*FOURTH VERSION*

# GUIDANCE FOR RATING THE VALUES OF WETLANDS IN NORTH CAROLINA

North Carolina Department of Environment, Health, and Natural Resources
Division of Environmental Management
Water Quality Section

January, 1995

This document has been approved by _____

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12/29/94
Date

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## INTRODUCTION

This fourth version of the *Guidance for Rating the Values of Wetlands in North Carolina* (previously known as the *North Carolina Division of Environmental Management Wetlands Rating System*) incorporates the results of a wetland program funded by the Environmental Protection Agency (EPA) to develop biological criteria for wetlands. A major product of the work accomplished under this grant was a document entitled *Indicators to Freshwater Wetland Function and Value for Protection and Management* (DEHNR 1993) which summarizes the results of an extensive scientific literature search for biological criteria. Much of the information presented in this rating system is taken directly from this document.

**Appendix I** presents a list of the literature citations that support the numerical values presented in this manual. In the interest of brevity, these citations are not repeated in the text. Refer to **Appendix II** for a glossary of terms and **Appendix III** for a list of rare plant species in North Carolina. The Division of Environmental Management (DEM) anticipates that this system will be re-evaluated on a regular basis to reflect new scientific data and field experience.

As with earlier versions of the Rating System, the primary use of this version will be as a tool for making decisions regarding 401 Water Quality Certifications by the DEM. **This system alone does not dictate 401 Water Quality Certification decisions.** The change in the title of this document further emphasizes that this system is for guidance. It could also be used as a tool for evaluating wetland acquisition and restoration as well as mitigation banks. In addition to being more scientifically valid, this new system should result in more consistent evaluations among the DEM's field staff, consultants, and the general public.

This rating system is intended for use with freshwater wetlands. Since activities in tidal salt marshes are governed by a different set of state laws and regulations (through the Coastal Resources Commission), this limits the applicability of this methodology in salt and brackish wetlands. This system is also not applicable to stream channels. Moreover, the use of this Wetland Rating System does not preclude the use of a more comprehensive method (such as the Wetland Evaluation Technique (WET) used by the

U.S. Army Corps of Engineers, the Habitat Evaluation Procedure (HEP) used by the U.S. Fish and Wildlife Service.

# INSTRUCTIONS FOR RATING VALUES OF WETLANDS

Values Based on Human Perspective

When using this rating system, it is important to note that the most pristine and undisturbed wetlands do not necessarily receive the highest scores for the protection of water quality. Since this system is designed to evaluate the values not the functions of wetlands, those wetlands within close proximity to disturbance are often provided a bonus for water quality.

The terms "functions" and "values" are often used interchangeably, but they have different meanings. Functions are processes taking place within the wetland ecosystem irrespective of their effect on human society. Net primary productivity and carbon export are examples of wetland functions. Values are those ecosystem functions that are perceived to have a positive impact on people. They are usually reflected in laws such as the Clean Water Act. Values may change over time as the perception of human society changes over time.

This system rates the value of wetlands based on "ability" and "opportunity." Ability is based on characteristics of the wetland such as plant structure, hydrologic regime, and topographic position. Opportunity is based on characteristics of the surrounding area and watershed and determines whether a wetland fulfills a given value. For example, the opportunity of a wetland to remove pollutants depends on the amount and type of pollutants the wetland receives from the watershed.

Ability and opportunity are both important for rating wetland values. A headwater forest with dense shrubs and vines on a low gradient stream has the ability to remove pollutants such as phosphorus and nitrogen. This type of wetland, however, has limited opportunity to remove pollutants if it is located in a predominantly forested watershed since it will receive few pollutants from the surrounding landscape. A disturbed area adjacent to a wetland, therefore, increases the value of the wetland to protect water quality even though the ability of the wetland to remove pollutants may not be greater.

General Information

This system rates six values of wetlands including: (1) water storage, (2) bank/shoreline stabilization, (3) pollutant removal, (4) wildlife habitat, (5) aquatic life value, and (6) recreation.education. Each wetland value has a corresponding narrative description and flow chart. These flow charts provide a series of choices to systematically guide an evaluator to a single score or range of scores for each value. The charts are intended to facilitate the text. When there is a question about the wording or meaning of a chart, the full text should always be consulted.

Primary source of water is an essential indicator for rating the value for water quality of a wetland. Source of water determines the opportunity for a wetland to store water as well as receive pollutants. Although most wetlands have more than one source of water, the main source should be considered for the purposes of the rating system. For example, the movement of groundwater into pocosins as a source of water is infinitesimal compared to precipitation which is the primary source of water. Bottomland hardwood wetlands receive water from precipitation, groundwater flow, and surface flow. Unless the stream associated with the wetland has been channelized and no longer floods, the primary source of water to these systems is generally surface flow.

The vegetation community is another important indicator for rating wetland vales since a change in vegetation structure often indicates a change in the magnitude of a value. In many cases, the vegetation community reflects the primary source of water to a wetland.

The values of a site should be rated by the "existing use" of the wetland. One exception to this rule involves wetlands that have been recently disturbed. Recent disturbances are defined as those activities such as logging that have occurred within three years prior to the evaluation. In the case of recent disturbances, the conditions of the wetland should be extrapolated to the undisturbed condition using nearby wetland remnants or similar wetland types in the area.

A copy of the "Wetland Rating Worksheet" is included in **Appendix IV**. Background information about the wetland, the surrounding landscape, as well as numerical scores should be entered on this worksheet. Scores for the six individual

wetland values as well as the final overall score for the wetland system can be considered in the final evaluation of a site for a 401 Water Quality Certification.

Evaluation of Different Wetland Types

Separate wetland evaluations should be completed where there are significant changes in the water source and/or vegetation community of a wetland complex. The flow chart in **Figure 1** provides guidance for determining the type of wetland that is being evaluated. In addition, **Figure 2** depicts a variety of scenarios where separate wetland evaluations are warranted. These scenarios are by no means inclusive.

In **Figure 2**, Wetland #1 represents the uppermost reaches of a headwater wetland. In this case, the contributing watershed is too small for evidence of surface flow or channel development within the wetland. The primary source of water for Wetland #1 is, therefore, generally groundwater flow. The diagram of Wetland #2 depicts a headwater wetland with distinct channel development. These systems generally have intermittent flow within the channel. Although the vegetation is often indistinguishable, Wetland #2 should be rated separately from Wetland #1 since the primary source of water is surface flow.

A bottomland hardwood forest is represented by Wetland #3. In this scenario, the wetland system receives overbank surface flow from the stream channel, which affects its rating for water storage. Depicted within this system are several changes in vegetation that should be rated separately. Wetland #4 illustrates a floodplain pool (i.e., ephemeral wetland) with the capacity to hold two feet of water at maximum depth. This situation also reflects a change in vegetation community to those species that can tolerate wetter conditions that those typically found in bottomland hardwood wetlands. The most dramatic change for Wetland #4 is an increased value for aquatic life because of its importance for amphibian reproduction.

A bottomland hardwood community that was timbered four years ago is represented by Wetland #5. In this case, the disturbed area has revegetated into a shrub-scrub community and as a result should be rated separately. The change in vegetation community will have the most pronounced effect on wildlife habitat. Wetland #6 depicts

a 50-foot fringe of freshwater marsh along a stream. The change in vegetation from forested to herbaceous may affect wildlife habitat, aquatic life value, and water quality.

The construction of dams by beavers frequently impounds headwater wetlands to create freshwater marshes. Wetland #7 represents a beaver impoundment. As stated previously, a change in vegetation from forested to a more open, herbaceous system, may affect a variety of wetland values.

A wetland located within an interstream divide is illustrated by Wetland #8. The majority of these systems are found in the coastal plain and, for the most part, include wet flats and pocosins. These wetlands are primarily driven by precipitation and should, therefore, be rated separately from systems that are affected by surface flow. The source of water to those systems dramatically affects their water quality and ecological values.

Evaluations Within the Same Wetland Type

In some cases, the rating of wetland values should be split within a wetland type that has the same vegetation community and source of water. This situation is common in bottomland hardwood forests of the coastal plain where the floodplains (wetlands) may be hundreds of feet in width. Refer to **Figure 3** for a diagram of a bottomland hardwood forest with different zones that would receive different ratings. These cases dictate that wetlands be evaluated based on where the proposed project is located in relation to surface water. Please note that generally only three values of water quality including water storage, bank/shoreline stabilization, and pollutant removal will be affected by this relationship to surface water.

For water storage and pollutant removal, those wetlands that are driven by surface water and that are within 300 feet of surface water will receive a higher rating than those wetlands with similar characteristics that are beyond 300 feet. The wetlands affected by a project located within 300 feet of surface water will, therefore, be rated higher than the wetlands affected by a project beyond 300 feet.

For bank/shoreline stabilization, the wetlands affected by a project within 50 feet of surface water will receive a higher score than those beyond 50 feet. Wetlands beyond 100 feet of surface water receive no points for shoreline stabilization, and, therefore, a project located beyond this distance will not affect the rating for this value.

This situation is also common in interstream divide wetlands such as pocosins and flatwoods on the coastal plain. In these cases, a project may only impact a small portion of a much larger wetland system. The ratings for water storage, pollutant removal, and wildlife habitat are all affected by the size of these wetland systems.

