

CARTOGRAPHIC CONVENTIONS  
FOR THE  
NATIONAL WETLANDS INVENTORY  
U.S. FISH & WILDLIFE SERVICE



FEBRUARY 1994





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## PREFACE



These Cartographic Conventions have been developed by the U.S. Fish and Wildlife Service, National Wetlands Inventory, to be used for map production of large scale (1:24,000, 1:25,000, 1:40,000, 1:62,500 and 1:63,360) and small scale (1:100,000 and 1:250,000) products. The conventions provide specific instructions to the cartographer for transferring delineations from interpreted photographs to map bases. These conventions are necessary to insure consistency in mapping efforts on a nationwide basis.



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## **EQUIPMENT**

### **ZOOM TRANSFER SCOPE**

The Zoom Transfer Scope (ZTS) is an instrument developed to enable an operator to view two superimposed materials, such as a photograph and a map, simultaneously. The purpose of the ZTS instrument may be map compilation, map revision, or preparation of special purpose maps. Successful operation of the Zoom Transfer Scope requires familiarization with the various parts of the scope and their functions. Rather than attempt to recreate diagrams showing the various parts in this booklet, refer to the zoom transfer scope manual. For explanation purposes, the photograph will always be placed on the "stage" (glass surface above scope). The topographic map (topo) and mylar overlay will go on the table.

First, select the correct map lens for the particular scale of map being transferred. When referring to map lens magnification, the symbol "X" is called "power", i.e., 1X = one power. A 1X map lens may be attached to the ZTS to transfer at the 7 1/2 minute scale. A 2X lens should be used for greater accuracy. In certain instances, due to the complexity of some 15' maps, a 4X (four power) lens may be used.

## **LARGE SCALE MAP PRODUCTION**

### **BASIC MATERIALS**

To begin, the technician will need a photo packet, clean, unfolded topos (referred to as copy 2 topos), clear film topos or orthophotoquads and the necessary equipment, such as pens, lettering guides, shields, erasers, etc.

### **MAP HISTORY - LARGE SCALE PRODUCTION**

In the front of the photo packet there will be a series of sheets called the Map History - Large Scale Production. DO NOT LOSE THESE SHEETS. They are used to track the production of the map and they include special instructions which must be followed while transferring.

The cartographic supervisor is required to complete Section IV., ZTS, on the map history before sending the map to quality control. Before beginning a map, refer to Section III USFWS - P.I. QC. of the map history. Contained within this section are notes from the U.S. Fish and Wildlife Service that detail special instructions concerning the transferring or labeling of the 1:100,000 map unit. Always refer to these instructions as work proceeds on the maps. Also check the ZTS section of the map history for special instructions.

## **SHIPPING MEMOS**

In addition to the map history, a shipping memo is included with the photo pack. This states whether all the topos were present when they were sent from the NWI map archives. Place this sheet in the front of the photo packet, so that it can accompany the maps when they proceed to the next production step.

Check over the topos and photos to make sure the set is complete. If there are questions concerning the information shown on the front of the photo packet, consult the Chief Cartographer.

When photos, topos, and memos concerning changes from FWS have been accounted for, the maps can be set up in preparation for transfer.

## **INITIAL PREPARATION**

Two mylar overlays in addition to a copy of the U.S.G.S. topographic base map or orthophotoquad are required for each NWI map:

1. **Legend Overlay.** The 7 mil legend overlay is punch-registered and printed with the NWI classification system legend. This overlay is used for linework, tic marks, map names, photo information and the technical responsibility tag.
2. **Lettering Overlay.** The 4 mil lettering overlay is used for labeling, tic marks, linear wetland breaks and, at the upper left corner, the topographic map name.

Attach the clear copy of the U.S.G.S. topographic map or orthophotoquad to the reverse side of the legend overlay setting the north neatline  $1/2$ " below preprinted title using drafting tape or a suitable equivalent over left and right edges.

Place tic marks on the legend overlay exactly over the four corners of the neatline of the clear-copy topographic map. Use a #000 pen and with a straight edge make the tic marks 1" x 1" long. Then, attach the paper topo map, aligning it to these tic marks. The colored features of the paper topo will be easier to see during transfer, but tic marks must align to the clear topo.

### **BORDER INFORMATION**

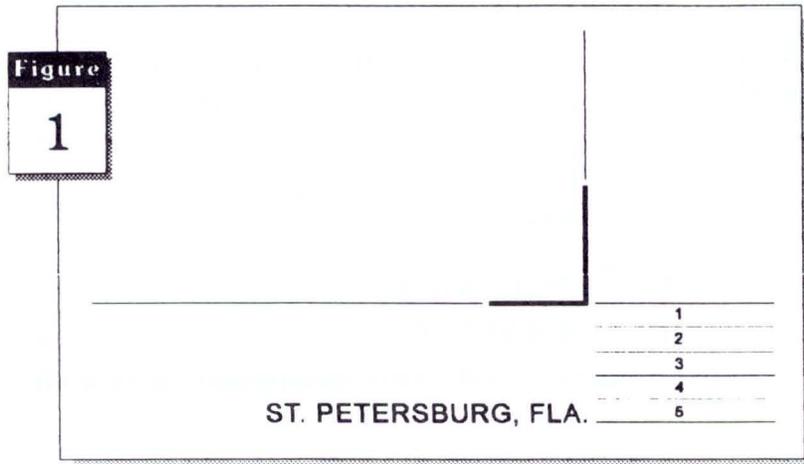
Use the Leroy lettering machine guide to letter all the collar information on the legend overlay. This includes the photo information. The lettering size used for border information is 3.2 mm. This is a larger size than that used for the interior of the map, which is  $1/16$ " (approx. 2 mm). Refer to Fig. 1.

When a topo has an area that extends beyond the neatline and corner tics, (also called an overedge quad) position the border information lower so it is clear of any topo features.

### **Topo Name**

Print the topo name exactly as it appears on the topo on the legend overlay 5 spaces down on the lettering guide from the southeast tic mark. Letter to the neatline but not beyond. Use a #000 pen. (Fig. 1).

**NOTE:** Topo name is repeated on the labeling overlay at the northwest corner, 3rd space above tic mark. (See Fig. 12)



While 1:100,000 scale map areas have their own unique name, they are most frequently referred to by the geographical quadrant of the 1:250,000 scale map in which they are located. For example, Atlanta SW is a 1:100,000 scale map area that is located in the southwest quarter of the Atlanta 1:250,000 scale map area.

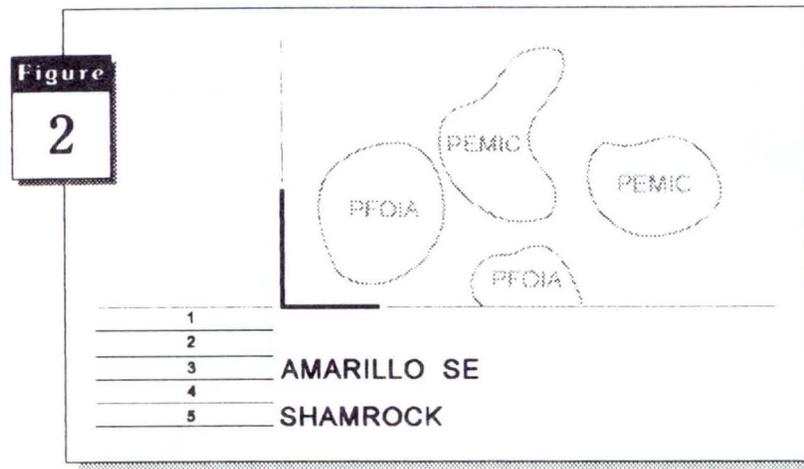
### **1:250,000 Quadrant Name**

Place the 1:250,000 quadrant name 3 spaces down on the lettering guide from the southwest tic mark of your legend overlay (Fig. 2). Do not letter to the left of the neatline.

### **1:100,000 Map Name**

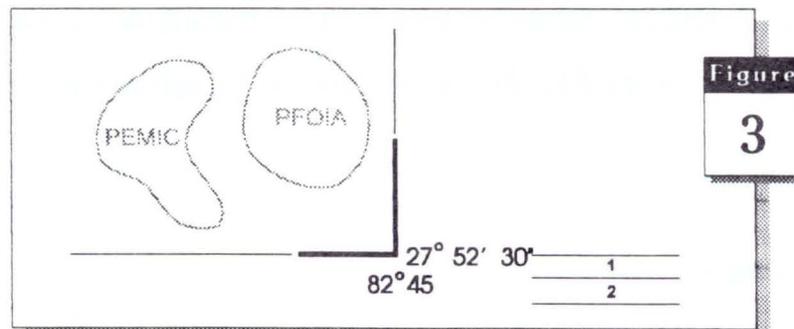
Locate the 1:100,000 “Map Name” assigned to this quadrangle. This can be found in the U.S.G.S. publication titled Topographic Map Series Quadrangle names 1:100,000 and

1:250,000 scale. Letter this name in the 5th space down from the southwest tic mark (Fig. 2).



### Coordinates

Map coordinates are normally contained at the corners of the clear topo base map. In the case of orthophotoquad base maps these coordinates may be absent, in which case they will have to be added to the linework overlay. The coordinates signifying the southeast latitude and longitude are labeled at a point to the right of the east neatline (latitude) and 2nd space down from the tic mark (longitude). These coordinates are centered exactly with the axis of the southeast tic mark and are placed on the legend overlay. (Fig. 3)



## Aerial Photo Information

Aerial photo information is on the label of each photo. Three items must be transferred to the blank printed on each overlay in the 1:100,000 map unit:

1. Date - Label month and year only (check all photos as all dates may not be the same).
2. Scale - Ex. 1:80K = 1:80 000; scale will vary, check all photos.
3. Type - refers to photo emulsion. Label as follows:

B-W - Black and white

CIR - color infrared

NC - natural color

DATE 4/ / 82

SCALE 1:65 000

TYPE CIR

Labeling should not touch the line  
above or below and should be  
centered in its appropriate space

*If one map contains photos of different dates, this information must be added on additional blanks.*

## EDGE TIES

All maps must tie to adjacent maps within the 1:100,000 map and with adjoining 1:100,000 maps along the edges both in the position of the feature and the label, unless otherwise specified in the task order or work order. Polygons or linears that are cut off by the neatline on one overlay must be in the same place where these same polygons or linears begin on the adjoining overlay. Use *non-photo blue* pencil to mark on the overlay where the linework meets the neatline of adjacent completed overlays. Before tying wetlands, make sure that the features on the topographic map underneath the wetland overlay tie. Ties should only be made to original maps that are in the "draft" stage and clear composite maps that are "final". As each overlay is completed, it must be tied to the next overlay started.

After completing a tie, it must be recorded on the tying diagram which is located in the photo packet; use a hook leader to indicate which two maps have been tied and initial by the hook leader. (See Appendix E)

The need to accurately tie all map overlays cannot be overemphasized. This is one of the first things users review in establishing the quality of a given map overlay.

Completed maps, meaning maps that have been finalized, cannot be changed. Linework and labels must match those already completed, unless otherwise directed by U.S. Fish and Wildlife personnel.

Preparation is now complete to begin transferring onto the first overlay in the 1:100,000 map unit.

## **SET UP AND TRANSFER**

### **Photo Review**

The first and most important step to take, before setting up to transfer, is to check to be sure that the photo overlay is aligned to the photo. Check to see that the delineated photo overlay has not been moved out of place. This can be done by making sure the register pin holes of the photo overlay line up with those on the photo. Look for easily recognized features on the photo and their counterparts on the topo map. Refer to these when making adjustments for alignment on the scope. Place a piece of frosted mylar between the photo and photo overlay, and place the photo face down on the stage. Cover it with a piece of glass to keep it flat.

**NOTE:** If photo has been removed from photo jacket, be sure and replace photo to the same jacket, as the jacket may have pertinent notes from the Regional office or National P.I. Quality Control written on it.

### **Setting the Scale**

Mark in pencil at least 3 points on the linework overlay, such as intersection of roads, buildings, etc. which would fall within a six inch area. Be sure to pick stable features (not lakes) that are clearly visible on both the photo and topo.

Line up these corresponding features while looking through the eye pieces. Use the “image rotation knob” to get these features parallel to each other. If the photo image appears larger or smaller than the corresponding feature on the topo, then adjust the scale knob until these features line up perfectly. Be aware that only the center of the viewing area will align sufficiently to transfer. Do not attempt to draw polygons or rivers that appear in the fringe of the viewing area.

### **Alignment**

Alignment is the extent to which the information you are transferring from the photo aligns with the information depicted on the topographic map. Proper alignment of the photo to the topo information cannot be overemphasized. Some pointers concerning alignment:

- Check stretch control - set at “0”.
- Adjust scale
- Adjust lamps.
- Maintain a low light intensity for the table lamp. This enables better feature identification.

- Keep the maps flat on table and check "tic marks" on the map overlay often to insure against slippage on topo.
- After realigning to transfer a new area, do not attempt to line up previously transferred polygons or rivers.

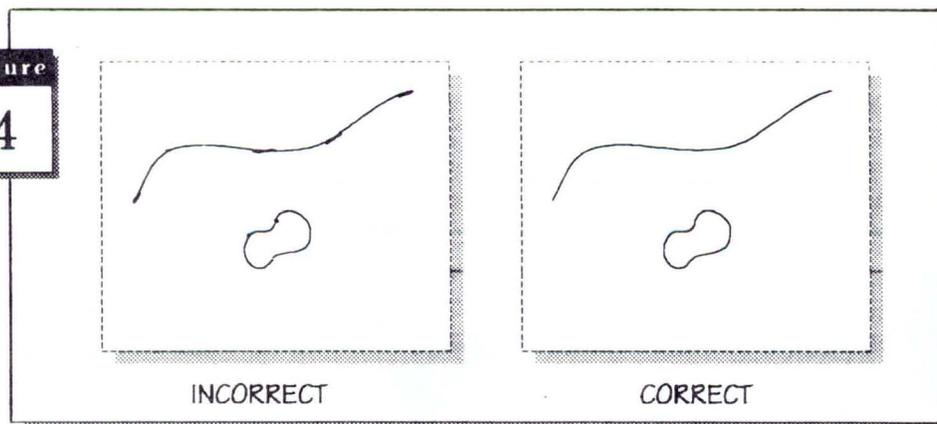
Maps that are in mountainous areas will require scale adjustment for different areas of the map to account for the variance in elevation.

### **LINEWORK**

Neat, uniform line weights are required. There should be no excessively heavy lines where the pen was raised from the mylar and then returned. There should be no "tails" at the ends of polygons (Fig. 4).

Figure

4



All linework is to be completed using a #0 pen point unless otherwise specified. (All linework should extend exactly up to the neatline and stop at it.) Use a straight-edge if the feature is straight, such as a channelized river, canal, or dam, etc.

