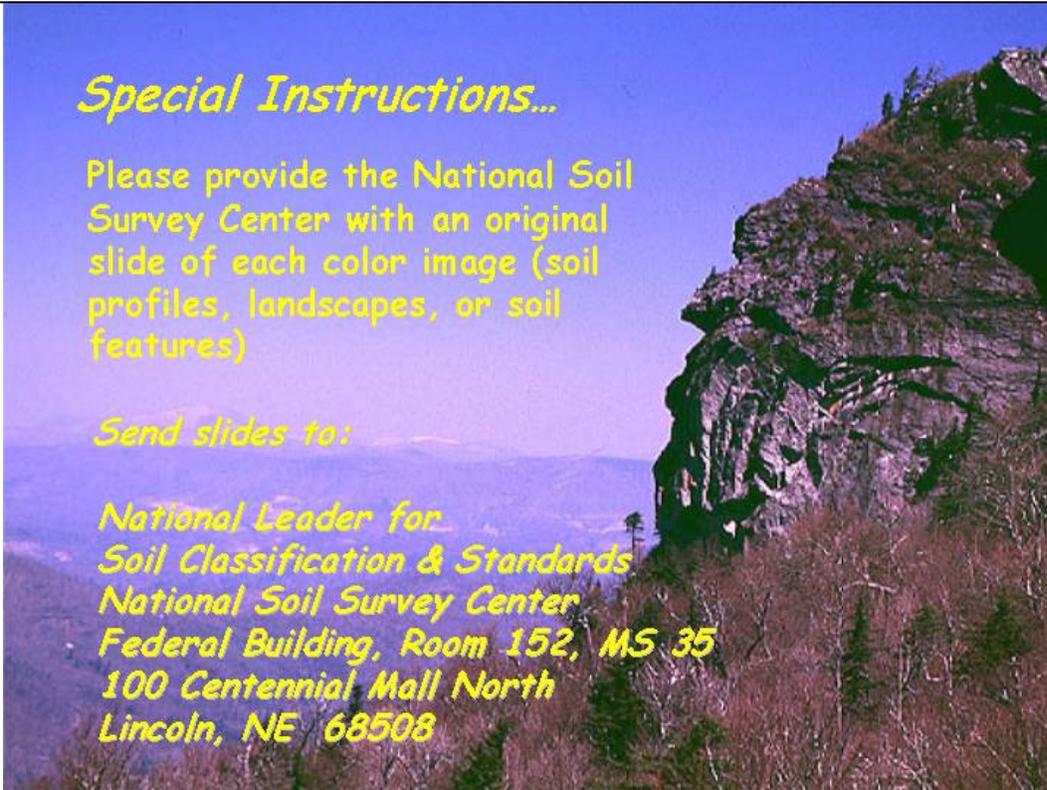
Which film is the most accurate for SOIL color?

Special Instructions...

Please provide the National Soil Survey Center with an original slide of each color image (soil profiles, landscapes, or soil features)

Send slides to:

*National Leader for
Soil Classification & Standards
National Soil Survey Center
Federal Building, Room 152, MS 35
100 Centennial Mall North
Lincoln, NE 68508*