In those cases where a project impacts only a portion of a much larger wetland system, two evaluations are required. The entire wetland system should be rated regardless of the proposed project. In addition, a separate evaluation should be made for the wetland that is proposed to be impacted by a project. In all cases, the final score for the wetland impact will be equal to or lower than the score for the entire wetland system.

Information to Gather in the Office

Useful preliminary information to gather to perform wetland evaluations includes: United States Geological Survey (USGS) topographic maps; National Wetland Inventory (NWI) maps; and Soil Conservation Service (SCS) soil maps. These maps can help determine the landscape location of a wetland and possible sources of water to a wetland before the area is assessed in the field. It is particularly important to use topographic maps to determine the boundary of the watershed that contains the wetland being assessed. In this way, the assessment area is put into a broader ecological context.

**Figure 1: KEY TO MAJOR TYPES OF WETLANDS**

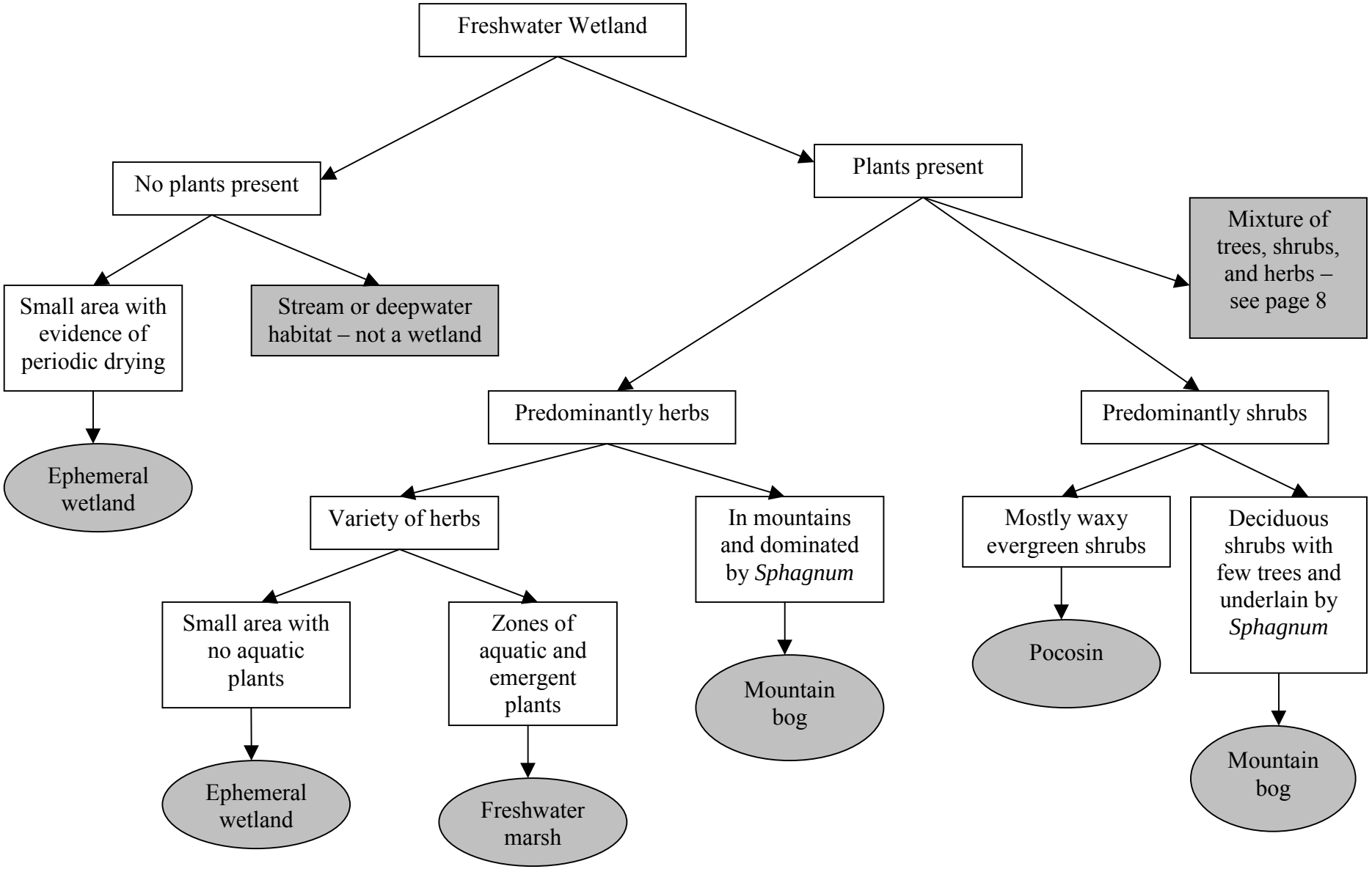
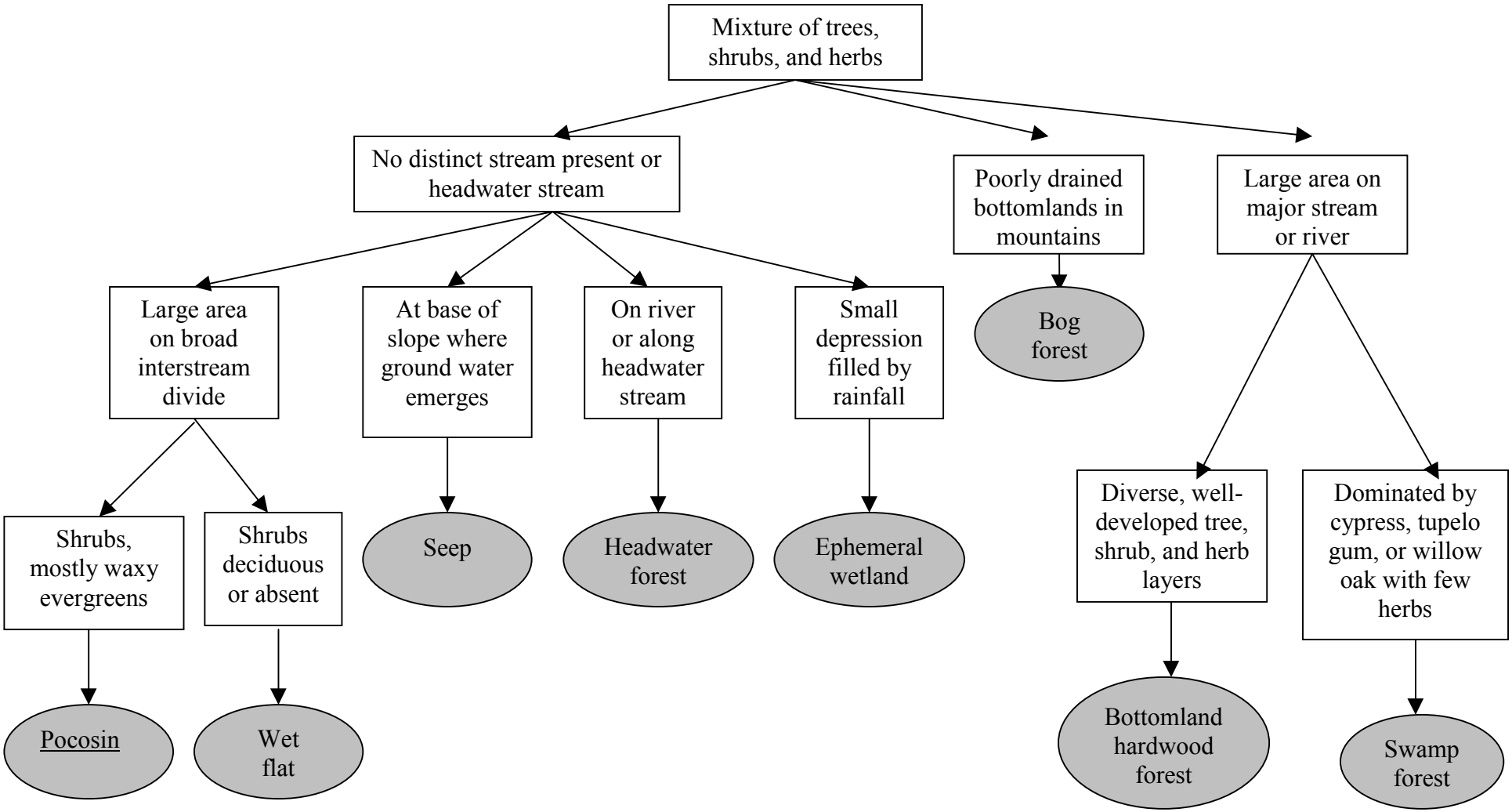