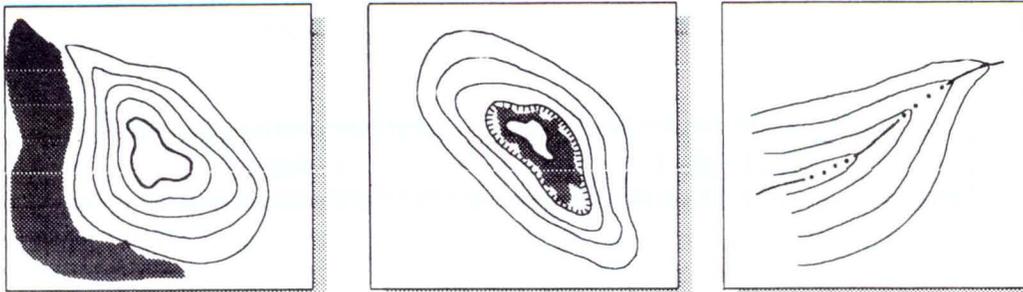
### Topo Information

Before beginning to transfer, study the topo and photo, looking for common features. Many wetlands delineated on photos are portrayed with symbols on the U.S.G.S. topos. Rivers, streams, lakes, and ponds are the most common wetlands appearing on both the topo and the photo. In cases where the photo closely duplicates the topo, follow the topo when placing your linework.

Brown is the color used to indicate contours on USGS topos. Care should be taken when delineating polygons and linears to follow the contours. Polygons and linears should conform to the relief depicted by these contour lines. Fig. 5 is an example of general conformation of polygons and linears to topographic contour lines.

Figure

5



**Note:** While many features such as hills and mountains remain stable over many years, others are affected and changed by the natural elements or by man. Topos that are twenty to ninety years old obviously cannot reflect changes that will appear on the photo. Consideration must be given to the disparity between topos and photos that differ radically in their dates. Decisions concerning delineation based on these differences can only be made through a complete understanding of contours and other topo symbols. (Read and understand information found under the heading of Topographic Maps, Appendix A). When considering the dates of photos vs. topos, it is important to remember that contour lines will generally not change except where extreme alterations to the landscape have taken place. It is, therefore, safe to assume that contours should be followed regardless of the difference in time between the photo and the topo.

## **Boundaries**

International boundaries are to be indicated on your maps. These will be the boundaries between the U.S.A. and Mexico or the U.S.A. and Canada. They should be drawn on the legend overlay just *exactly* as they are indicated on the topo . The remaining area on your map that lies outside the U.S.A. is left blank. Identify as "UNMAPPED AREA" on labeling overlay. "UNMAPPED AREA" is also used when a state boundary falls within a particular 1:100,000 map area, and mapping within that state is not funded. Use a straight-edge to draw these lines if they are straight.

When international boundaries are narrow linears, open the linear to an open polygon with one boundary being the international boundary symbol. Make it as narrow as possible.

## **Holidays**

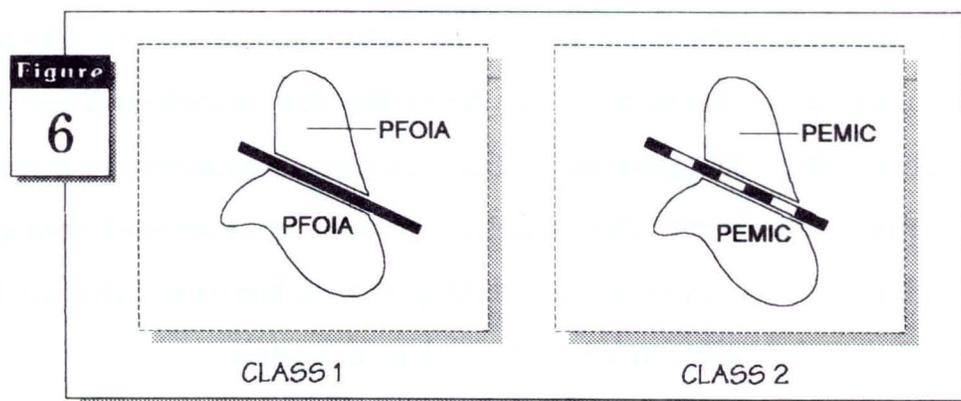
Holiday is a term used to indicate areas that cannot be mapped because photography is not available. If a Holiday falls within the 7 1/2' or 15' quad, the map is to be delineated up to where the Holiday line falls on the photo. Draw the Holiday line on the legend overlay just as it appears on the photo using a straight-edge and the same pen weight as the rest of the linework. Letter the words PHOTOGRAPHY UNAVAILABLE in capital letters on the lettering overlay in the center of the holiday area. Use the same lettering size and line weight used on the interior of the map and label so that both words are on one line, if possible.

If a 7 1/2' or 15' quad falls completely within a holiday area, an overlay is prepared but with no delineations. On the label overlay the words PHOTOGRAPHY UNAVAILABLE are placed in the center of the map.

## Roads

Primary Roads, Class 1 (solid red or purple lines): If a polygon is shown on the photo to cross a road designated as a primary road on the topo, then this polygon must be divided and made into 2 separate polygons to make way for the road. Each polygon must be labeled with the same classification (see Fig. 6).

Secondary Roads, Class 2 (red and white or purple and white dashed): If a polygon is shown on the photo to cross a road on the topo designated as a secondary road, then this polygon must also be broken into two separate polygons to make way for the road. Again, each polygon must be labeled with the same classification (see Fig. 6).



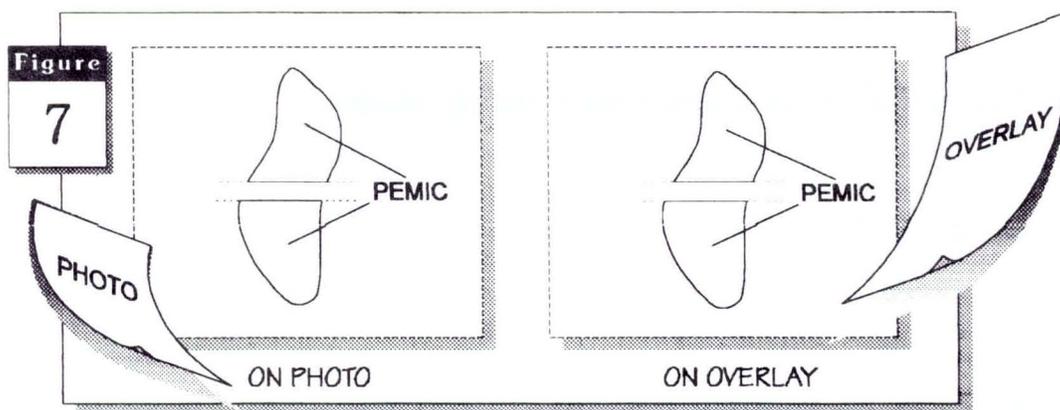
The National Wetlands Inventory uses *provisional topographic maps, T-sheets, advance prints* and *orthophotoquads* as base maps for ZTS whenever published topographic maps are not available. These products do not have primary or secondary roads shown as solid red or

dashed red and white lines. In order to properly break polygons for these roads, 15' maps should be referred to for identification of these roads. When *provisional topographic bases* are being used, break polygons for roads indicated by the Interstate Route and U.S. Route symbols only. In all cases where the road dividing wetlands is a straight feature, the use of a straight-edge to draw the wetland boundaries along that road will be required.

**Improved or Hard Roads** (Double-lined): Do not break polygons for these roads.

**Trails/Dirt Roads** (Dashed lines): Do not break polygons for these roads.

If the photointerpreter has shown a break of a polygon by actually separating it on the photo, it should be broken on your map. This may occur even though there is no road indicated on the topo (see Fig. 7).



Polygons are not to be broken for any roads if they are classified in the **Lacustrine** and **Riverine** systems or for any other system if they contain an open water (UB, OW, RB) classification. Linear wetlands also are not broken for roads.

Under certain circumstances, the Region may request that polygons of other classifications not be broken for roads. This is a rare instance and verification and approval in writing should be obtained from the Regional office.

**Linear Wetlands:** (See page 33 for application of these conventions on Alaska large scale maps).

Linear wetlands are those which are too narrow to be shown as polygons and, therefore, are represented by “dash” or “dot-dash” symbols. These will be delineated on each photo as dashed lines; however, the particular classes found in each wetland area will determine whether the “dash” or “dot-dash” format will be used on the actual map.

Use “dot-dash” symbolization for linears in the following classes only:

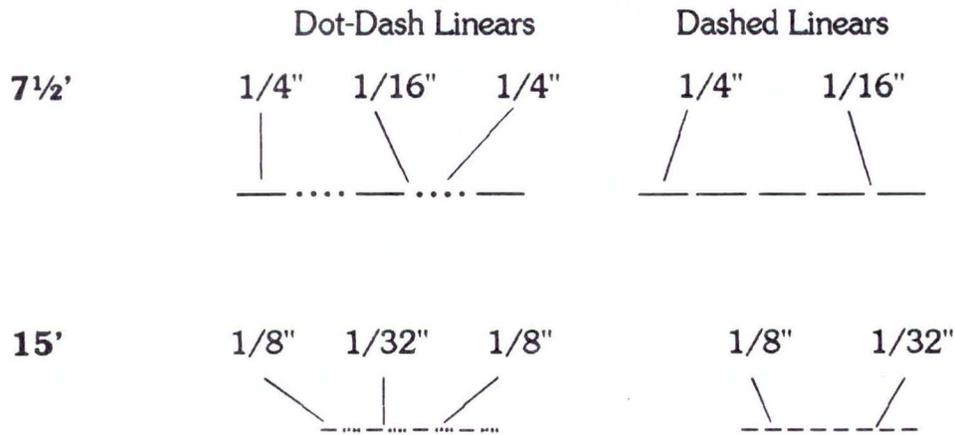
OW, SB, AB, RB, UB, US

Use “dash” symbolization for linears in the following classes:

EM, RS, RF, SS, FO, ML

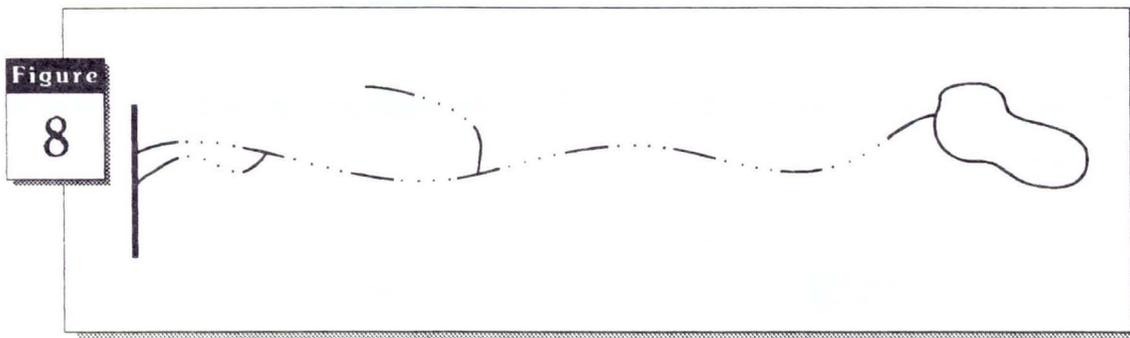
Occasionally the photointerpreters will delineate riverine wetlands as linears due to a lack of space to indicate the wetland as a polygon. Make the areas solid-line polygons if there is room to do so and they are designated as such on the topo as rivers 1/16" wide or greater.

The following are the specific guidelines for proper "dash" and "dot-dash" symbols:



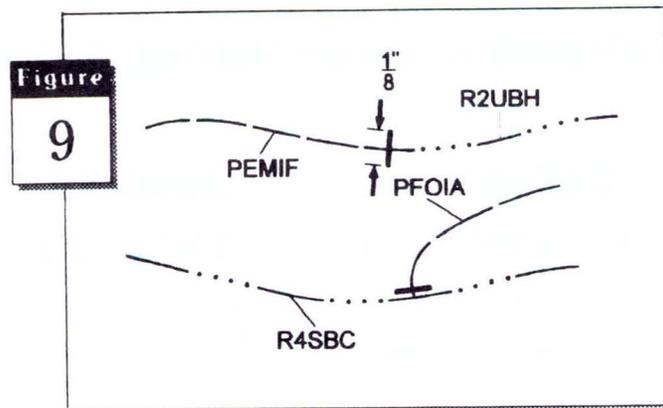
Linear wetland symbols less than 3/8" long will be shown as solid lines.

Linear wetlands always adjoin dash to dash, start with a dash and end with a dash. (Fig. 8)

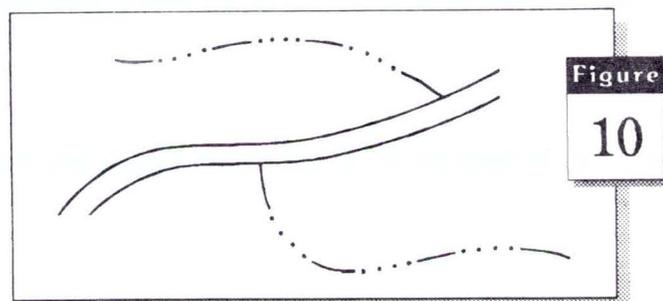


**Breaks:**

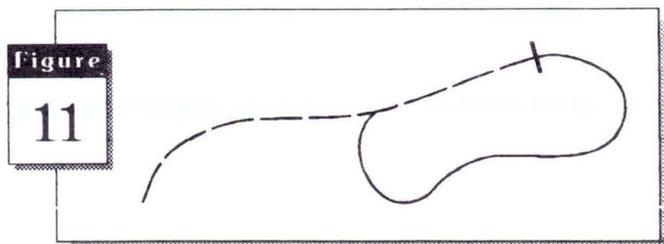
When linear wetlands show a change of classification, a break must be made to indicate this change. The break is made perpendicular to the linear or parallel to the primary linear, whenever possible, and it always goes through the dash. It should be drawn as a double thickness of the #000 pen line and measure 1/8" on all maps. It should also center across the linear (Fig. 9). All breaks should be placed on the lettering overlay only.



When a linear wetland begins at a double-line stream, it is **not** necessary to put a break symbol on the linear wetland (Fig. 10).



Linears that border along polygons only part of the way must have a break to show where they stop (Fig. 11).