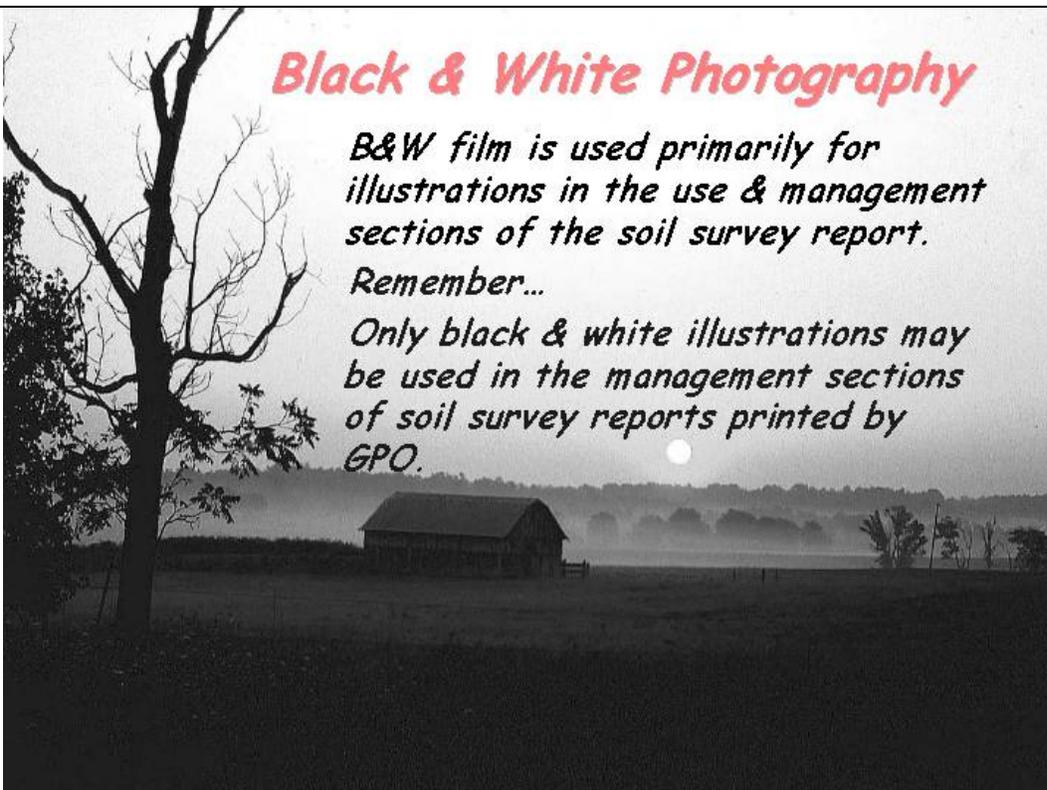


Black & White Photography

B&W film is used primarily for illustrations in the use & management sections of the soil survey report.

Remember...

Only black & white illustrations may be used in the management sections of soil survey reports printed by GPO.



Suggested Procedures

- *Use Kodak Tmax 100 (400 is often too grainy)*
- *When processing B&W film, request 3.5 x 5 inch prints*
- *Record and carefully store negatives*
- *Do not have enlargements made until photos have been reviewed and the total number reduced and approved by the MLRA Office*
- *Submit negatives to the MLRA Office or State Office for hand processing to generate 8x10's for the soil survey manuscript*
- *You can use red, yellow, or green filters to enhance B&W photos, but a polarizing filter will produce about the same effect*

Use & Management Photos

Appropriate subjects are...

- *crops common to the survey area*
- *common land uses*
- *conservation practices*

Avoid negative photos...

(failed practices, severely eroded areas, etc.)



Digital Photography



Can we use digital cameras and images in survey reports??

ONLY in reports printed by NPSS or printed in-house!

Remember!

... When using a digital camera, a film image can be scanned and digitally enhanced, but a digital image shot back to film has significantly reduced quality.

You must know your final print product before deciding digital vs. film image.

Digital Photography

...RESOLUTION

Size of images vs. resolution
(lines x rows scanned per image)

1280 x 960 minimum resolution for 5x7 soil survey publication image

1024 x 768 acceptable for in-house products and newsletters

640 x 480 for use on WEB pages



Digital Photography & Image Formats...

- .jpg** (joint photographic experts group-- jpeg)--a **compressed file** commonly used to display continuous tone images, primarily photographs on the www
- .gif** (graphics interchange format)--used to display indexed-color graphics on the www
- .png** (portable network graphics)--highest quality, noncompressed image for display on the www