**Figure 1: KEY TO MAJOR TYPES OF WETLANDS (continued)**



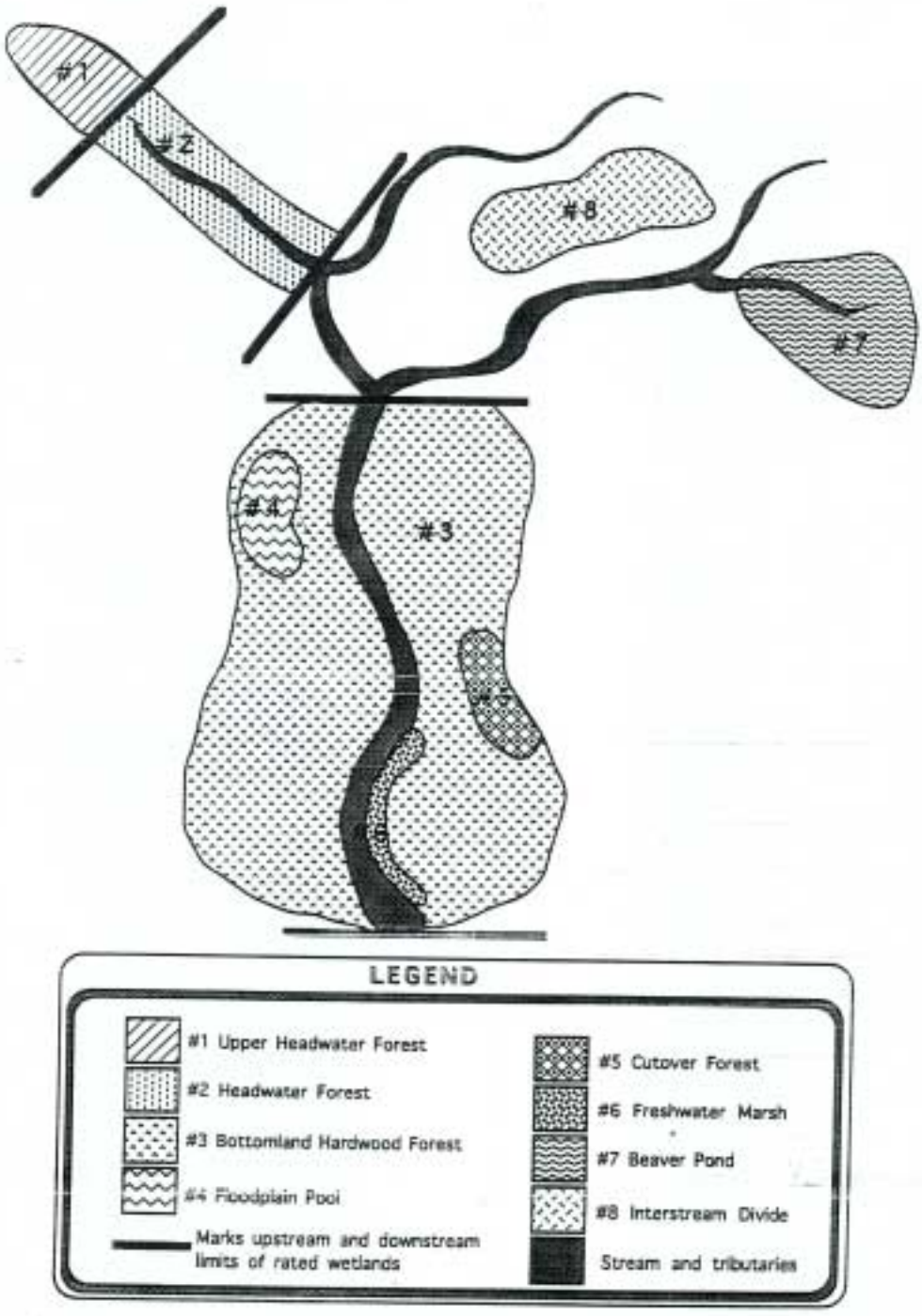



Figure 2. Boundaries for wetland evaluations with varying types of wetlands.

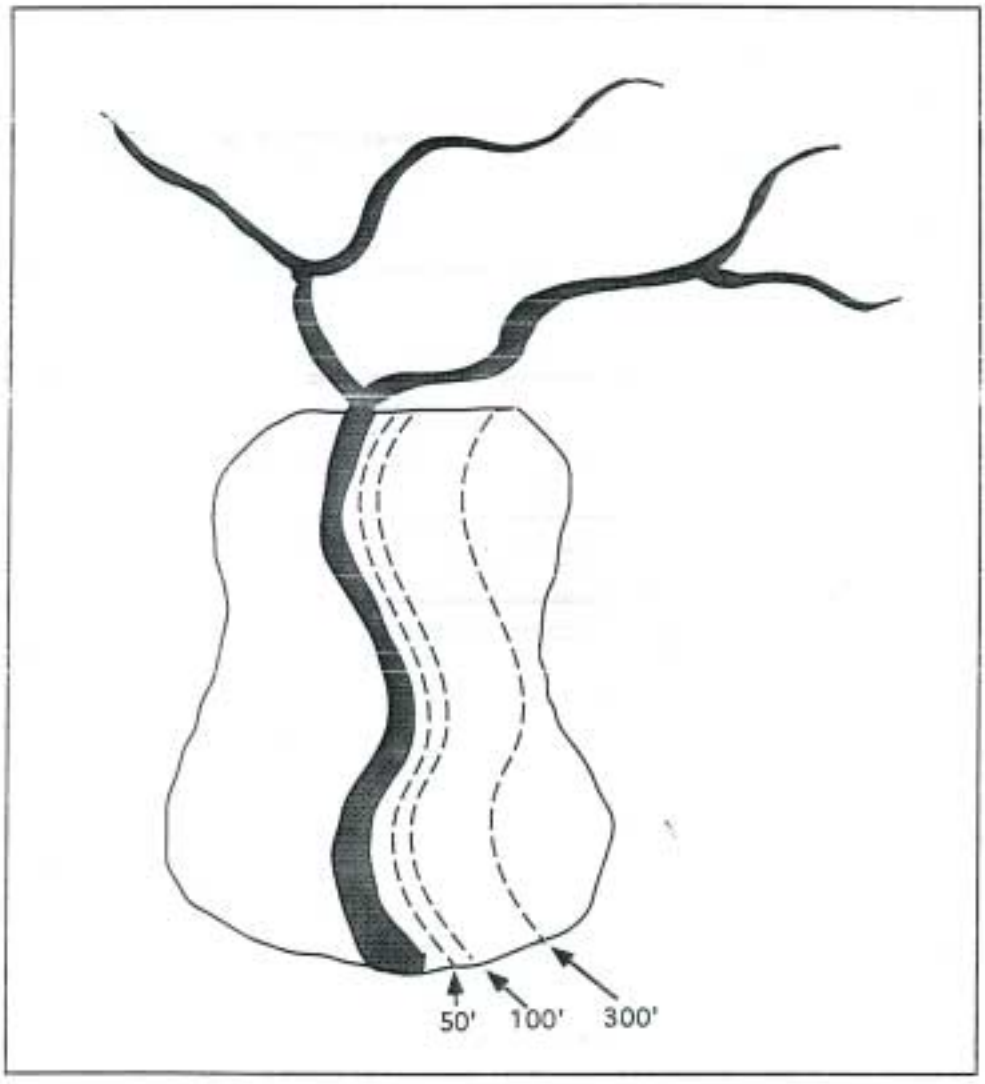



Figure 3. Boundaries for wetland evaluations within same type of wetland

## INSTRUCTIONS FOR USING THE FLOW CHARTS

The series of boxes that most closely describe the wetland being evaluated should be followed. The flow charts will guide the evaluator to a rating or in some cases a range of ratings.

The charts are designed so that each horizontal row has a number of choices that are arranged in columns. Each column represents a different factor that is important for that particular value. In some cases the evaluator may reach a point on the chart where the wetland does not meet the criteria stated but meets all of the previous criteria. At this point, the evaluator should:

1) drop to the next lowest box within the same column;
2) ignore the description within this box and follow the arrows to the next column;
3) select the description which best represents the wetland being evaluated; and
4) continue on the new level until another criterion is not met or a rating is reached.

There may be cases where the evaluator makes two drops within the same chart. Scores can only be lowered through this process; they cannot be elevated.