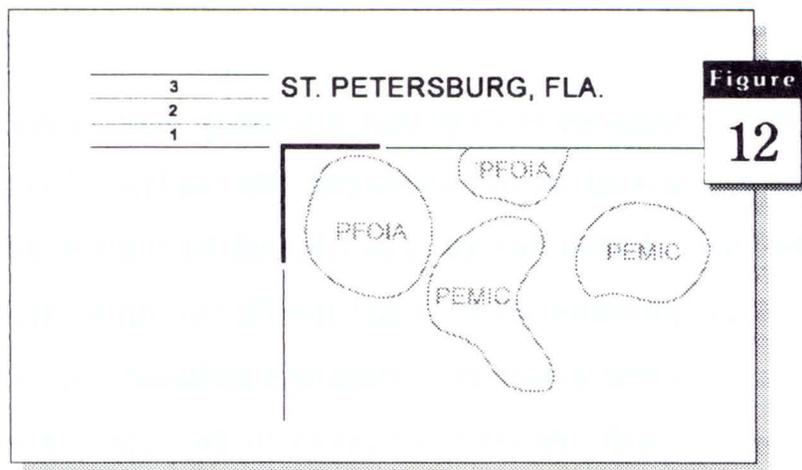


## LETTERING AND LABELING

Once the linework of all the wetland areas has been transferred, it will now have to be labeled. Attach a sheet of plain, frosted mylar to the map, using registration pins in the pre-punched holes at the top of each sheet. This will become the lettering overlay. Tape this overlay in place

to make certain it stays in proper alignment while the labels are added.

Using a #000 pen, add tic marks in each corner. These will be placed exactly over the tic marks on the linework overlay, and are the same size. Add the topo name in the northwest corner of the lettering overlay using a #000 pen placed on the third space above the tic mark (Fig. 12).



The styles and sizes set forth by this manual must be adhered to for conformity. The style must be uniform so that all labels are alike when the maps are tied together. Follow the lettering style shown (Fig. 13).



## **Penpoint Sizes**

On 7½' maps use # 0 point on linework.  
#000 point on leaders and labels.

On 15' maps use #000 on linework.  
#000 on leaders and labels.  
#0000 on leaders and labels in complex maps.

## **Label Placement**

When uniformity and neatness are accomplished in lettering, the next step is to learn correct placement of labels in or around features transferred onto overlays. There are definite guidelines to proper placement of labels that are to be followed, but it should be stressed that there are exceptions to these guidelines under certain specific conditions that occasionally arise. Approval to by-pass the normal guidelines concerning a particular map or problem area must be given by NWI map QC staff. As labels are placed on the maps, the features (polygons & linear wetlands) are of primary interest to the user. If these features are obscured by poor label placement, then the purpose of the map has been defeated. Care should be taken to avoid drawing labels over the features or drawing leaders through rivers or polygons to reach other rivers or polygons. However, when maps are extremely congested, it is sometimes impossible to avoid these practices. A clear view of the features makes a more usable, easily understood product.

When large polygons cross a map and are closely intertwined, label these polygons at various points to aid in their identification.

The wetland overlays are *composited* (photographically combined) with USGS topographic maps. The clear copy topos provided will appear on the final NWI maps, therefore, labels

should not be placed over some of the features contained on the topos, such as:

1. Any place names on topo
2. Red roads and red/white dashed roads (Class 1 and 2).
3. Purple photo-revised areas, including solid and dashed roads (Class 1 and 2).
4. Pink urban areas (where possible).
5. Any dark features, houses, buildings, etc.

Do not letter right to the neatline. In some instances these maps are reduced in size, trimmed to the neatline and panelled together to produce a 1:100,000 scale wetland map. Lettering that is on or near the neatline might get lost in the process.

### **Split Classes**

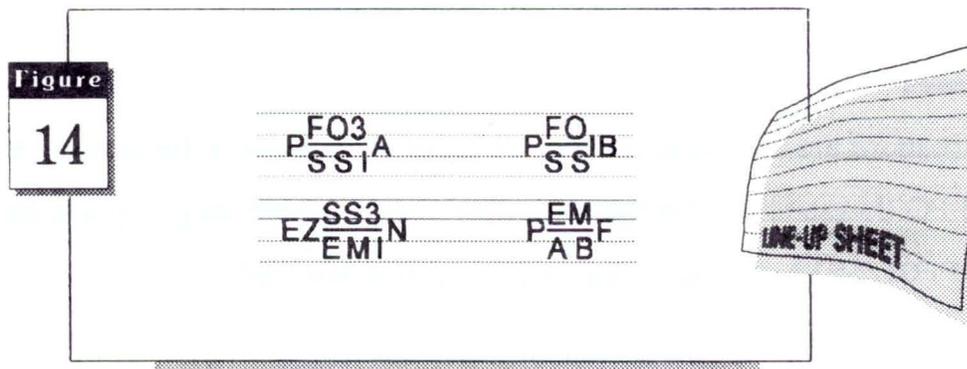
Split classifications are used to symbolize two types of wetlands in the same location, such as a mixture of FO (forested) and SS (scrub-shrub). On the photo they may appear with a slash. Example: PF01/SS1A. On maps they will be labeled as a fraction.

If the classification is a single class but has a mixed sub-class, it is written with a slash dividing the sub-classes. Should one wetland area share two classes and/or sub-classes, follow the guidelines listed below for labeling:

		ON PHOTO	ON OVERLAY
Same Class Split Sub-class	—————	PFO1/2F	PFO1/2F
Split Class No Sub-class	—————	PFO/EMC	$P \frac{FO}{EM} C$
Split Class Same Sub-class	—————	PFO1/SS1Ab	$P \frac{FO}{SS} 1Ab$
Split Class Split Sub-class	—————	PFO3/SS1B	$P \frac{FO3}{SS1} B$

(Modifiers are not made part of the fraction)

Split classes should occupy two lines on the line-up sheet and the fraction bar is always drawn with a straight-edge. The letters should not touch the bar. (Fig. 14)



### List of Mixed Classes

Mixed classes shall be limited to the following combinations and their reciprocals:

EM, EM, EM, FO, FO, FO, FO, SS, SS, SS, AB, US  
 AB UB US EM SS UB US EM US UB UB UB

## List of Mixed Subclasses

Mixed subclasses shall be limited to the following combinations and their reciprocals:

FO1/2, FO2/4, FO1/4, FO1/3, SS1/4, SS1/3

If mixed classes are used, then mixed subclasses cannot be used in the same mapping unit.

Example:      FO1/2  
                 P \_\_\_\_\_ A is illegal  
                 SS1/3

## Special Modifiers

When special modifiers are used in combination, the letters should be written in order of listing in the legend, that is, alphabetically. (example: PUBHrx)

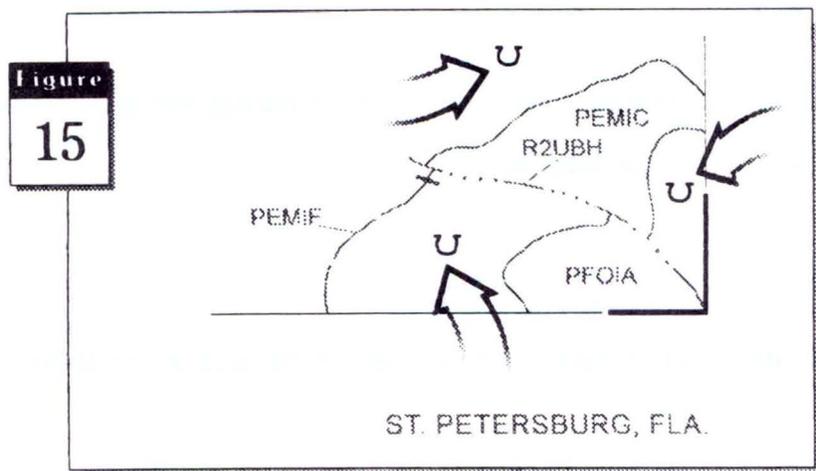
## “K” Water Regime

When the “K” (artificially flooded) water regime is used with a second water regime, the “K” is written first. (example: R4SBKcx)

## Upland Symbols

This symbol "u" stands for upland or non-wetland. The symbol is drawn to the same height as the other lettering on the same map.

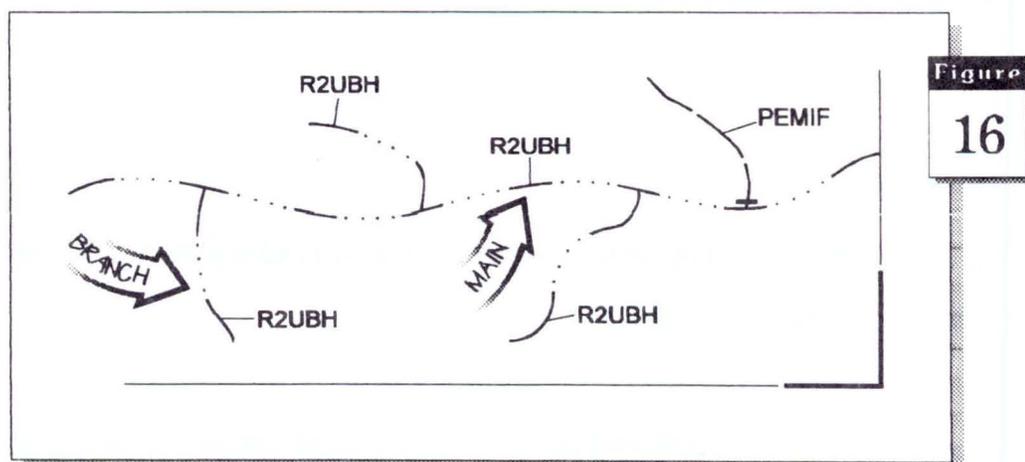
The upland symbol should be centered roughly in every non-wetland area that is enclosed by polygons or linear wetlands or enclosed by these wetlands and the neatline. (Fig. 15)



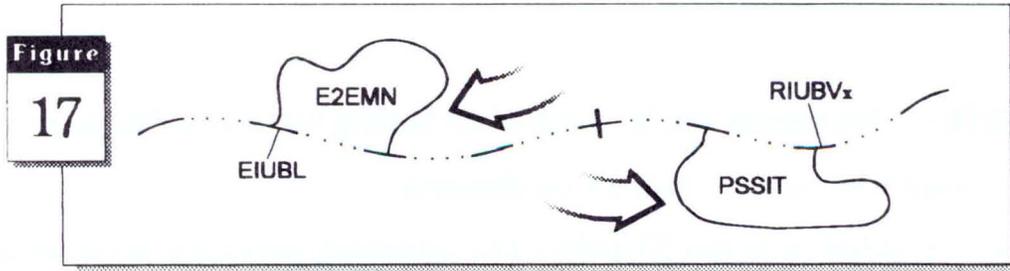
### Linear Wetlands

Linear wetlands should be labeled more than once if they meander across the map or if they pass through congested areas.

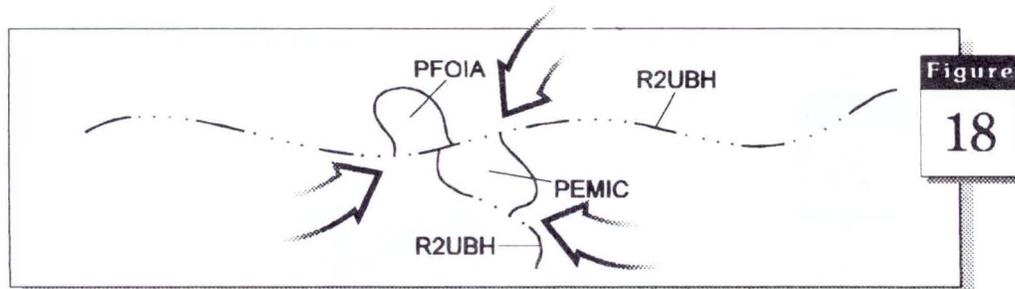
When labeling riverine systems, it is not necessary to label the main artery of the river immediately after a branch if the main artery is obvious. The branch, even though the same classification, must be labeled (Fig. 16).



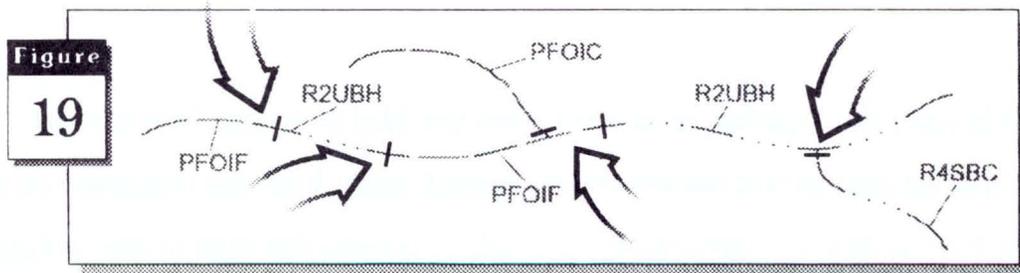
Polygons whose sides are formed by linear wetlands must be labeled as well as the linear wetlands (Fig. 17).



Polygons bordering linears may connect at a dot if the spacing of dots and dashes force it to. This is the only instance when this will happen. (Fig. 18)



The linear must be labeled on each side of all breaks (Fig. 19).

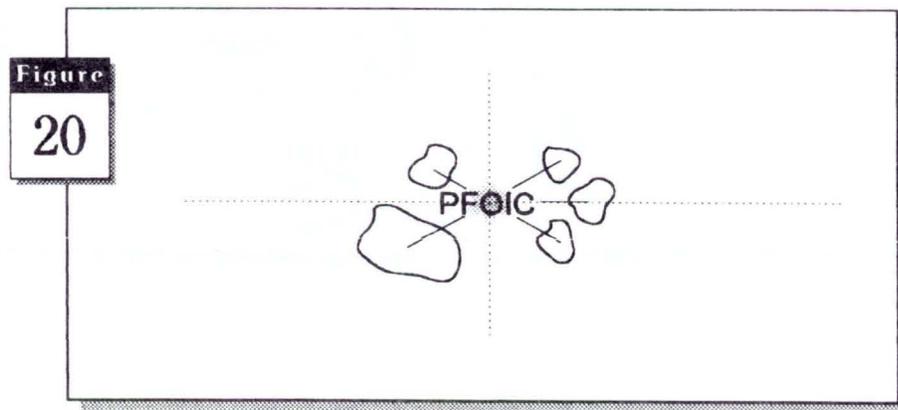


## Leaders

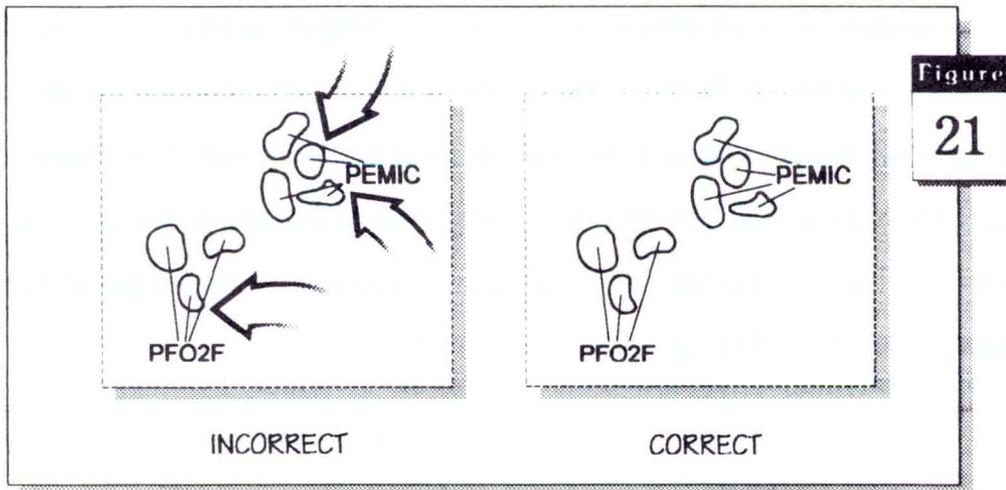
Leaders are to be drawn with a straightedge, no less than 1/8 inch, no longer than 3/8 inch and should never cross labels, breaks, or other leader lines. Also, avoid crossing river systems or polygons, to reach other polygons or river systems.