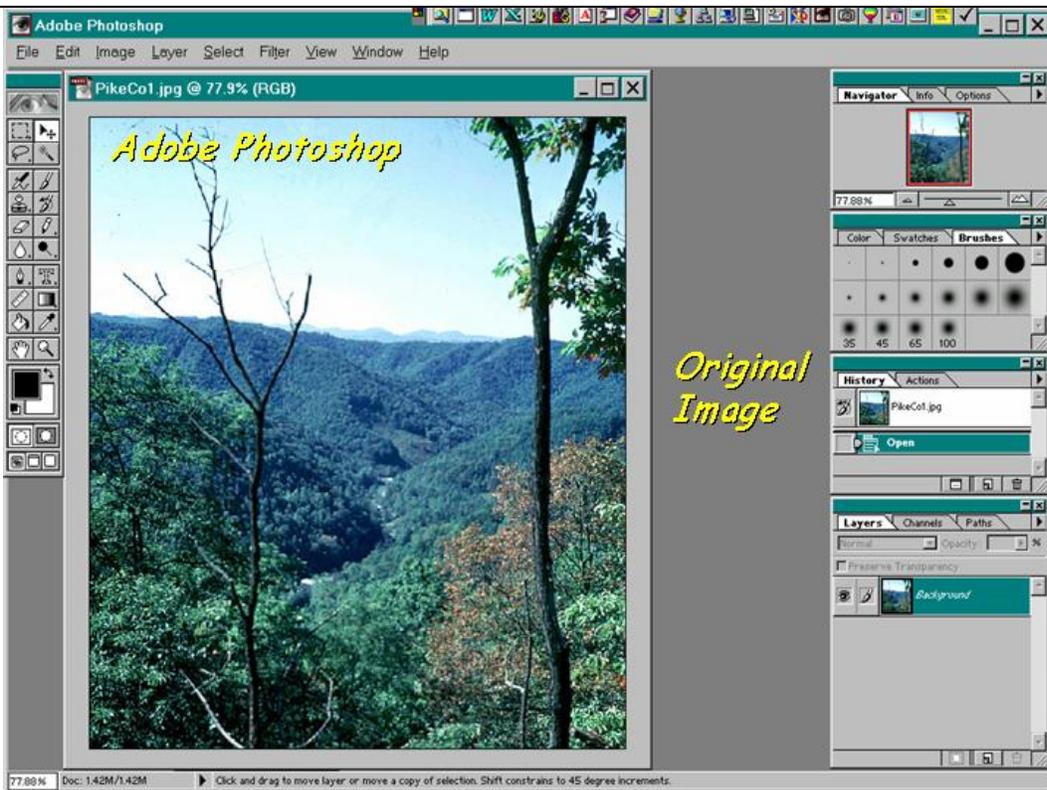
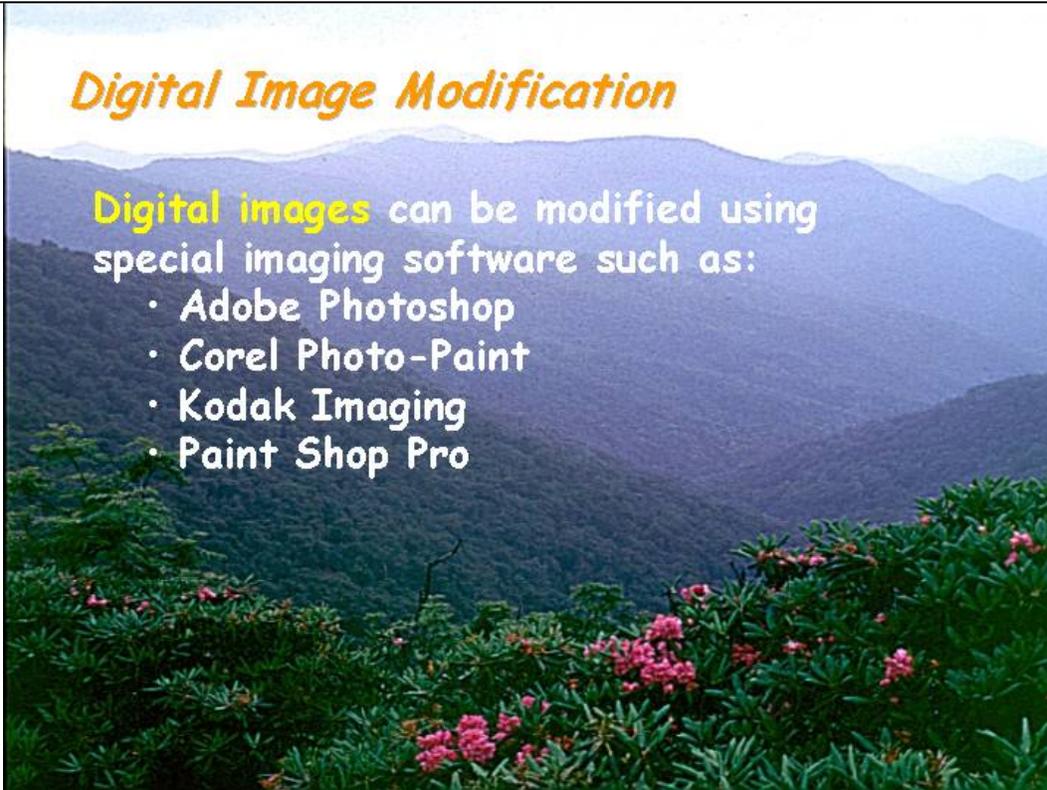
Digital Photography & Image Formats...