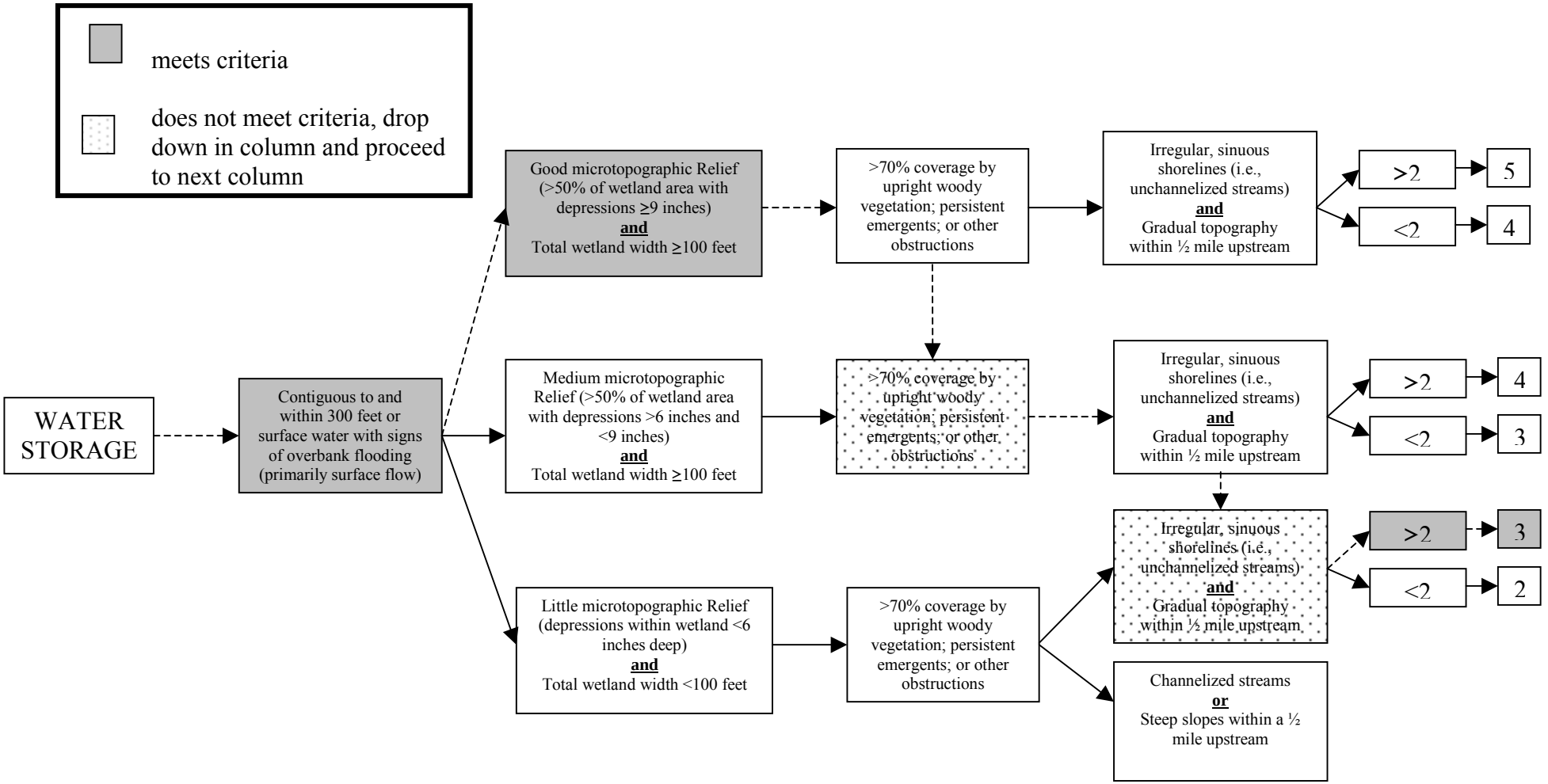
These charts should be applicable to most freshwater wetlands in North Carolina. There may be cases where a particular flow chart is not entirely applicable for the wetland being assessed. In these cases, the evaluator should modify the score as appropriate and document the reasons for this modification.

Refer to the next page for an example of how to use the charts. In this example, water storage is being evaluated.

EXAMPLE

A wetland with the following characteristics would receive a score of 3 for water storage (follow the dashed arrows):

1) Contiguous to and within 300 feet of surface water with signs of overbank flooding;
2) Good microtopographic relief and wetland width ≥50 feet;
3) <70% coverage by upright, woody vegetation;
4) Channelized streams or steep slopes within ½ mile upstream;
5) ≥ 2 acres in size.



## WATER STORAGE

Water storage is a physical process that occurs in the depression containing the wetland. It refers to the storage or conveyance of floodwaters or groundwater seepage and the storage or retardation of runoff. Geomorphic variables as well as characteristics of the wetland determine how much water is stored.

Water is stored to some degree in virtually all types of freshwater wetlands. The first category that can receive the highest scores for water storage include those wetlands that are contiguous and within 300 feet of surface water with signs of overbank flooding. Bottomland hardwood forests are wetlands that may meet this criterion. See **Figure 4a** and **Figure 4b** for illustrations of wetlands that are contiguous and not contiguous to surface water. The second category of scores is for those wetlands that are beyond 300 feet or surface water but still have signs of flooding. This situation is most common on the coastal plain where floodplain wetlands may extend beyond 300 feet of a stream or channel.

The next two categories refer to wetlands with no evidence of flooding. The first includes those wetlands contiguous to and within 50 feet of the edge of a linear depression, canal, ditch, or estuarine fringe and non-linear depressions such as freshwater marshes with no signs of surface water flow. In this category, the primary source of water is groundwater. The last category refers to those interstream divide wetlands such as pocosins and wet flats that receive primarily precipitation. Please note that for wetlands that do not flood but that appear to receive significant amounts of stormwater, the final score for water storage should be increased by one point.

The remaining criteria listed in **Chart 1a** and **Chart 1b** refer to the ability of a wetland to store water. In all three categories, the degree of microtopographic relief is an important criterion. Microtopographic relief refers to the depressional storage capacity within a wetland. This term should not be confused with the topography of a watershed since it refers to subtle changes (less than 1 foot) on the surface of a wetland. It includes those wetlands with hummocky and depressional areas such as pocosins, swamp forests, bog forests, and certain bottomland hardwood forests, as well as wetlands that are in depressions such as freshwater marshes. Those wetlands with a greater degree of microtopographic relief can receive higher scores.

For those wetlands associated with surface waters with signs of flooding, the width of the wetland is also important. Riparian areas should be at least 50 feet wide on each side of the channel or a total width of 100 feet to provide good capacity for water storage.

Ability to store water is also affected by the frictional resistance of the wetland. Canopy coverage is a good surrogate measure for stem density in most cases. A wetland should have >70% coverage by upright woody vegetation; persistent upright emergents; or other obstructions such as boulders and logs to slow the flow of water. For those wetlands with no signs of surface flooding, the criterion is >70% coverage by some form of vegetation as a reflection of the rate of evapotranspiration.

In addition, those wetlands within watersheds characterized by gently sloping topography will have more ability to store water than those where slopes are steep. Moreover, wetlands located in watersheds characterized by irregular, sinuous shorelines have more ability to slow flood waters through physical resistance in contrast to watersheds where streams have been heavily channelized.

Finally, higher value wetlands will be of sufficient size to store large volumes of water. For wetlands affected by surface flooding as well as wetlands primarily influenced by groundwater, this size criterion is 2 or more acres. Wetlands such as interstream divides must be at least 20 acres to meet this criterion since normally their only source of water is rainfall.

A wetland contiguous to and within 300 feet of surface water with signs of surface flooding can receive a maximum score of 5 depending on the ability of the wetland to slow and retain water. Those wetlands beyond 300 feet of surface water by with signs of flooding or flow can receive a maximum score of 4. Wetlands associated with interstream divides and linear depressions can receive a maximum of 3 points depending on the degree of microtopographic relief, vegetative coverage, and size.