**NOTE:** Exceptions can be made when dealing with congested maps or unusual situations. Consult NWI map QC staff for clarifications.

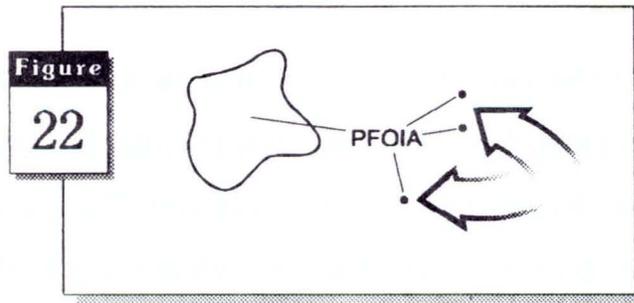
Labels can accommodate up to five (5) leaders when absolutely necessary, however, one or two leaders to a label is considered best on uncongested maps. The leader should point from the center of the label (Fig. 20).



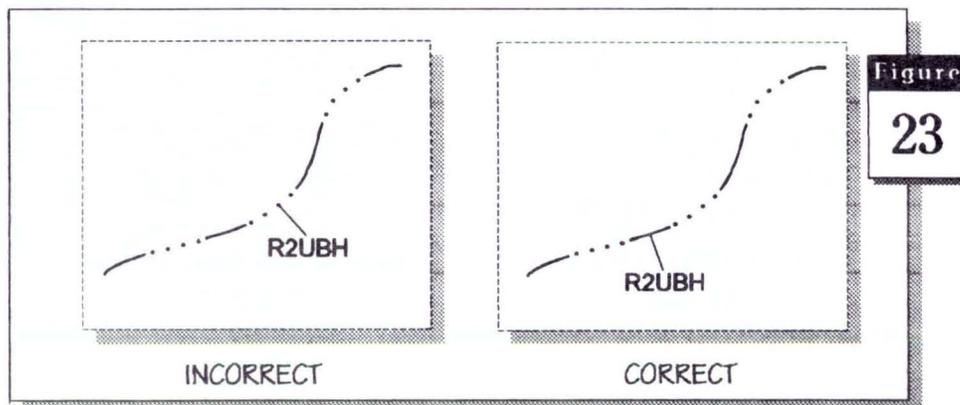
Do not let leaders run together or to stem from the label in a disorderly fashion. Keeping in mind that the features should remain visible, a small move from the imaginary center point is acceptable if it will help to avoid passing through or grazing the edge of one polygon to reach another (Fig. 21).



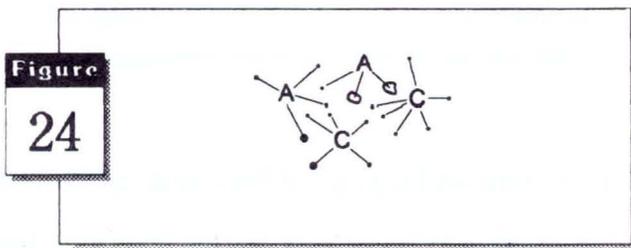
Leaders should always go to a point well inside the perimeter of the polygon. Polygons that are so small that they are not open should have their leader lines stop just short of touching (Fig. 22).



Leaders pointing to linear features should always touch a dashed line, ideally at near 90 degree angles, if possible. The leader should touch the center of the dash. (Fig. 23)

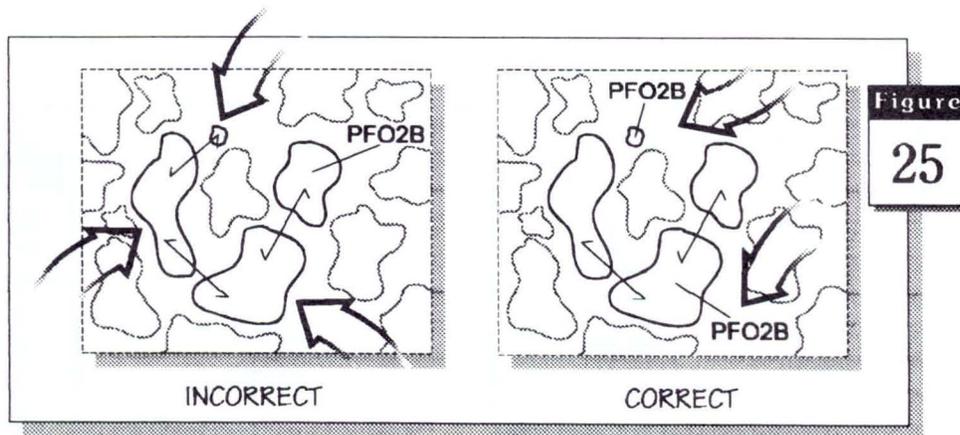


Extremely congested maps are difficult to label and sometimes require special handling when it comes to leaders and labels. When features from the same classification are packed in an extremely tight formation, special abbreviations are sometimes used to label and identify them. Generally, water regimes with the emergent class only are shown. A special “note to the user” must be added to the map legend when this occurs. However, these are not to be used without prior approval from NWI map QC. staff.



### Hook-Leaders

Hook leaders may be used to tie together two polygons of the same classification when there is no room to label each separately (Fig. 25). Each polygon must be large enough to place the hook inside without the hook touching the wall of the polygon. The leader itself must be at least 1/8 inch long and no more than 3/8 inch in length. When using hook leaders, the polygon must be hooked to one that has been labeled. Use hook leaders as a last resort, when all other types of labeling have been tried.



## **15' MAP CONVENTIONS**

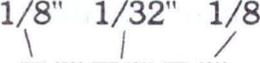
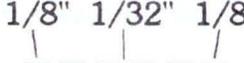
Generally, the conventions used for 7½' maps can be applied to 15' maps. However, due to the compact nature of these maps and the relative congestion at this scale, some conventions may be modified.

### **Penpoint Sizes**

Linework: #000  
Leaders and labels: #0000

### **Linear Wetlands**

The following are the specific guidelines for proper "dash" and "dot-dash" symbols.

<u>Dot-dashed linears</u>	<u>Dashed linear</u>
$\frac{1}{8}''$ $\frac{1}{32}''$ $\frac{1}{8}''$	$\frac{1}{8}''$ $\frac{1}{32}''$ $\frac{1}{8}''$
	

*Linear wetland symbols less than 3/8" long will be shown as solid lines.*

### **Labeling**

Unlike the 7½' mapping convention, a special lineup guide is used for the 15' series maps. The spacing between lines is 1/32" (approx. 1 mm).

In certain instances, due to congestion, some labeling conventions may be sacrificed:

1. labeling over topographic information
2. labeling over primary roads and secondary roads (solid red or purple and dashed red or purple roads)
3. labeling outside of the neatline

## **Leaders**

On 15 minute maps that are congested, a deviation from the standard leader length (1/8" to 3/8") is permissible, but good judgment should be used as to what is reasonable and visually acceptable. Certainly leaders should appear larger than mere dots yet not so as to cause confusion on the part of the user.

## **UPLAND CLASSIFICATION OVERLAYS**

Occasionally wetland maps are compiled in which there exists an upland classification system. When this occurs there will be a third overlay on which upland labels and upland linework are placed.

**NOTE:** Wetland maps should be cartographically correct as they will be reproduced without upland overlays. Upland overlays are only used in conjunction with wetland overlays.

## **Penpoint sizes:**

linework:	#0
leaders & labels:	#000

## **Set up**

Registration pins should be used when compiling upland overlays.

All three overlays should have 4 tic marks aligned to the clear film topographic map.

Topo name is placed above the northwest tic mark, flush with neatline, 5th space up. (2 spaces above topo name on wetlands labeling overlay.)

## **Edge ties**

Upland overlays need to be tied or edgematched the same as all wetland maps. Linework and classifications must tie internally within the 1:100,000 area and externally with surrounding 1:100,000 areas.

## **Upland linework**

Transfer linework that separates upland classifications only. Use the wetland linework to define areas of upland polygons whenever possible. Make sure upland linework meets wetland linework in a neat, clean junction.

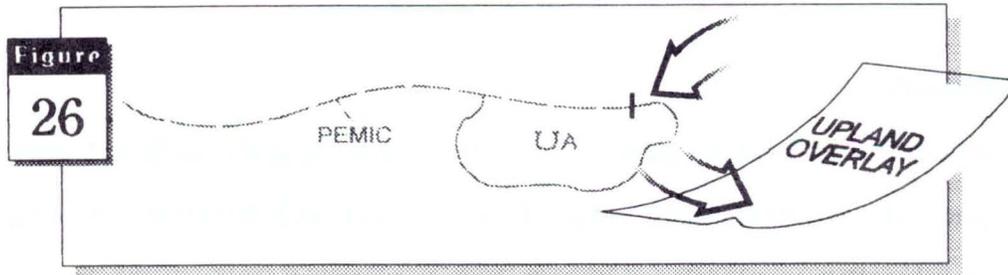
Linear or point uplands on photography should only be transferred if they can be delineated as a polygon.

## **Upland labeling**

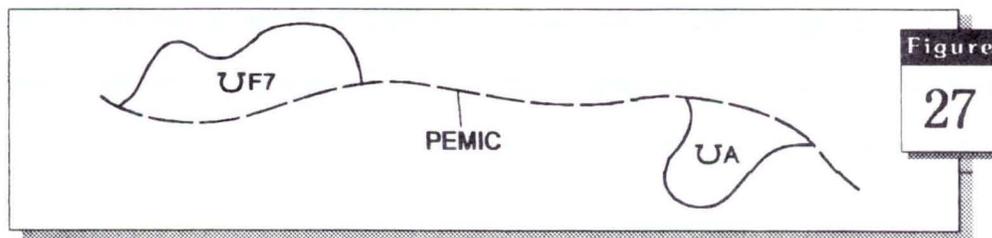
After each upland symbol on the wetland label overlay, there must be an upland classification which is placed on the overlay. Placement of upland symbols on wetland overlays must be considered in order to do this properly. Additional uplands created on the upland overlay are labeled on the upland overlay only.

## Breaks

A break is necessary when a linear runs directly into the end of an upland polygon line. This break is placed on the upland overlay. (Fig. 26)



A break is not required when the upland polygon meets another wetland polygon or meets a wetland linear at an angle. (Fig. 27)



## ALASKA MAPPING CONVENTIONS

When drafting Alaska maps, the conventions used are basically the same as used on 1:24,000 scale maps, with a few special exceptions. Alaska maps are drafted to a 15' base at a scale of either 1:63,360, or 1:40,000. The linework, label, and pen size are different for each scale, and are shown below.

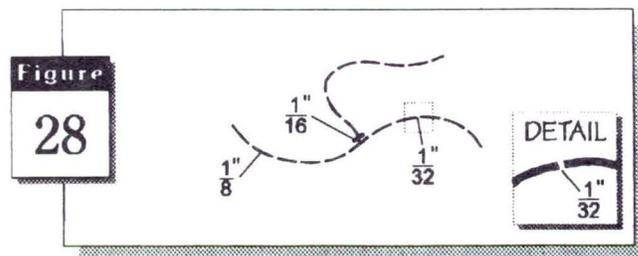
### Specifications for 1:63,360 scale maps:

#### Penpoint Sizes

Linework: #000  
Leaders and Labels: #0000

#### Linework

Linework is transferred much the same as with 7½' maps. A #000 pen is used due to smaller size features. Much of Alaska is mountainous, and the relief shown on the base map must be considered when transferring wetland linework to be certain it is aligned properly. Linear wetland symbols less than 3/8" long will be shown as solid lines. Linear wetlands are shown with the dash-dash format for all classes in Alaska. Dot-dash linears are not used. The following are the specific guidelines used for linear wetlands and their symbols. (Fig. 28)



## **Labeling**

A special lineup guide is used to label 1:63,360 maps. The spacing between lines is 1/32" (approximately 1 mm). Leader length shall be between 1/8" to 3/8" in length, with slightly longer or shorter leaders allowed in congested areas. When labeling polygons at or near the neatline boundary, it is allowable to place the labels outside the neatline to avoid running the leader through other polygons. Place labels outside the neatline anytime it will result in a more legible map. On selected maps, it will be specified in the map history or on related correspondence that all PUBH polygons will not be labeled, or that PUBH polygons in congested areas will be left unlabeled. In this situation, a statement saying "all unlabeled wetlands are classified PUBH" shall be placed in the legend under user notes.

Also in selected situations, due to congestion or an abundance of palustrine wetlands, the statement "all unlabeled wetland polygons are in the palustrine ecological system" is used, in which case these polygons are not to be labeled.

Both of these labeling techniques should be done only with prior approval or direction from U.S. Fish and Wildlife Service personnel.

## **Specifications for 1:40,000 Scale Maps**

### **Penpoint sizes**

Linework: #000

Leaders and Labels: #000

### **Labeling and Linework**

All of the conventions used on 1:63,360 scale maps apply to 1:40,000 scale maps. As noted, labeling will be done with a #000 pen, and will be the same size as that used in 7½' maps, which is 2 mm. Linear wetlands on 1:40,000 scale maps will be shown as dash-dash symbols for all classes, with the size used being the same as 7½' maps which is ¼" dashes with 1/16" spaces between them.

### **Border Information (1:63,360 and 1:40,000)**

Border information on Alaska maps is identical to that which is used on 7½' maps. This will be made using the Leroy lettering machine at the size of 3.2 mm, using a #000 pen. One exception used on border information on all Alaska maps is that the 1:250,000 map name is placed in the third space below the southwest corner of the quad. The 1:100,000 map name does not apply. When adding the photo information on 1:63,360 scale maps, use a lettering size of 2mm.

## SMALL SCALE MAP PRODUCTION

### 1:100,000 SMALL SCALE MAPS

In some cases wetland delineations will be transferred directly to a 1:100,000 base map. Generally, the conventions for 7½' maps apply; in addition, the following conventions should be followed.

#### Special Instructions

Currently the National Wetlands Inventory uses a non-reproducible blueprint on the back of *Herculene* mylar (matte both sides) as a base map. This type of base map can be directly compiled and inked on the front and erasing will not disturb base lines.