- .tif** (tagged-image file format)--**most commonly used** and flexible format for exchanging files between image and layout applications
- .bmp** (bitmap)--standard **windows** image format (wallpaper)
- .pdf** (portable document format)--used by Adobe Acrobat

Digital Image Modification

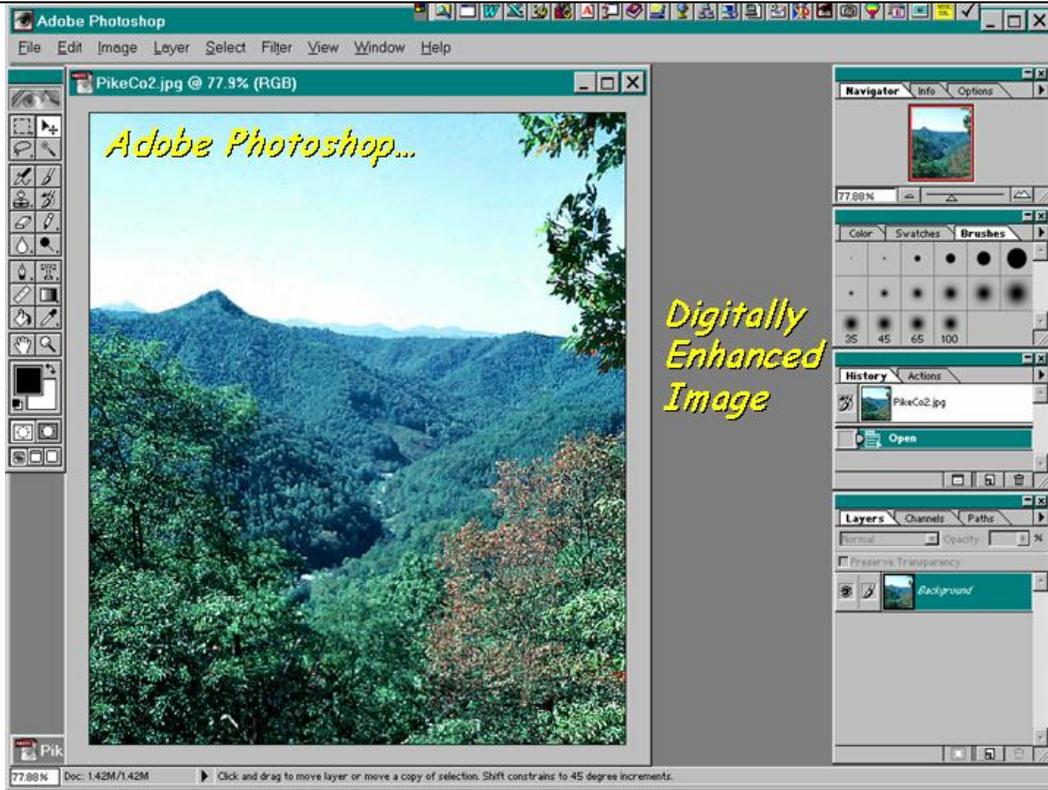
Digital images can be modified using special imaging software such as:

- Adobe Photoshop
- Corel Photo-Paint
- Kodak Imaging
- Paint Shop Pro



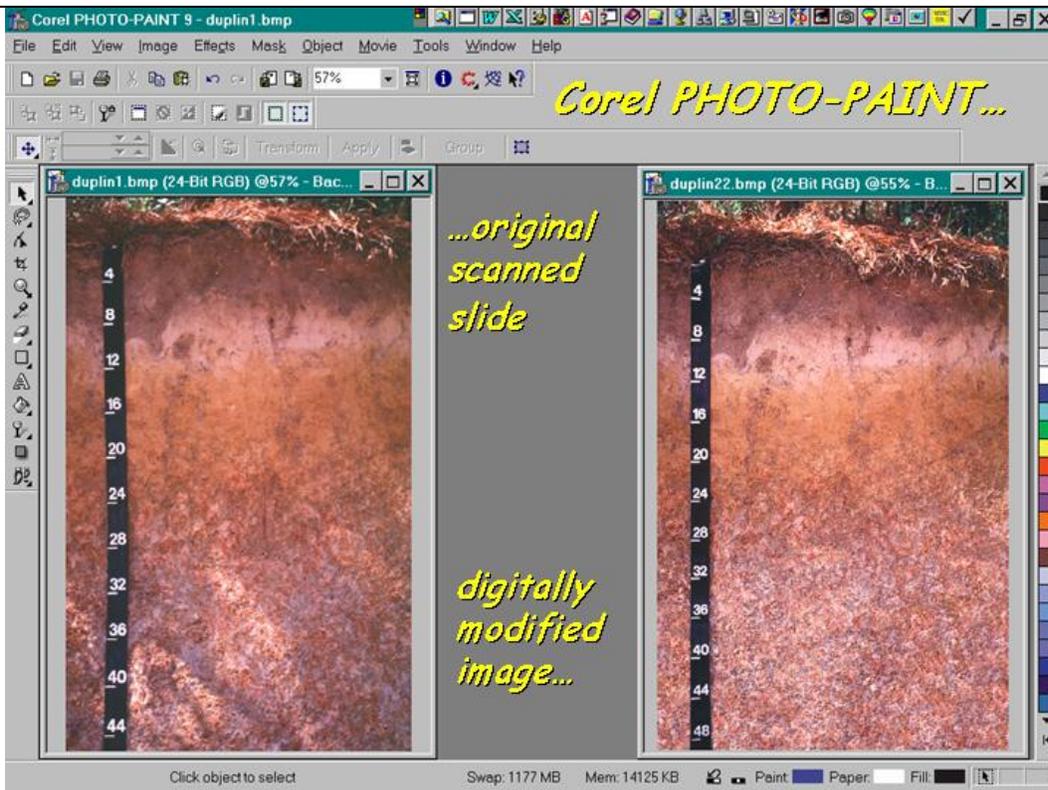
Slide 87

Animation Clicks: 6



Slide 88

Animation Clicks: 6



Digital Equipment

Are digital cameras practical for soil survey photography?



Cost comparisons:

Digital point & shoot...	\$350+
Standard 35 mm P&S...	\$75+

Digital full option...	\$3,500+
Full option 35 mm...	\$500+

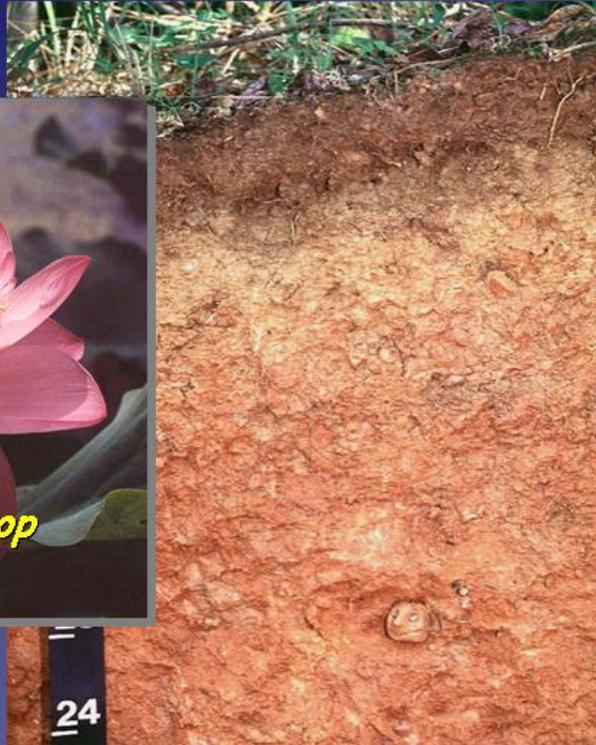
Software...	\$500+
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*Given the additional costs and limited print options--
probably not at this time!*

HAVE FUN!!!



*Take time to stop
and smell the...*



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