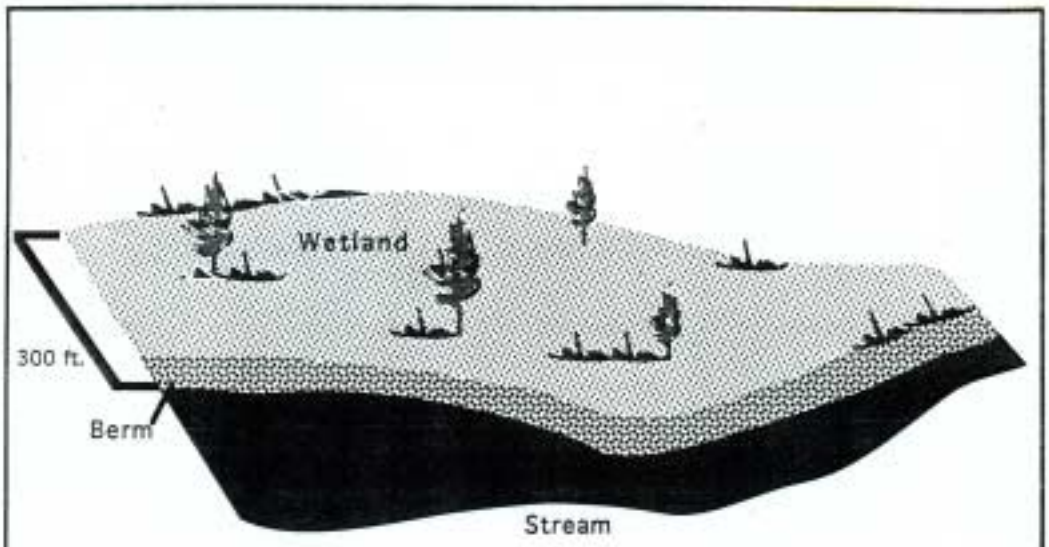



Figure 4a. Wetland contiguous and within 300 feet

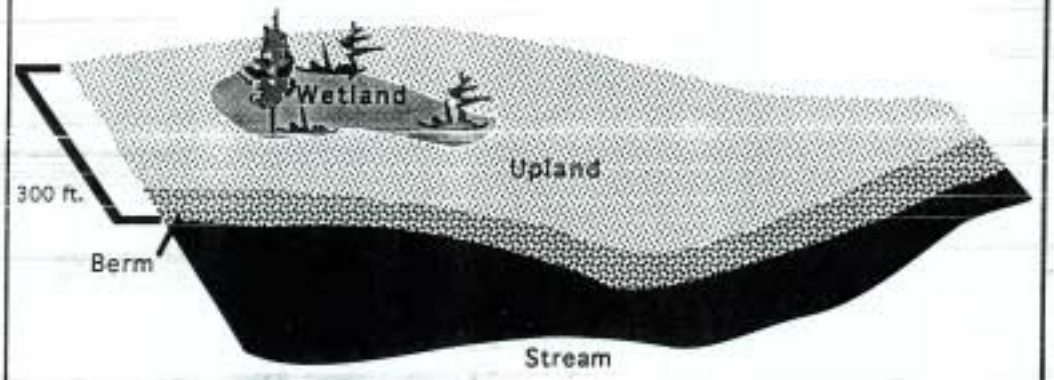



Figure 4b. Wetland within 300 feet but not contiguous

**Chart 1a.**
**WATER STORAGE**

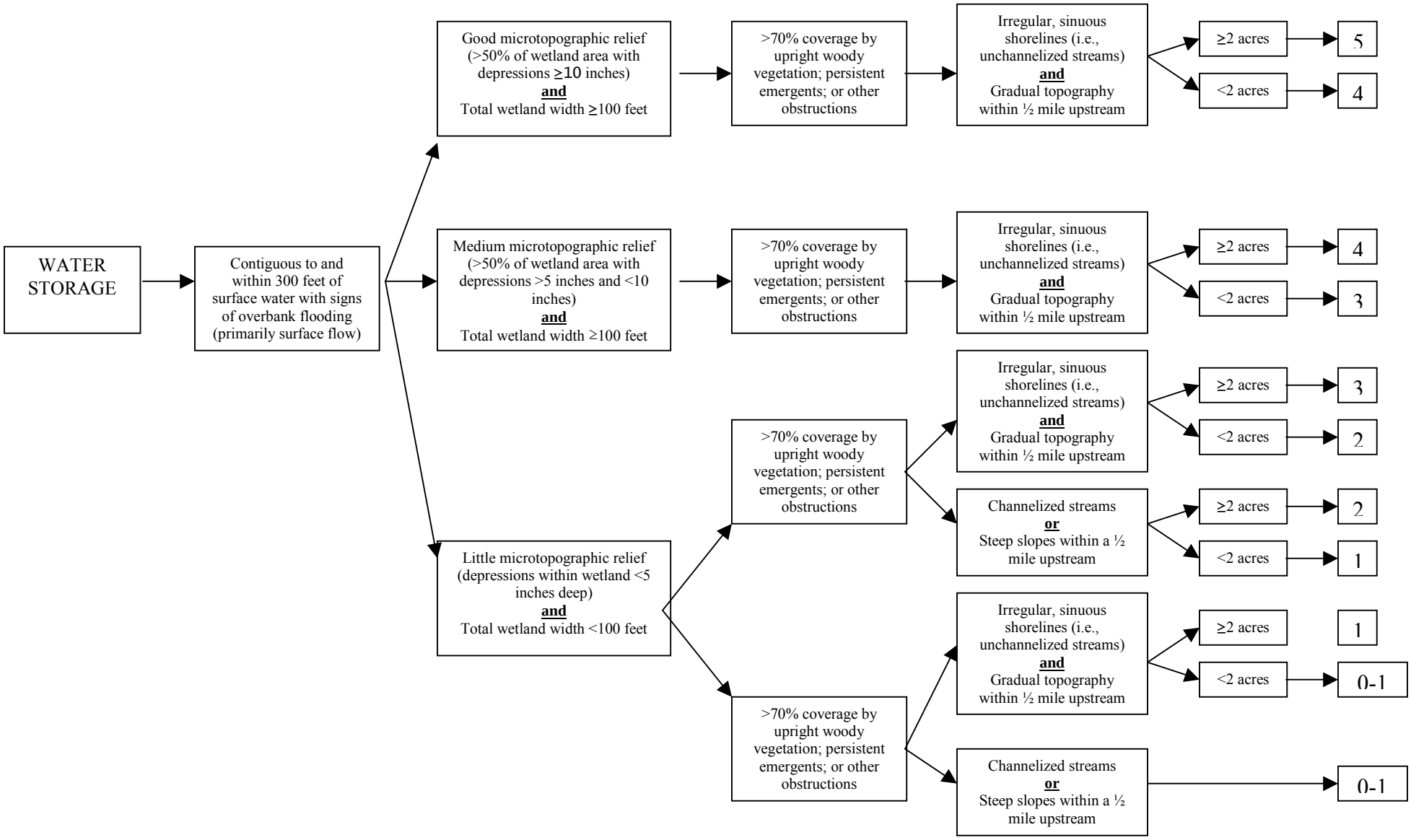
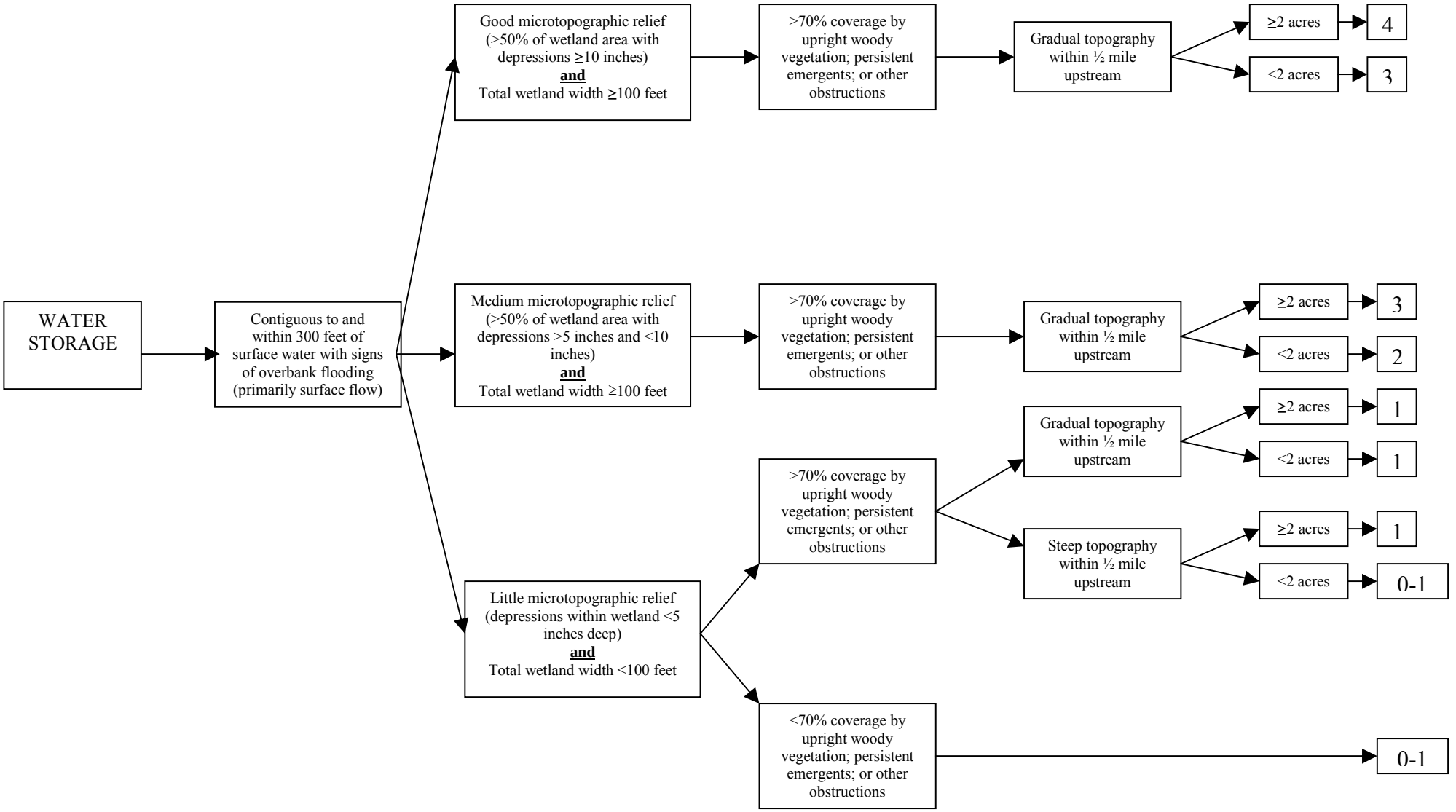
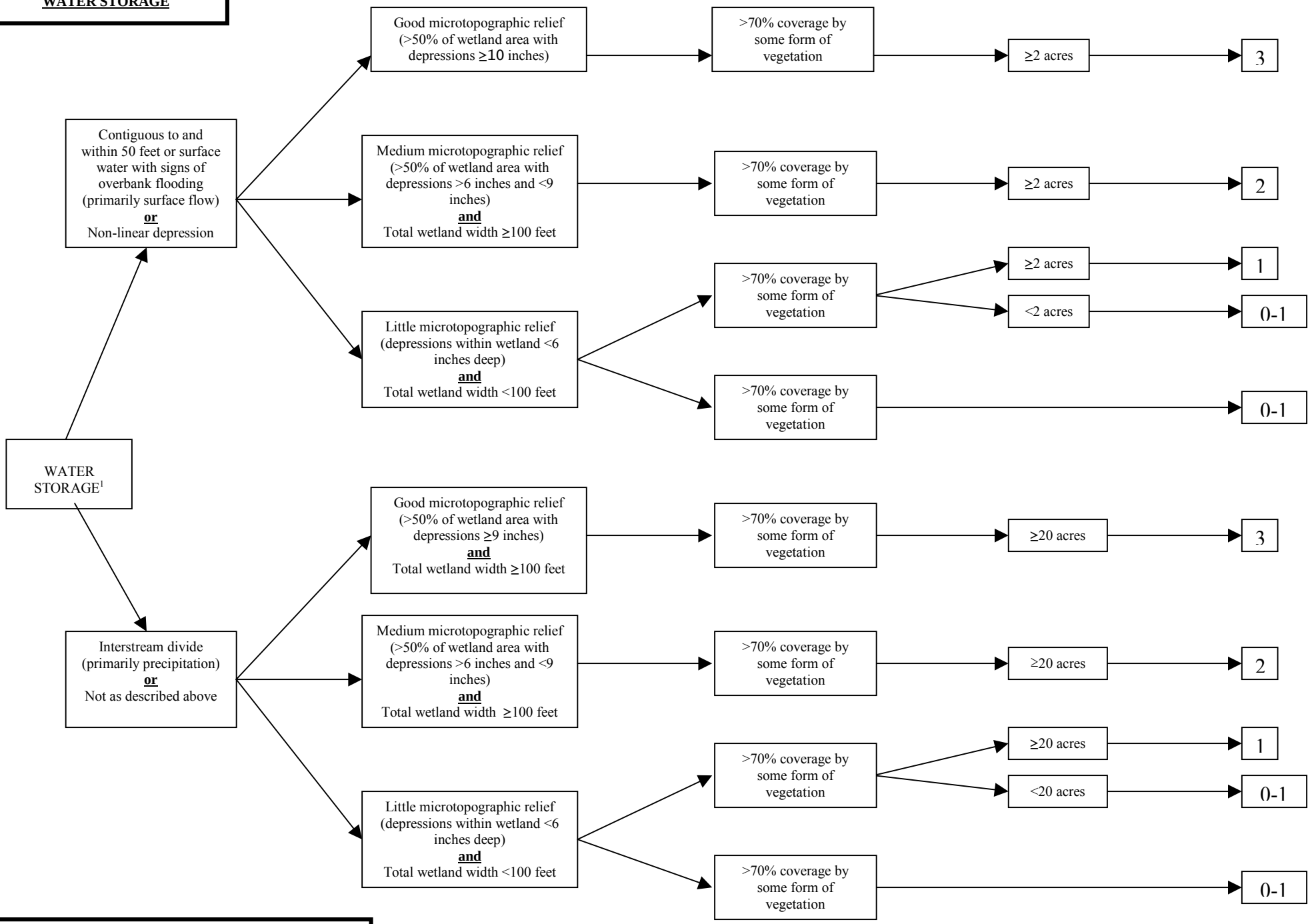