#### Penpoint Size

Linework: #000 point  
Labels and Leaders: #000 point

**NOTE:** In some situations, due to congestion, a #0000 pen may be used for linework and labels.

#### Border Information

Tic marks, 1:250,000 quadrangle name, 1:100,000 map name, topo name, responsibility tag are added. Use same lineweight, spacing, and lettering guide as 7½' map.

#### Edge Ties

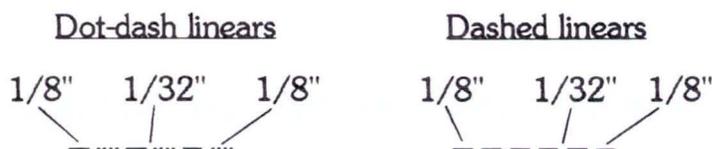
All maps should be tied in the same manner as other 7½' maps. (Compiled adjoining maps are obtained from FWS map archives).

## Transfer

Same procedure as 7½' maps. The use of a 4x lens on the zoom transfer scope will be necessary.

## Linear Wetlands

The following are the specific guidelines for proper "dash" and "dot-dash" symbols:



Linear wetlands less than 3/8" long will be shown as solid lines.

## Breaks

Breaks should be drawn double thickness of the pen line and 1/8" long.

## Leaders

Leaders should be no shorter than 1/8" and no longer than 1/4".

**NOTE:** Exceptions can be made when dealing with congested maps or unusual situations.

## 1:250,000 SMALL SCALE MAPS

At present the National Wetlands Inventory is producing 1:250,000 small scale maps in certain regions of the country. The conventions for these small scale maps are still in developmental stages and are subject to revision. Once again, the conventions for 7½' maps apply, however the following changes should be made:

## Penpoint Sizes

Polygon linework and linears	#00 point
Labels and leaders	#000 point

**Note:** *Older versions of the 1:250,000 scale maps produced may have differing linework and labeling penpoint size and/or symbology. Refer to the individual map legend for specific information.*

## Border Information

As with Large Scale Map Production, USGS paper topos and clear film topos are used as the base. Due to the scale, some of the border information, such as the coordinates are included on the base. The tic marks are added to the linework and lettering overlays prior to map production and the responsibility tag is added by the technician when transferring begins. The 1:250,000 name (the quadrant designation is dropped) and the standard collar information is added prior to photo lab reproduction.

## Overlays

In addition to the linework and label overlays, a separate dot overlay is used for the transfer of polygons less than 10 acres and 10 to 40 acres.

## Transfer

Same procedure as 7½' maps. The use of a 4X lens on the zoom transfer scope will be necessary.

Wetlands of 40 acres or larger are transferred as polygons and labeled to class. Numerous small wetlands located within a 40 acre or larger wetland will not be delineated. The label which comprises 60% of the larger polygon will be used. Wetlands between 10 and 40 acres are transferred as red dots; wetlands less than 10 acres are transferred as blue dots; neither type is labeled. Both will be designated only in upland areas on a separate overlay as previously men-

tioned. Where numerous wetlands, within an upland area, occur too closely to be pulled out individually, a polygon conforming to the general shape is drawn around this dense wetland area. Numerous wetland basins are not labeled as they will be screened on the final map; however, the letters NWB (numerous wetland basins) are written in pencil within the polygon at transfer stage.

### Linear Wetlands

All linear wetlands will be transferred except where omissions are absolutely necessary for clarity. If questions arise, consult with NWI Map QC staff. Omission of linears with seasonal or wetter water regimes, is not permitted.

Emergent (EM) linear wetlands will be delineated as 3/16" dashes. (Fig. 29)

Forested (FO) and scrub-shrub (SS) wetlands will be delineated as solid lines.

BECAUSE OF SPACE LIMITATIONS, WETLANDS DISPLAYED ON THIS MAP  
HAVE BEEN GROUPED ACCORDING TO THE FOLLOWING:

**WETLAND SYMBOLOGY**

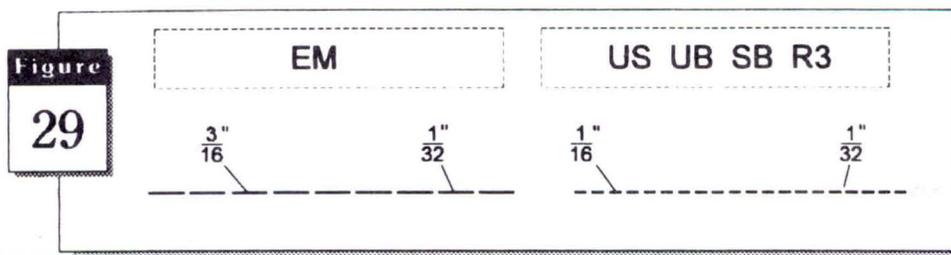
**POLYGONS**

- WETLAND SMALLER THAN 10 ACRES
- WETLAND BETWEEN 10 ACRES AND 40 ACRES
-  NUMEROUS WETLANDS
-  WETLAND 40 ACRES OR LARGER

**LINEARS**

- FO/SS (FORESTED-SCRUB/SHRUB)
- - - - EM (EMERGENT)
- US/OW/UB/SB (UNCONSOLIDATED SHORE/OPEN WATER/  
UNCONSOLIDATED BOTTOM/STREAMBED)

Unconsolidated shore (US), unconsolidated bottom (UB), streambed (SB) and upper perennial (R3) linear wetlands are delineated as 1/16" dashes. (Fig. 29)



Linear wetlands less than 3/8" long will be shown as solid lines.

### Labeling

A #000 point is used for labeling. Linear wetlands and polygons of 40 acres or larger are labeled and then just to class. The lettering guide used has 1/32" (approx. 1 mm) spacing between lines which is one-half the spacing of the 7½ minute lettering guide.

**NOTE:** On older versions of the 1:250,000 scale maps, linear wetlands are not labeled.

## MAP COMPLETION

### Technical Responsibility Tags

When completing each task on a map, the technical responsibility tag must be filled out. The tags are located at the bottom left of the map. Indicate your name, which task you performed, and the date you completed the task. (See Fig. 30)

Figure  
30

1:100,000 NAME:	TOPO NAME:	TECHNICAL RESPONSIBILITY		
		TASK	NAME	DATE
		ZTS      Transfer		
		Lettering		
		ZTS QC		
		MAP PI QC		
		ZTS CORRECTION		
		CORRECTION CHECK		
		F.W.S. ACCEPT		

Upon completion of your maps, and after you have corrected all mistakes found by map QC staff, separate the paper topos from the overlays. Be extremely careful not to tear the topos. Remove all tape from both the topos and the overlays and clean all your overlays with *Renuzit* cleaner. Do not use any other chemical. Excess *Renuzit* must be wiped off and the overlays allowed to dry before placing them together.

### CORRECTIONS AND REVISIONS GUIDELINES:

Once the maps have been completed, each team leader will edit each map, using blue pencil. Do the corrections and erase the pencil marks as each correction is made. The maps will then be sent to the Quality Control (QC) Department for further checks and corrections. A mylar

diazo sheet will be made of the lettering overlay, and corrections will be drawn on this sheet in colored pencil. First QC calls will be in red. Calls for the P.I. will be in blue. The P.I. will make comments and answer questions to him/her in purple. The maps are then returned to the cartographic technicians for corrections. As each correction is made, initial each call in yellow on the diazo sheet. Refer to the list of Editing Corrections Symbols and Colors for proper interpretation of correction calls. (Appendix F)

Conform line weights, and label style and size, to match those used when the map was originally drafted. Upon completing a map, fill in the "ZTS correction" section on the technical responsibility tag. The maps now return to QC for a correction check. Additional calls will be made in green pencil (2nd QC) and, if necessary, orange pencil (3rd QC) and black pencil (4th QC). The maps will then go to the FWS editing staff for an additional edit. Any corrections will be noted on the maps with red arrows and a QC review form describing the corrections will be made. Check and initial the completed calls on the review sheet. Do not remove the arrows on the maps; they will be removed later by the FWS editor. At that point, the maps are considered completed "draft" maps.

## **FINAL REVIEW PROCEDURES**

The completed draft maps will be sent to the FWS Regional Coordinator who will review the maps. Revisions will be drawn on the map paper copy, along with descriptions of changes to be made. These instructions will be written in red pen or pencil. Other comments and notes may be present written in green, blue, or black pen or pencil. Always refer to the red instructions for final map corrections, unless specified otherwise. These corrections will be effected to the map originals and then the maps will go through a QC procedure similar to that given a draft map. When these steps are completed, the maps are considered to be "final" maps.

## APPENDIX A

### TOPOGRAPHIC MAPS

A topographic map (topo) is a line and symbol representation of natural and selected man-made features of a part of the earth's surface plotted to a definite scale. A distinguishing characteristic of a topographic map is the portrayal of the shape and elevation of the terrain by contour lines.

The various symbols, colors and lines found on the topo make specific reference to features found on the earth's surface. Thorough understanding of these symbols will help in the proper transfer and compilation of photo information to that found on the topo.

U.S. Geological Survey topographic maps and orthophotoquads are used by the National Wetlands Inventory as base maps on which mylar overlays are placed and information is transferred. The topos are printed on paper, orthos on film and should be handled with care. When beginning work on a set of maps, ensure that all topos or orthos are present and that they correspond in name to the names on the index in the front of the photo pack. Clear film copies of the topos or orthos will also be available before work is begun.

#### **Symbology:**

**Blue** is of primary concern in that it represents water and NWI is mapping water-related areas. Many polygons and linear wetland areas found on the photo will also be found on the topo. Look for similar shapes when transferring and when those polygons and linears on the photo are similar in size, shape and location to features represented on the topo, generally follow the topo. This is especially true of linear wetlands occurring in steep terrain.

**Green** is symbolic of woodland and other types of vegetation. Vegetation patterns are a pri-

mary consideration of the photo interpreters when determining the identification of wetlands and should also be referred to while transferring. There are no hard and fast rules for following the vegetation tints and symbols depicted on the topo, but if the photo indicates a wetland almost identical in size and shape to a green tinted area on the topo, use the topo as a guideline for location.

**Blue grasslike** symbols indicate marshes or swamps and are given the same consideration as the green vegetation patterns mentioned above.

**Purple** tints on the topo reflect areas which have been photo revised. Photo revision is the process of updating maps from aerial photographs and other available sources to reflect planimetric changes which have occurred since the date the map was originally published. Purple tinting indicates these areas are accurate representations of features even though the topo itself is several years older.

## **Contour Lines:**

Brown is the color used to indicate relief, or elevation contours.

The objective in representing relief is to portray the heights and shape of the land. The relief is shown for two purposes. First is to present an accurate geometric description of the terrain. Second, to give a picture of the landscape. Relief symbols and lines are designed to attain both objectives.

Contour lines are the best means of portraying relief because they present both elevation information and a terrain picture. Other relief symbols only show one or the other. Spot elevations, for example, show the height above mean sea level but give no topographic form. All relief features are influenced by the drainage in the area.

Spot elevations are used to supplement the map information shown by contour lines. Checked spot elevations are shown in black, unchecked in brown. Where exact location is not evident, they are shown with a brown cross.

When examining contours, it is important to keep in mind the contour interval. The contour interval is the vertical difference between any two contours. The contour interval is listed in the legend of all topographic maps.

The figures shown on page 47-48 display the use of contours to indicate terrace or bench.

In addition to the standard topo, we occasionally work with other base maps. These include:

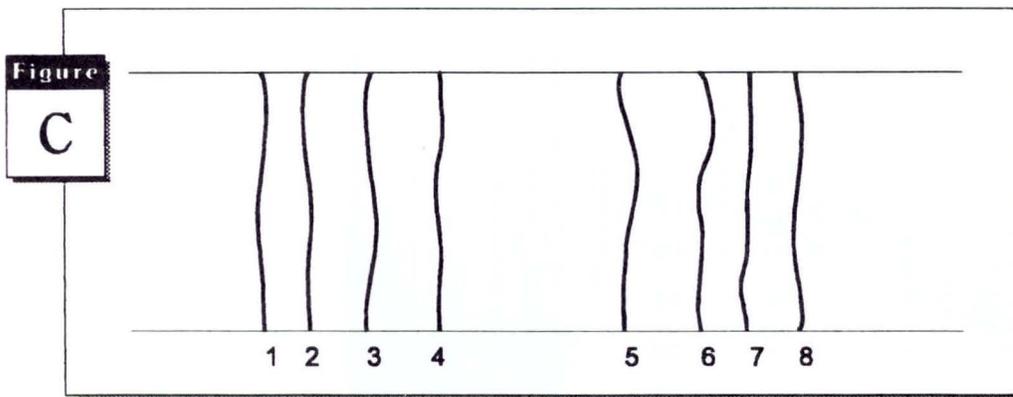
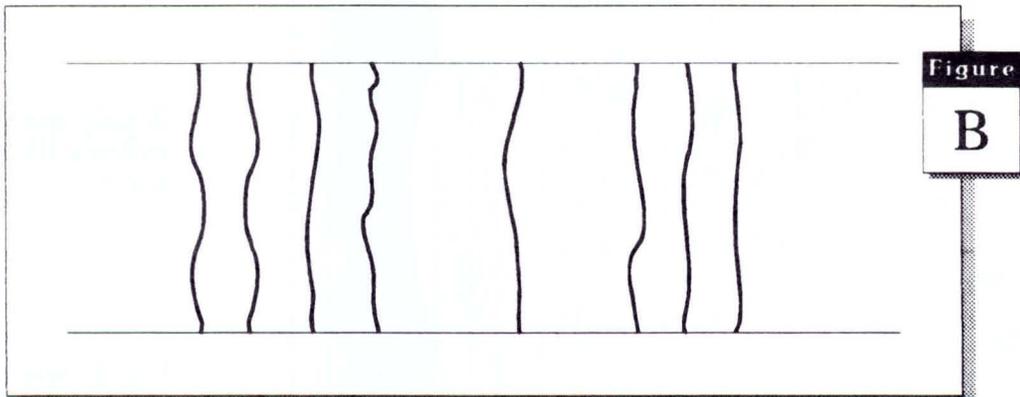
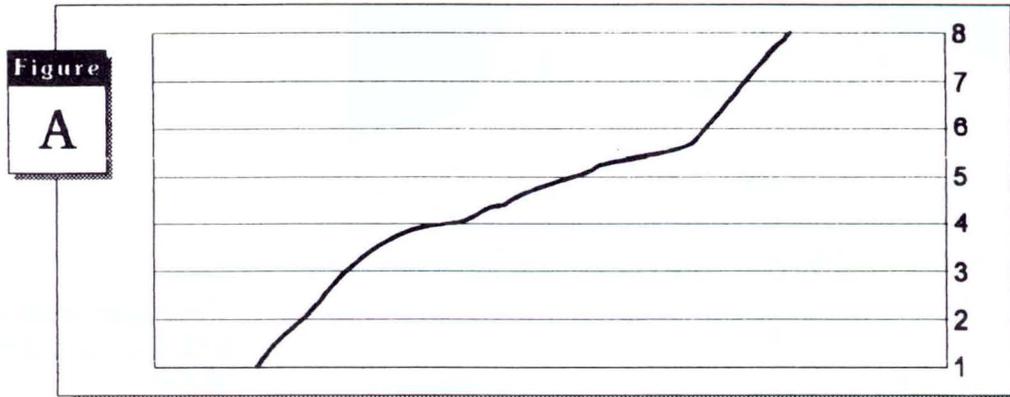
**Orthophotoquads** are a basic type of photoimage map prepared in quadrangle map format. These quads are made from the actual black and white photograph. There are no map symbols or color-shaded areas. Orthophotoquads are valuable as map substitutes in unmapped areas and as complements to existing line maps.

**Orthophotomaps**, produced for selected quadrangles in the Topographic Map series, show land features primarily by color-enhanced photographic images which have been produced to show detail in true position. Orthophotomaps may or may not include contours. Because imagery naturally depicts an area in a more true-to-life manner than the conventional line map, the orthophotomap provides an excellent portrayal of extensive areas of sand, marsh, or flat agricultural areas.

**Figure A** shows Profile.

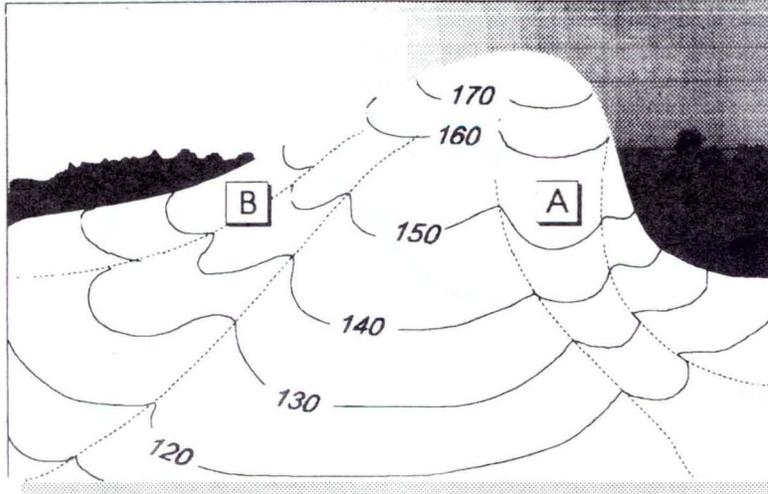
**Figure B** shows Contours as originally plotted.

**Figure C** shows Contour (Figure A) adjusted about one-fourth an interval uphill to emphasize bench.

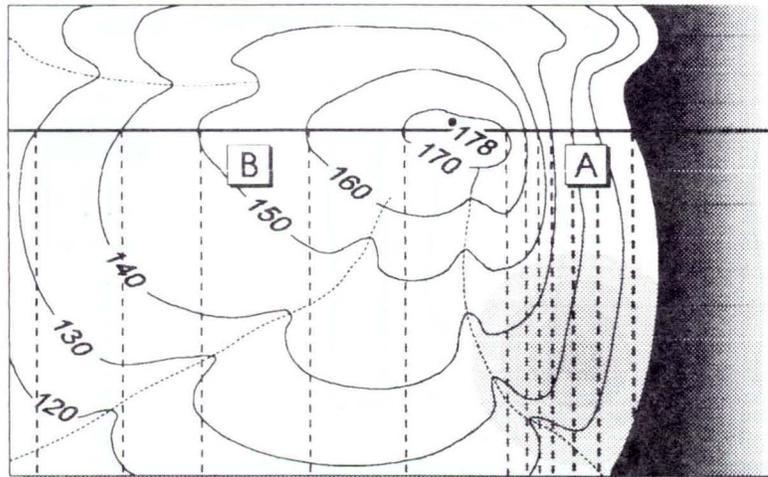


## GENTLE & STEEP FORMATION

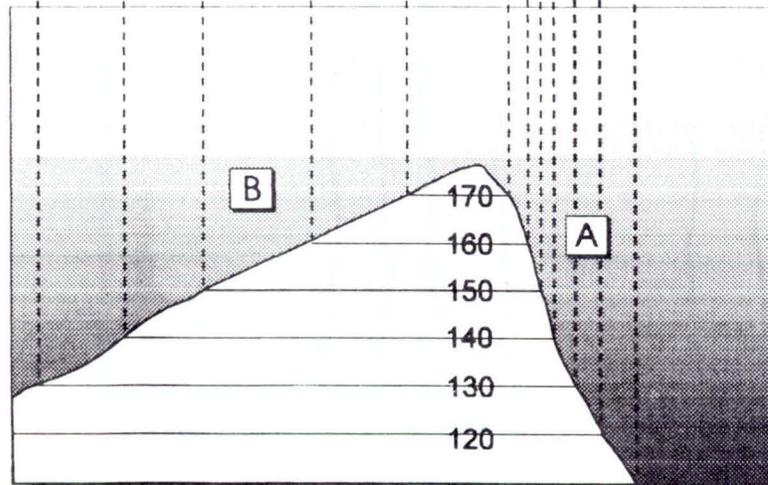
The horizontal spacing of the contours on a map indicates the type and degree of slope



Closely spaced contours indicate (A) a steep slope



Widely spaced contours indicate (B) a gentle slope



Evenly spaced contours indicate a uniform slope

## APPENDIX B

### LOCATING MAPS

In cartography, it is necessary to identify and locate maps by their latitude and longitude coordinates. Coordinates are linear or angular values which designate the position of a point in relation to a given reference system. The symbols used for latitude and longitude coordinates are:

degrees - 00°	1 deg. = 60'
minutes - 00'	1 minute = 60"
seconds - 00"	

**Longitude** - is measured east and west from the prime meridian by lines that run north and south.

**Latitude** - is measured north and south from the equator by lines that run east and west.

Degrees of longitude increase as you go east or west from the prime meridian which passes through Greenwich, England. Degrees of latitude increase as you go south or north from the equator.

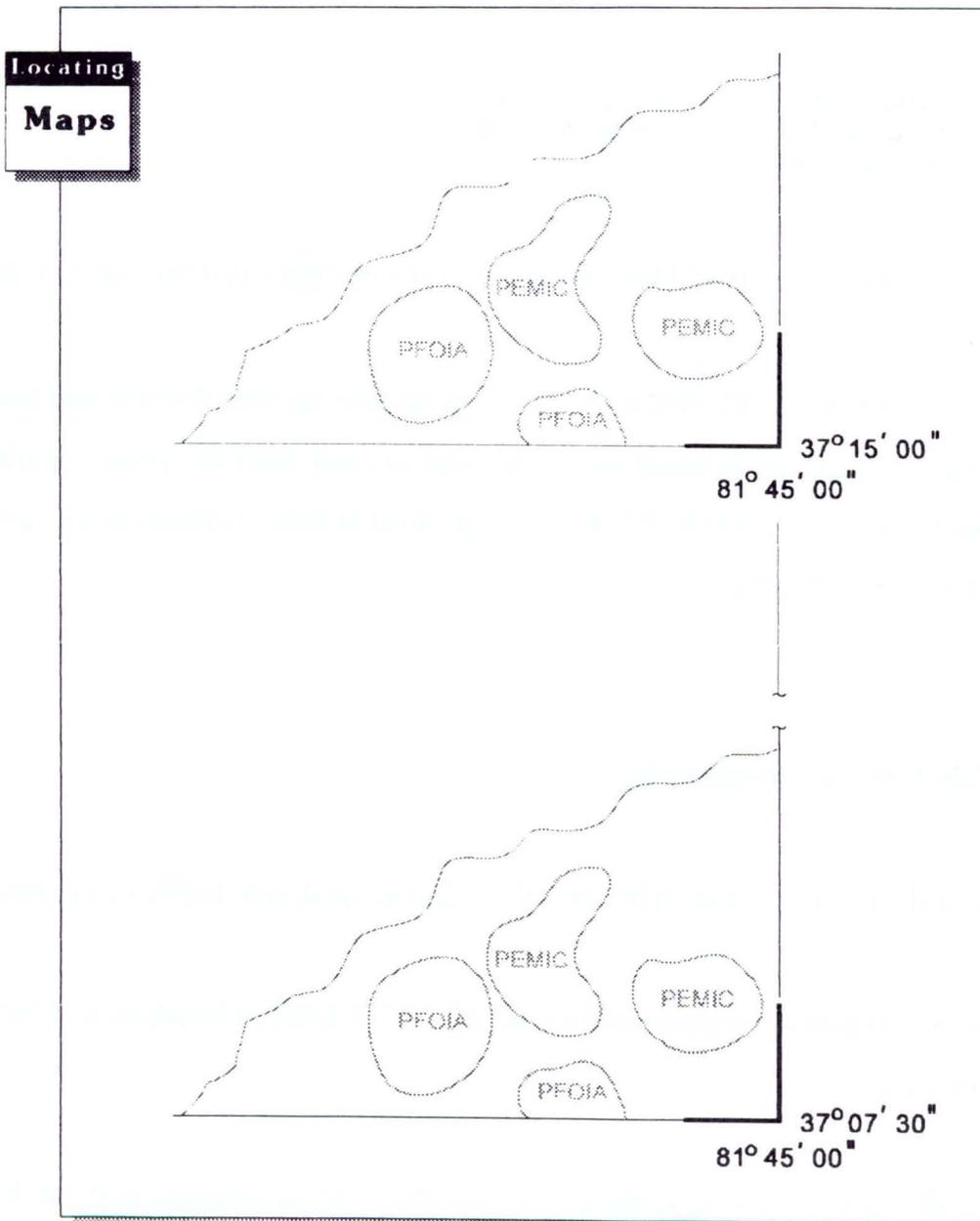
#### Scale vs. Latitude and Longitude:

-1:100,000 scale maps are thirty minutes (30') in latitude and one degree (1°) in longitude.

-1:24,000 scale maps are the equivalent of 00° 07'30" (7 1/2') in longitude and 00° 07'30" (7 1/2') in latitude.

-1:62,500 scale maps are the equivalent of 00° 15'00" (15') in longitude and 00° 15'00" (15') in latitude. Four 7 1/2' maps = one 15' map.

If you had a 7 1/2 minute map with the coordinates in the SE corner as in the example below, and you wanted to find the map directly North of that, you would look for the same longitudinal coordinates reading  $81^{\circ}45'00''$  and latitudinal coordinates reading  $37^{\circ}15'00''$  or  $7'30''$  more than the SE corner coordinates, i.e.  $37^{\circ}07'30''$ .



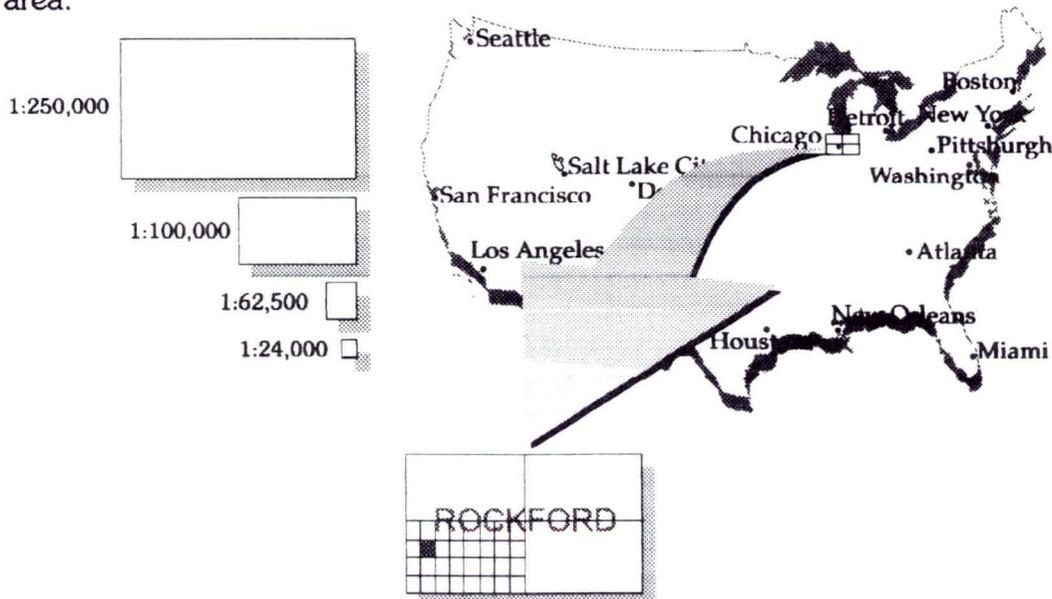
## APPENDIX C

### MAP SCALE

Map scale defines the relationship between a known unit of measure on a map and the same unit of measure on the ground. Scale is generally stated as a ratio or fraction - 1:24,000 or 1/24,000. The numerator represents map distance, and the denominator represents horizontal ground distance. Thus, the scale 1:24,000 states that any unit, such as 1 inch or 1 centimeter on the map, represents 24,000 of the same units on the ground.

Large scale maps, such as 1:24,000 (7½') are especially useful for highly developed areas or rural areas where detailed information is needed. Maps such as 1:62,500 cover larger areas and are especially suited for land management and planning. Small-scale maps, 1:100,000, 1:250,000, etc., cover very large areas on a single sheet.

The 1:100,000 scale map area consists of 32 1:24,000 scale maps arranged 8 east-to-west and 4 north-to-south. These are also referred to as 7½ minute maps because they cover 7½ minutes of latitude and 7½ minutes of longitude. The 1:100,000 scale map area, therefore, covers one degree longitude by one half a degree latitude and is one quarter of a 1:250,000 scale map area.



**Scale Equivalents:**

1 map at 1:250,000 scale = 4 maps at 1:100,000 scale.