**Chart 1b.**
**WATER STORAGE**



# Chart 1c.
**WATER STORAGE**




For those wetlands influenced primarily by groundwater and precipitation but that apparently receive significant amounts of stormwater, increase final score for water storage by 1 point.

## BANK/SHORELINE STABILIZATION

Bank stabilization refers to the role of a wetland in protecting the shorelines of intermittent and permanent streams, rivers, lakes, ponds, and estuaries from erosive forces. This value must be rated on the ability of a wetland to anchor a shoreline as well as the opportunity for highly erosive forces to affect the shoreline.

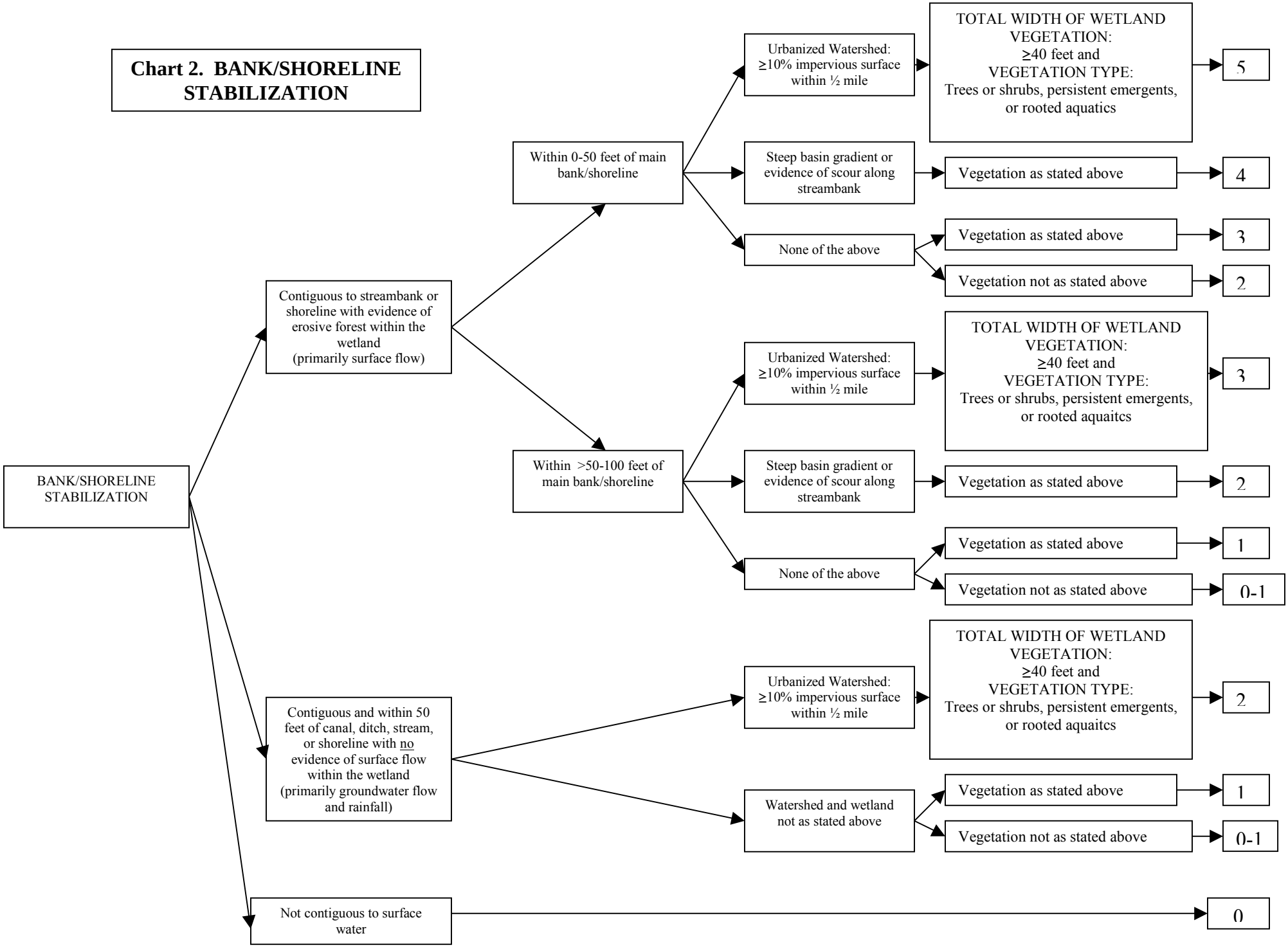
The opportunity for a wetland to stabilize a shoreline refers to the magnitude of erosive forces in the watershed as well as the erodability of adjacent lands. Therefore, those wetlands associated with streams in urbanized watersheds (>10% impervious surface within ½ mile upstream) have more opportunity for erosive forces than those in primarily forested landscapes. Steep basin gradients will generally be associated with riparian systems where both the stream and the associated wetland are on a gradient. A steep gradient should be evaluated based on the relative topography of a physiographic province. In this way, there may be areas on the coastal plain that are relatively steep. Similarly, there may be wetlands in the mountains that are located where the topography is relatively gentle. Wetland systems where there is evidence of scour along the stable streambank should also be rated relatively high for this value.

The vegetative cover of a wetland is the key to determining its ability to stabilize a streambank or shoreline. Upright, shoreline vegetation should be at least 40 feet wide. This criterion refers to the presence of a total wetland width of 40 feet on both sides of the main channel but does not include the width of channel itself. Trees, shrubs, persistent emergents, and rooted aquatics are important vegetation types for bank stabilization. Refer to **Table 1** for a list of plant species with potentially high value for shoreline anchoring.

Those wetlands contiguous to surface water with evidence of surface flow and within 50 feet of the shoreline should receive the highest range of scores for bank/shoreline stabilization depending on the variables for opportunity and ability. The next category of wetlands in **Chart 2** are those that are greater than 50 and less than 100 feet from the shoreline. These wetlands have a less direct effect on the stabilization of shorelines. Wetlands associated with canals or ditches that carry surface water within a channel but have no evidence of surface water within the wetland can receive a maximum score of 2.

Wetlands that are not associated with surface waters should receive no points for this function.

## Chart 2. BANK/SHORELINE STABILIZATION



## POLLUTANT REMOVAL

This function refers to the ability of a wetland to retain or remove sediment, nutrients, and toxicants (such as heavy metals, PCB's, or pesticides) as well as its opportunity to receive these pollutants. Opportunity is primarily affected by the source of water, land use in the watershed, and position in the landscape. Ability relates to the density, type, and extent of vegetation; wetland width; and gradient of the watershed.

The first major break in the accompanying **Charts 3a**, **3b**, and **3c** involves the source of water to the wetland. Those wetlands within 300 feet of surface water with evidence of surface water flow have the most opportunity to receive particulate and dissolved pollutants from surface runoff and floodwaters, as well as dissolved pollutants in groundwater and precipitation. This buffer immediately adjacent to surface waters is the most valuable for the protection of water quality and, therefore, can receive the maximum score for this function.

The wetlands represented in **Chart 3b** that are beyond 300 feet of surface water can receive the second highest range of scores since they may receive significant inputs of pollutants from the surrounding landscape by overland flow. **Chart 3c** includes those wetlands within 50 feet of the edge of a linear depression, canal, ditch, or estuarine fringe and non-linear depressions such as freshwater marshes with no signs of surface water. These areas would have the opportunity to receive soluble pollutants from groundwater and rainfall but would not receive sediments from surface runoff. Wetlands in interstream divides should receive the lowest scores for pollutant removal. Soluble pollutants from precipitation are generally the only pollutants associated with this category of wetlands.

In addition to the source of water, wetlands in watersheds with ≥ 10% disturbed land (i.e., urbanization, agriculture, actively-managed sivicultural plantations, golf courses, etc.) have more opportunity to receive pollutants than those in undisturbed watersheds or in watersheds that are recovering from a past disturbance such as logging. Wetlands associated with first order streams or areas that flood at least seasonally also have more opportunity to retain pollutants than higher order streams that do not flood seasonally. Refer to **Figure 5** for a diagrammatic representation of stream order. Also refer to the definition of stream order in the glossary.

Vegetative cover is a factor indicating the ability of a wetland to remove pollutants and is again used as a surrogate measure for stem density. Those areas where trees, shrubs, or upright, persistent emergents provide ≥ 80% canopy cover will be most effective at this function. Also, wetlands located in areas of gradual topography will have more ability to retain sediments and associated pollutants since retention time will be longer.

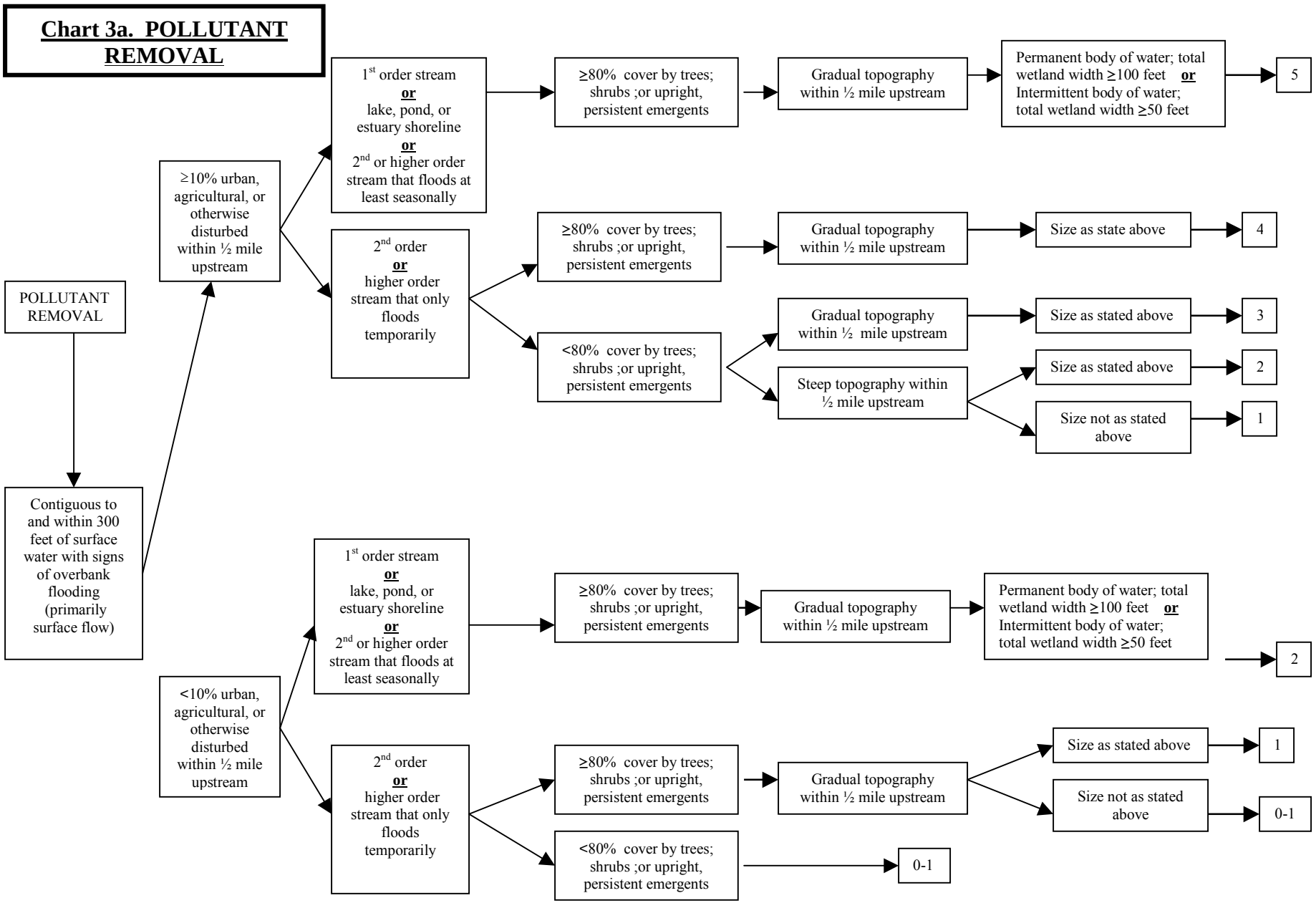
Riparian wetlands should be at least 25 feet wide on each side of the channel or a total width of 50 feet wide along intermittent streams, and 50 feet wide on each side of the channel or a total width of 100 feet along perennial streams to provide the greatest value for retaining pollutants. Lakes and estuaries require at least 100 feet along their fringe to provide the highest value for pollutant retention.

Non-linear depressions and estuarine fringe forests should be at least 2 acres in size to have a higher value for removing pollutants. Wetlands contiguous to linear depressions, canals, or stream banks with no evidence of surface flow have a similar size criterion to those wetlands with evidence of surface flow. These wetlands must be a total width of 50 feet and 100 feet for intermittent and permanent bodies of water, respectively, to provide greater value for removing pollutants. Wetlands associated with interstream divides must be at least 20 acres in size to meet this size criterion since normally their only source of pollutants is precipitation.

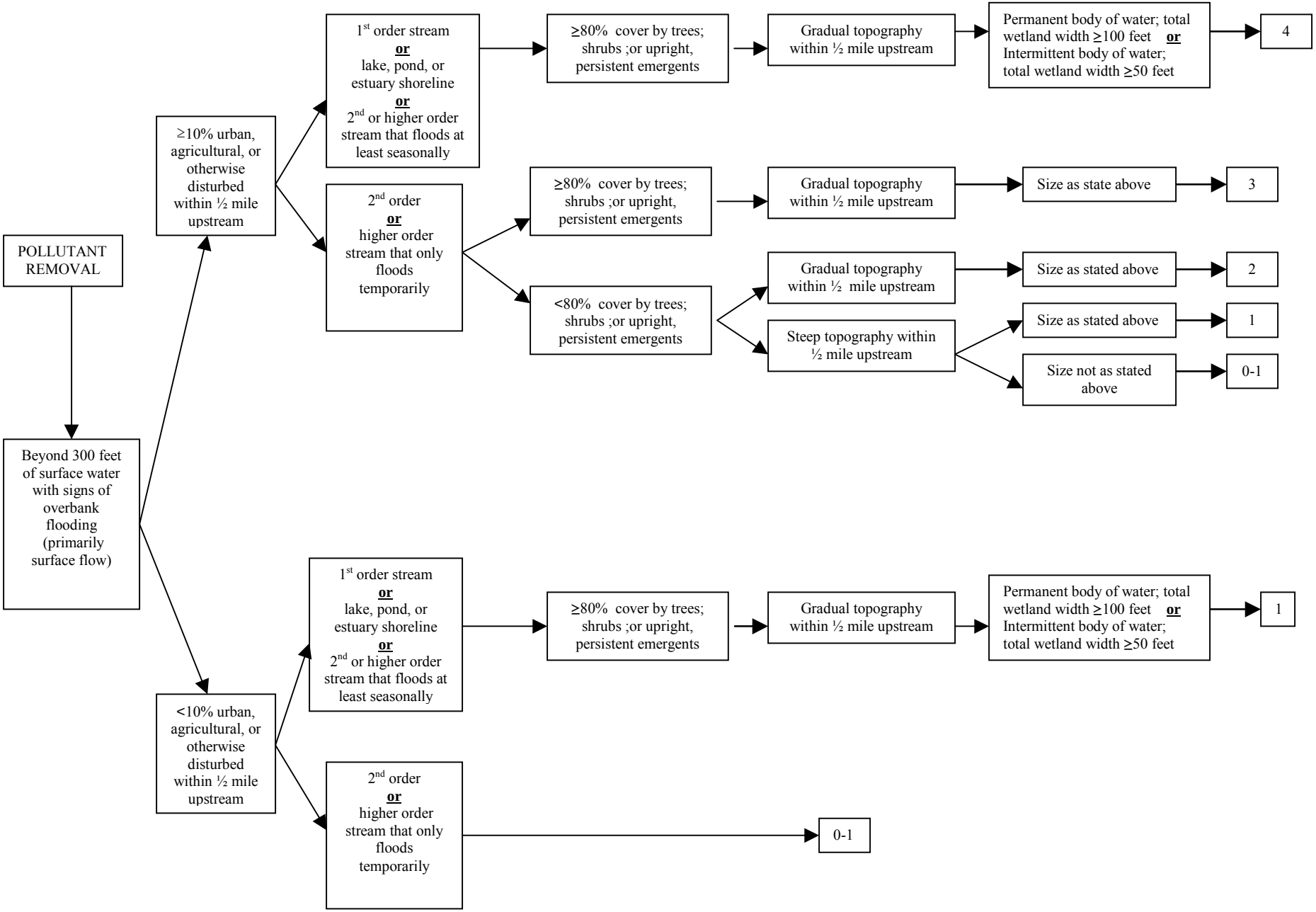
In summary, those wetlands (1) within 300 feet of surface water where there is evidence of surface flow; (2) within ½ mile downstream of ≥ 10% nonpoint source disturbance; (3) within headwaters (first order streams) or areas that flood regularly; (4) with adequate vegetative cover by trees, shrubs, or persistent emergents; (5) in areas of gradual topography; and (6) at least 50 or 100 feet wide will be most valuable for pollutant retention and should receive a score of 5. With all other characteristics are similar, those wetlands beyond 300 feet of surface water with evidence of surface flow can receive a maximum score of 4 for this value. Wetlands within 50 feet of linear depressions and no surface flow and wetlands that are non-linear depressions can receive a range of scores from 0-3 depending on disturbance within the immediate watershed, vegetation, topography, and wetland size. Wetlands associated with interstream divides can receive a score of up to 2 for pollutant retention.