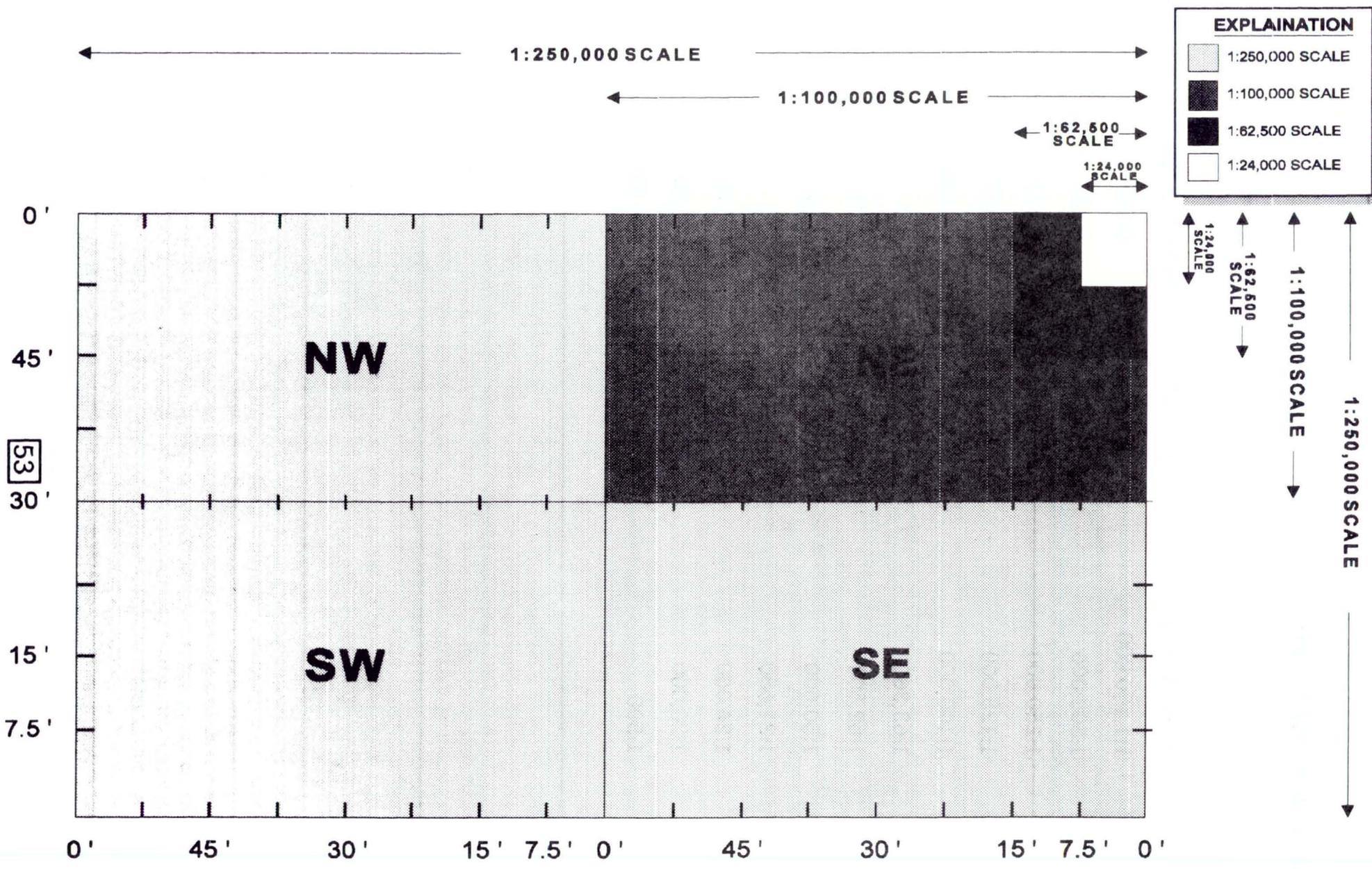
1 map at 1:100,000 scale = 32 maps at 1:24,000 scale.

1 map at 1:100,000 scale = 8 maps at 1:62,500 scale.

1 map at 1:100,000 scale = combinations of the two such as 4-15' maps and 16-7  
1/2' maps.

1 map at the 1:62,500 scale = 4 at the 1:24,000 scale.

\* Refer to the diagram on the following page.



**MAP SCALE DIAGRAM**

### Comparative Map Scales:

<u>Fractional Scale</u>	<u>Feet Per Inch</u>	<u>Inches Per Mile</u>
1:1,100,000	83,333.33	0.063
1:500,000	41,666.67	0.127
1:250,000	20,833.33	0.253
1:125,000	10,416.67	0.507
1:100,000	8,333.00	0.6336
1:63,360	5,280.00	1.0
1:62,500	5,208.33	1.01
1:50,000	4,166.67	1.27
1:31,680	2,640.00	2.0
1:24,000	2,000.00	2.640
1:20,000	1,666.67	3.168
1:500	41.667	126.72

## APPENDIX D

### DESCRIPTION OF ALPHA-NUMERICS COMPRISING THE WETLANDS CLASSIFICATION SYSTEM

Wetland data is displayed on the overlays by a series of letters and numbers (alpha numerics) with the first letter representing the system and subsequent alpha numerics representing sequentially the subordinate levels of detail down to the modifiers. The legend divides these symbols into pre-determined groups. Ecological systems and subsystems, classes and sub-classes, and modifiers make up the major groups. These symbols are placed in a specific, constant order when brought together to form a label.

#### **System:**

The first symbol in a label is always a letter, and it represents the ecological system. These letters will be either M, E, L, P, or R. Example: M10W, E2EM, PUB.

#### **Subsystem:**

All ecological systems, except Palustrine (P), have a subsystem. The subsystem symbol is always a number and when it is found within the label, it occupies the position next to the system symbol. Example: E1, R2, L1, M2.

#### **Class:**

Every label will include two letters which stand for class. These two capital letters will occupy the 3rd and 4th position of the label when the label begins with the system symbols: M, E, L, or R. These system symbols always have subsystem symbols next to them. Examples are E1UB and E2EM. When the label begins with a "P", the two class symbols occupy the 2nd and 3rd position in the label. Examples are PUB, PFO, and PEM.

Occasionally, two classes share the same wetlands area, for example:

FO	SS
SS	EM

**Subclass:**

If the label includes a subclass, it will always be a number and will always follow the class.

Examples: E2US3, L2AB5, PEM1.

Occasionally, one wetland area will share two subclasses, for example:

PSS1/4, PFO1/3

**Modifying Terms:**

Following either the class or subclass symbols are the modifiers. They may be capital letters, lower case letters, numbers, or combinations of these. Examples: PF01C, PSS1A, PUBHx

Example: Classification of wetlands to water regime and special modifier:

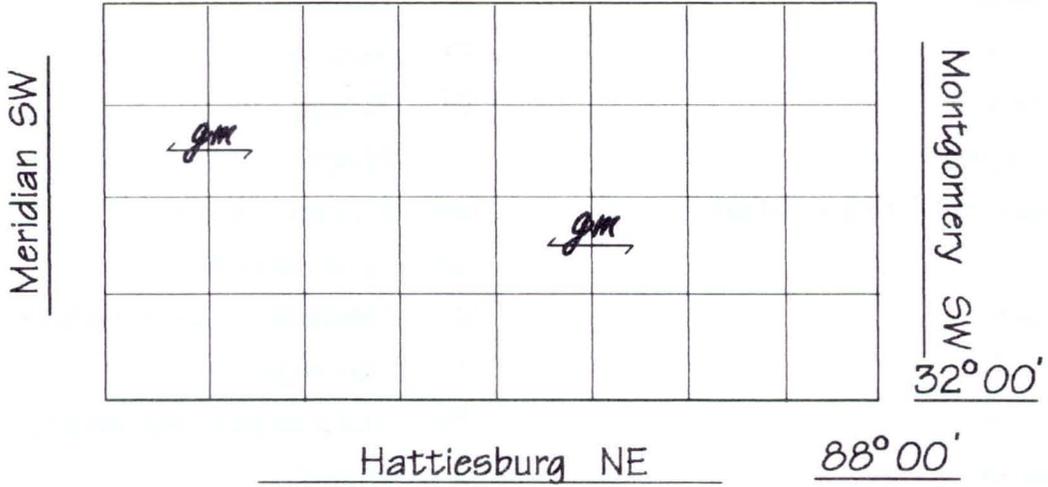
<b>System:</b>	Estuarine
<b>Subsystem:</b>	Intertidal
<b>Class:</b>	Emergent
<b>Subclass:</b>	Persistent
<b>Water Regime:</b>	Regularly Flooded
<b>Special Modifier:</b>	Partially drained/ditched

The above would be symbolized as E 2 EM 1 N d.

**APPENDIX E**

**MAP NAME:** Meridian SE

Meridian NE



**COMMENTS:**  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## APPENDIX F

### EDITING CORRECTIONS SYMBOLS

<b>A</b>	Add	<b>LT</b>	Lettering
<b>AJ</b>	Adjust	<b>LW</b>	Linework
<b>AL</b>	Align	<b>M</b>	Move
<b>B</b>	Break	<b>NL</b>	Neatline
<b>C</b>	Connect	<b>OL</b>	Overlay
<b>CG</b>	Change	<b>P</b>	Polygon
<b>CK</b>	Check	<b>R</b>	Repair
<b>CL</b>	Clean	<b>RE</b>	Reduce
<b>D</b>	Delete	<b>RL</b>	Relabel
<b>E</b>	Enlarge	<b>S</b>	Shape
<b>H</b>	Make heavier ( line weight )	<b>SH</b>	Shorten ( cut back )
<b>IM</b>	Improve	<b>SP</b>	Spell correctly
<b>IN</b>	Inside	<b>ST</b>	Straighten or use straightedge
<b>L</b>	Label	<b>T</b>	Tie ( edge match )
<b>LN</b>	Linear	<b>TH</b>	Make thinner ( line weight )
<b>LR</b>	Leader	<b>X</b>	Extend

---

### EDITING CORRECTIONS COLORS

#### Large Scale

<b>RED</b>	First QC Calls
<b>BLUE</b>	Calls Directed to Photo Interpreters
<b>PURPLE</b>	PI Large Scale Review
<b>YELLOW</b>	ZTS Corrections Completed
<b>GREEN</b>	First Correction Check by QC
<b>ORANGE</b>	Second Correction Check by Q.C.

## APPENDIX G

### CARTOGRAPHIC TERMS

**ACCRETION:** The increase or extension of the boundaries of land by the gradual or imperceptible action of natural forces, as by the washing up of sand or soil from the sea, or a river, or by gradual recession of the water from the usual watermark.

**ACCURACY:** Degree of conformity within a standard.

**AERIAL PHOTOGRAPH:** A photograph of a portion of the earth's surface taken by a camera mounted in an aircraft.

**BREAK:** A symbol used to notify a change of classification on linear wetlands.

**BRIDGE:** A structure erected over a river, stream, or open body of water to serve as a crossing for railroad, vehicular, or foot travel. Clearance generally exists between the bridge floor and the surface of the water.

**CARTOGRAPHY:** The art and science of expressing graphically, by use of maps and charts the known physical features of the earth's surface, usually including the works of man and his varied activities.

**CHART:** (Classification): A system of arranged symbols to designate the composition of habitats.

**MAP COMPILATION:** The process of extracting map detail from existing maps, aerial pho-

tographs, and other sources, and the preparation of a new or improved map based on this detail.

**CONTOUR:** An imaginary line on the ground, all points of which are at the same elevation above or below a specified datum surface. A contour is illustrated by the shoreline of an imaginary body of water whose surface is at the elevation represented by the contour. A contour forming a closed loop around lower ground is termed a "depression contour." The datum surface most generally used for contours in the U.S. is mean sea level.

**CONTOUR, INDEX:** A contour line shown distinctively for easy identification and generally labeled with figures of elevation. Depending on the contour interval, every fourth or fifth contour is made an index contour to aid in reading the map.

**CONTOUR, INTERMEDIATE:** A contour line drawn between index contours.

**COORDINATES:** Linear or angular quantities, or both, which designate the position of a point in relation to a given reference system.

**CULTURAL FEATURES:** Those features of the terrain that have been constructed by man, such as roads, trails, buildings, and canals; boundary lines.

**CULVERT:** Any structure, not classified as a bridge, which provides a waterway or other opening under a road.

**DATUM PLANE:** Any level surface used as a plane of reference from which elevations or depths can be determined.

**DEGREE:** A unit of measure for angles or arcs, 1/360th of the circumference of the earth.

**DELINEATE:** To draw the features represented on the topo and aerial photo.

**DOUBLE-LINE STREAM:** The map symbol for a watercourse delineated to scale on the map by two lines representing the banks.

**ELEVATION:** The vertical distance from a datum, generally mean sea level, to a point or object on the earth's surface.

**EQUATOR:** The great circle on the earth midway between the poles and in a plane perpendicular to the earth's axis of rotation. It is the line of 0 deg. latitude.

**FATHOM:** A unit of distance equivalent to 6 feet, generally used in measuring water depth.

**FIDUCIAL MARKS:** Those marks, generally four in number, which define the axes whose intersection fixes the principal point of the photograph.

**FIELD CHECK:** The operation of checking map compilation on the ground.

**GRID:** A grid is a network composed of two sets of lines in a definite pattern and intersecting the other in a specific geometric arrangement. The common form of a grid consists of uniformly spaced parallel lines intersecting at right angles. The most widely used grid system is the *Universal Transverse Mercator Grid (UTM)*. The UTM grid serves two basic purposes; first, it provides the means to identify rapidly any point on the ground; second, it enables surveyors and others to compute very rapidly range and azimuth between any two points on the ground.

**GROUND TRUTHING:** The process of verifying in the field information contained on a map.

**INTERPOLATION:** Determination of an intermediate value between fixed or tabulated values

from some known or assumed rate or system of change.

**LANDFORM (Traverse):** The north-south component of a traverse course. The angular distance expressed in degrees, minutes, and seconds of a point on the spheroid, north or south of the equator.

**LEADERS:** Straight lines running between the classification symbols and their corresponding polygons.

**LINEAR WETLANDS:** Linear (very narrow) wetlands and some deepwater habitats are indicated by use of a dashed line or a combination dash-dot line.

**MAP:** A representation on a plane surface, at an established scale, of the physical features (natural, artificial, or both) of the earth's surface, by means of signs and symbols.

**MAP, BASE:** A map which contains the fundamental framework necessary for adequate geographical reference and positioning of information that may be drawn or overprinted on it.

**MAP, CONTOUR:** A topographic map which portrays relief by the use of contour lines.

**MAP, TOPOGRAPHIC:** A map which presents the horizontal and vertical positions of the features represented. The 'topo' generally uses contour lines or comparable symbols to show mountains, valleys and plains.

**MAP, REVISION:** The updating and correction of a map to reflect changes that have occurred since the original survey or latest revision.

**MAP SCALE:** The relationship existing between a distance on a map and the corresponding

distance on the earth. Map scale may be expressed as an equivalence, usually by different units, that is 1 inch = 1 mile; as a numerical fraction or ratio (1/62,500 or 1:62,500) or by use of a bar scale.

**MAP SERIES:** A family of maps conforming generally to the same specifications or having some common unifying characteristic. (See examples below)

**7.5 MINUTE SERIES:** -- maps having quadrangle dimensions of 7.5 minutes in both latitude and longitude, the bounding parallels and meridians being integral multiples of 7.5 minutes. The standard scale of this series is 1:24,000.

**15 MINUTE SERIES:** -- maps at 1:62,500 scale having quadrangle dimensions of 15 minutes in both longitude and latitude.

**ALASKA 1:63,360 SERIES:** -- maps of Alaska usually having quadrangle dimensions of 15 minutes in latitude and 10 to 36 minutes in longitude, depending on the quadrangle latitude.

**1:100,000 SERIES:** -- maps generally having quadrangle dimensions of 1 deg. by 30'. A 1:100,000 map is composed of up to 32 7-1/2 minute maps or 8 15 minute maps or combinations of the two.

**1:250,000 SERIES:** -- maps generally having quadrangle dimensions of 1 deg. in latitude and 2 deg. in longitude.

**MEAN SEA LEVEL:** The average height of the sea for all stages of the tide.

**MERIDIAN:** A north-south line. A line of constant longitude.

**MINUTE:** One 60th of a degree.

**NEATLINE:** The actual limits of a map or chart; the border or frame.

**ORTHOPHOTOQUAD:** A base map quad which has been derived from perspective photographs. In a perfect orthographic quad, there are no displacements of images because of tilt or relief.

**OVERLAY:** A record on a transparent medium to be superimposed on another record.

**PHOTOGRAMMETRY:** The science or art of obtaining reliable measurements from photography.

**PHOTO INTERPRETATION:** The act of examining photographic images of objects in order to identify the objects and deduce their significance.

**POLYGON:** A plane figure, especially one with more than four sides and angles.

**PROJECTION:** Projection is a systematic representation of the earth's surface upon a plane or a system for reducing the curved surface of the earth to a flat surface upon which a map is drawn. The type of projection used must be selected according to the use of the map. There are seven different types of projections. They fall in three different groups.

1. **Cylindrical** - Transverse Mercator and Mercator
2. **Conic** - Scant, Polyconic and Simple
3. **Plane** - Polar and Gnostic

**QUADRANGLE:** A four-sided figure bounded by parallels of latitude and meridians of longitude, used as an area unit in mapping.

**SCALE:** Scale of map shows the relationship between a known unit of measure on a map and the same unit of measurement of the ground. For example a scale of 1:24,000 means that one unit on the map equals 24,000 identical units on the ground.

**SCRIBING:** The means of manually preparing a negative which can be reproduced by contact exposure. Portions of a photographically opaque coating are removed from a transparent base with specially designed tools.

**SECOND:** One 60th of a minute.

**SINGLE LINE STREAM:** The map symbol for a watercourse too narrow to depict at map scale by two lines representing the banks.

**STEREOCOMPILATION:** The procedure of producing a map from aerial photographs by means of stereoplottting instruments.

**SPLIT STREAM:** A stream shown on the map by a single line and containing an island that divides the stream into two channels. Also applies to a single-lined stream that divides with the branches flowing into separate drainage areas.

**TIC MARKS:** Inked corner marks that are placed on the mylar overlays in direct conjunction with the corresponding topo.

**TOPOGRAPHY:** the features of the surface of the earth considered collectively as to form.

**Z.T.S.:** Zoom Transfer Scope - An instrument used to perform primary compilation of our maps.

APPENDIX H

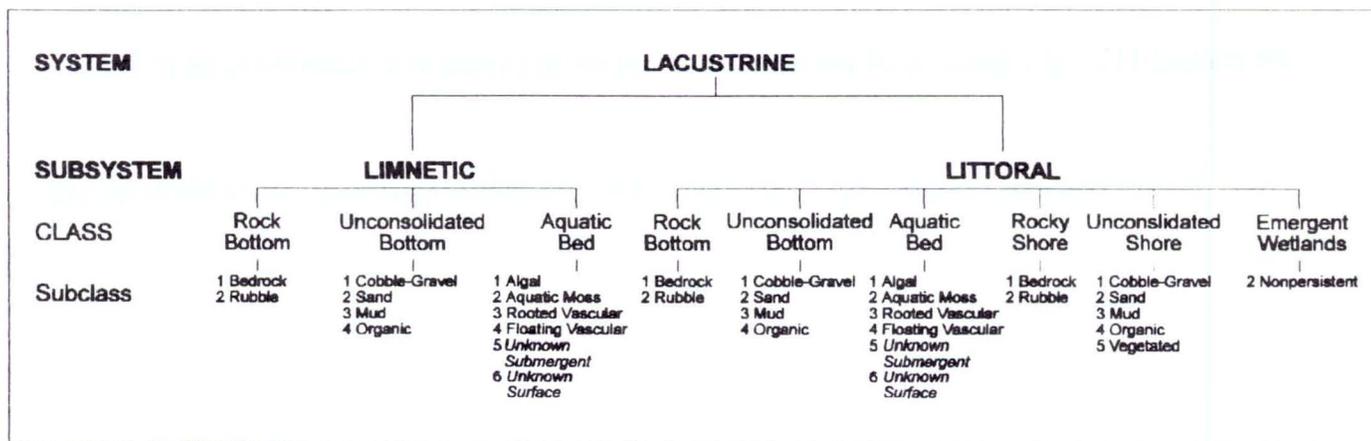
United States Department of the Interior  
FISH AND WILDLIFE SERVICE

NATIONAL WETLANDS INVENTORY  
9720 EXECUTIVE CENTER DRIVE  
SUITE 101 - MONROE BUILDING  
ST. PETERSBURG, FL. 33702

June 24, 1986

NATIONAL WETLANDS INVENTORY  
Information and Legend  
For Large Scale  
Draft Topical Wetland Overlays

**Classification System:** The U.S. Fish and Wildlife Service has adapted and used the "Classification of Wetlands and Deepwater Habitats of the United States", 1979 by Cowardin, et al., to delineate and identify wetlands. This system is hierarchical and structured around a combination of ecological, biological, hydrological and substrate characteristics which permits it to be used universally across the United States, its territories and possessions. It consists of five systems: **Marine**, **Estuarine**, **Riverine**, **Lacustrine** ( lake ) and **Palustrine** ( swamps, bogs, marshes, etc. ) and proceeds in a hierarchal manner through subsystem, class, and subclass. It also contains provisions to use water regime, water chemistry, soil and special modifiers to provide additional levels of detail. The following example of the Lacustrine system is provided to illustrate the hierarchical structure.



**Use of Wetland Legend:** Wetland data is displayed on the overlays by a series of letters and numbers (alpha numerics) with the first letter representing the system and subsequent alpha numerics representing, in a sequential manner, the subordinate levels of detail down to the modifiers. Where classes and subclasses have been mixed, they are separated by a diagonal line.

**Examples**

a. Classification of wetlands to water regime and special modifier:

**System:** Estuarine  
**Subsystem:** Intertidal  
**Class:** Emergent  
**Subclass:** Persistent  
**Water Regime:** Regularly Flooded  
**Special Modifier:** Partially Drained/Ditched

E 2 EM 1 N d

b. Mixing of wetland classes and subclasses:

PFO/EM1A = Palustrine, Forested, (PFO) mixed with Palustrine, Emergent, persistent (PEM1) with a temporary water regime (A).

**WETLAND LEGEND\***

System

Subsystem

M	Marine	R	Riverine
	1 Subtidal		1 Tidal
	2 Intertidal		2 Lower Perennial
			3 Upper Perennial
			4 Intermittent
			5 Unknown Perennial
E	Estuarine	L	Lacustrine
	1 Subtidal		1 Limnetic
	2 Intertidal		2 Littoral
P	Palustrine		
	No Subsystem		Upland**

\*Should be used in conjunction with "Classification of Wetlands and Deepwater Habitats of the United States," (1979), Cowardin et al.

\*\*May include wetlands that could not be inventoried because of procedure used or due to mapping conventions.

## CLASSES AND SUBCLASSES

Class	Subclass		
AB	Aquatic Bed	RS	Rocky Shore
	1 Algal		1 Bedrock
	2 Aquatic Moss		2 Rubble
	3 Rooted Vascular		
	4 Floating Vascular	SB	Streambed
	5 Unknown Submergent		1 Bedrock
	6 Unknown Surface		2 Rubble
EM	Emergent		3 Cobble/Gravel
	1 Persistent		4 Sand
	2 Nonpersistent		5 Mud
FO	Forested		6 Organic
	1 Broad-Leaved Deciduous		7 Vegetated
	2 Needle-Leaved Deciduous	SS	Scrub/Shrub
	3 Broad-Leaved Evergreen		1 Broad-Leaved Deciduous
	4 Needle-Leaved Evergreen		2 Needle-Leaved Deciduous
	5 Dead		3 Broad-Leaved Evergreen
	6 Deciduous		4 Needle-Leaved Evergreen
	7 Evergreen		5 Dead
ML	Moss/Lichen		6 Deciduous
	1 Moss		7 Evergreen
	2 Lichen	UB	Unconsolidated Bottom
OW	Open Water/ Unknown Bottom		1 Cobble/Gravel
			2 Sand
			3 Mud
			4 Organic
RB	Rock Bottom	US	Unconsolidated Shore
	1 Bedrock		1 Cobble/Gravel
	2 Rubble		2 Sand
RF	Reef		3 Mud
	1 Coral		4 Organic
	2 Mollusk		5 Vegetated
	3 Worm		

## **MODIFIERS TO WETLAND CLASSIFICATION**

### **WATER REGIME MODIFIERS**

#### **Nontidal**

A Temporarily Flooded  
B Saturated  
C Seasonally Flooded  
F Semipermanently Flooded  
G Intermittently Exposed  
H Permanently Flooded  
J Intermittently Flooded

#### **Tidal**

L Subtidal  
M Irregularly Exposed  
N Regularly Flooded  
P Irregularly Flooded  
R Seasonally Flooded  
S Temporarily Flooded  
T Semipermanently Flooded  
V Permanently Flooded

#### **Nontidal and Tidal**

U Unknown  
K Artificially Flooded

### **WATER CHEMISTRY MODIFIERS**

#### **Coastal Halinity**

1 Hyperhaline  
2 Euhaline  
3 Mixohaline (Brackish)  
4 Polyhaline  
5 Esohaline  
6 Obligohaline  
0 Fresh

#### **Inland Salinity**

7 Hypersaline  
8 Eusaline  
9 Mixosaline  
0 Fresh

#### **pH Freshwater**

a Acid  
t Circumneutral  
l Alkaline

### **OTHER MODIFIERS**

#### **Special**

b Beaver  
d Partially Drained  
f Farmed  
h Diked/Impounded  
r Artificial  
s Spoil  
x Excavated

#### **Soils**

g Organic  
n Mineral

**Statement to Users:** The overlays were prepared primarily by stereoscopic analysis of high altitude aerial photographs. Wetlands were identified on the photographs based on vegetation, visible hydrology, and geography in accordance with "Classification of Wetlands and Deepwater Habitats of the United States." The aerial photographs typically reflect conditions during the specific year and season when they were taken. In addition, there is a margin of error inherent in the use of aerial photographs. Thus, a detailed on-the-ground and historical analysis of a single site may result in a revision of the wetland boundaries established through obscured by dense forest cover may not be included on this map. Federal, State, and local regulatory agencies with jurisdictions over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, State, or local government or to establish the geographical scope of the regulatory programs and proprietary jurisdictions that may affect such activities.

**Additional Information:** Contact the appropriate National Wetlands Inventory Regional Wetland Coordinator at the following U.S. Fish and Wildlife Service Regional Office:

**NATIONAL WETLANDS INVENTORY  
National Office  
Suite 101, Monroe Building  
9720 Executive Center Drive  
St. Petersburg, FL 33702  
813/893-3624**

**Region    Geographical Area**

**Regional Wetland Coordinator**

**1** California, Nevada,  
Idaho, Oregon, Washington

Dennis Peters  
U.S. Fish and Wildlife Service  
911 NE 11th Avenue  
Portland, OR 97232-4181  
503 / 231-6154

**2** Arizona, New Mexico,  
Texas, Oklahoma

Warren Hagenbuck  
U.S. Fish and Wildlife Service  
500 Gold Avenue, S.W. Room 4012  
P.O. Box 1306  
Albuquerque, NM 87102  
505 / 766-2914

**3** Minnesota, Wisconsin,  
Illinois, Indiana,  
Michigan, Ohio, Missouri,  
Iowa

Ron Erickson  
U.S. Fish and Wildlife Service  
4101 E. 80th St.  
Bloomington, MN 55425-1600  
612 / 725-3417

**4** Arkansas, Louisiana,  
Florida, Mississippi,  
Alabama, Georgia, South  
Carolina, Tennessee,  
Kentucky, Puerto Rico,  
North Carolina, Virgin  
Islands

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**6** Montana, Wyoming, North  
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Nebraska, Utah, Colorado,  
Kansas

Chuck Elliott  
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**7** Alaska

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1011 East Tudor Road  
Anchorage, AK 99503  
907 / 786-3471

APPENDIX I

NATIONAL WETLANDS INVENTORY

UNITED STATES DEPARTMENT OF THE INTERIOR

CLEARWATER, FLA.

Second Line

Page 19

On Lettering Overlay:  
-- Quad Name  
Same as in Lower Right Corner

1/2" From Neatline

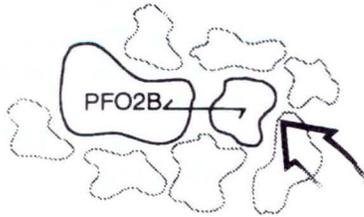
Page 4

Tie Aligned Right on Neatline

Page 4

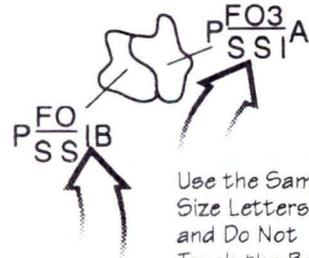
Centered on Topo

Page 4



Page 28 Use Hook Leader Only as a Last Resort

SPLIT - CLASS LABELS:



Use the Same Size Letters and Do Not Touch the Bar

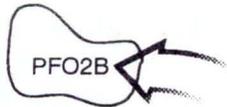
Place Number on This Line if They Are Both the Same

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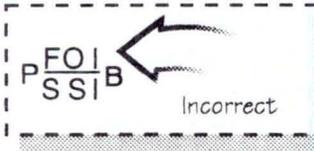
GENERAL NOTE:

Page 4

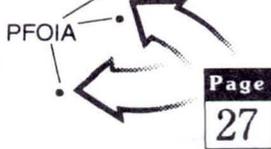
When Transferring, Follow Topo Features and / or Contour Lines, Unless There Has Been an Obvious Change on the Topo



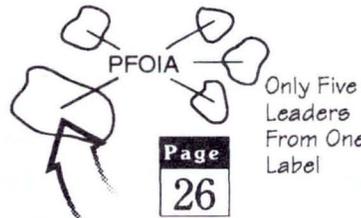
Page 20 Place Label Inside of Polygon if Large Enough



Stop Leaders Short of Dot Polygons



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Page 26

Only Five Leaders From One Label

Leader to Center of Polygon



Page 7

Stop Linework Right at the Neatline, and Make Sure It Ties to the Adjoining Maps

Always Connect at a Dash



Page 24

A Polygon Along a Linear is the Only Instance When a Line May Connect at a Dot

Breaks -- 1/8" Long / 2 Lines Wide

Neatline

TAMPA NW ST. PETERSBURG

Page 6

Third Line "Old Name"  
Fifth Line "New Name"

Map Reference Guide

CLEARWATER, FLA.

Fifth Line Quad Name Show Exactly as on Topo