For those wetlands that are located in sensitive watersheds where there is ≥ 10% nonpoint disturbance within ½ mile upstream, upslope, or radius, the final score should be increased by one point for a maximum score of 5 points. Sensitive watersheds are defined as formally classified or recognized watersheds that include: Nutrient Sensitive Waters (NSW), Outstanding Resource Waters (ORW), High Quality Waters (HQW) such as shellfishing waters (Class SA), DEM and Wildlife Resources Commission (WRC) trout waters, Primary Nursery Areas (PNA), Secondary Nursery Area (SNA), and water supply watersheds. The protection that a wetland provides these waters is primarily related to its ability to retain or remove sediments and nutrients. It is also understood that in some cases wetlands provide other benefits of water quality such as shading (temperature) in trout streams. These other benefits will have to be evaluated on a case-by-case basis.

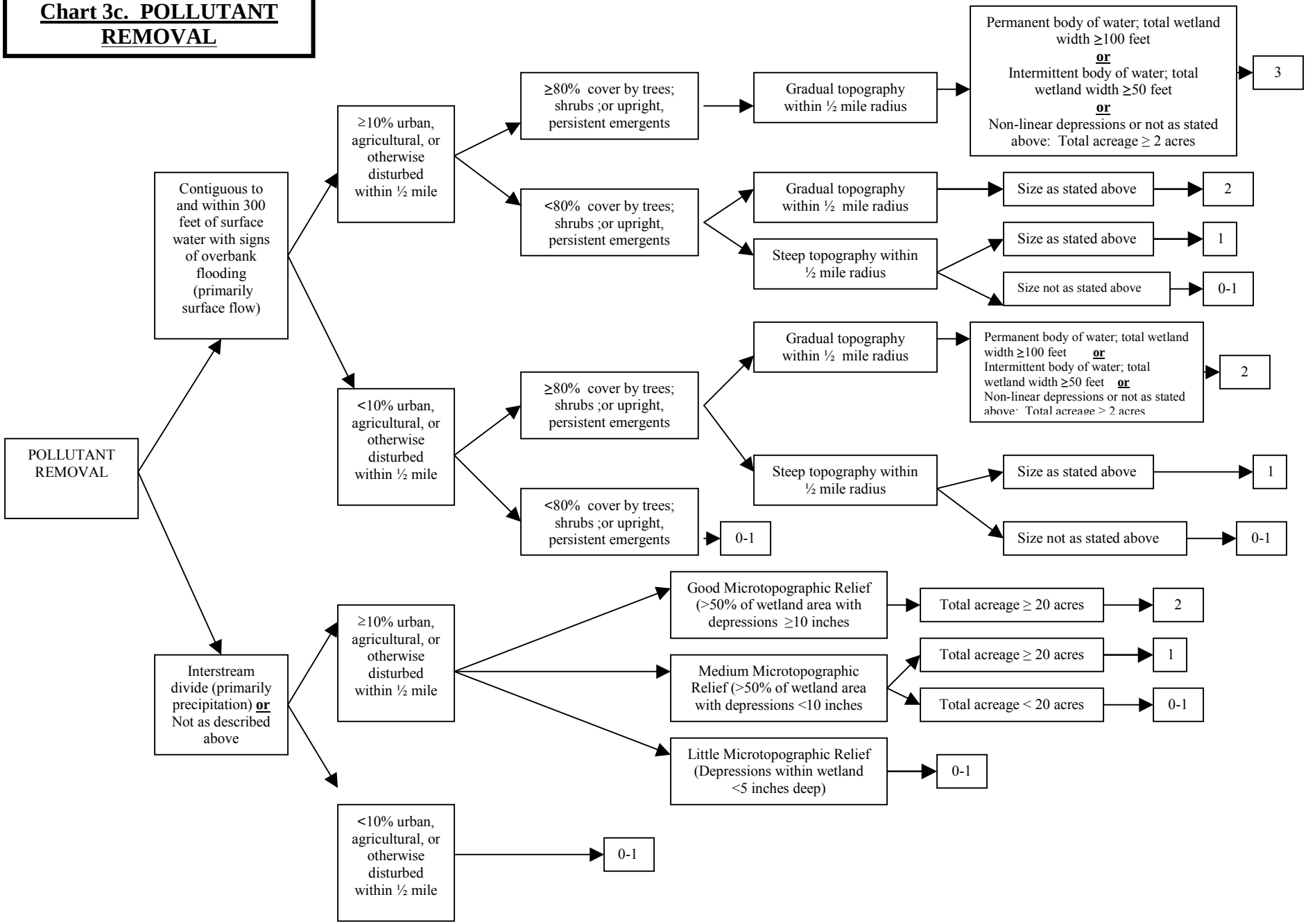
# Chart 3a. POLLUTANT REMOVAL



# Chart 3b. POLLUTANT REMOVAL



# Chart 3c. POLLUTANT REMOVAL



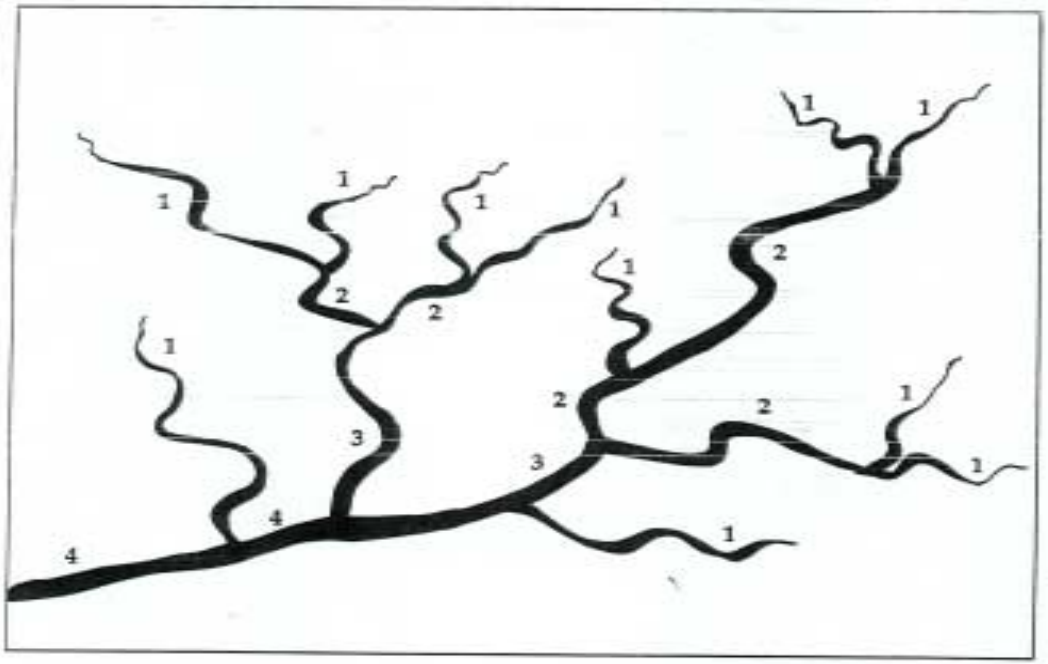



Figure 5. Stream order

## WILDLIFE HABITAT

Assessing the wildlife value of a wetland is particularly difficult because of the diversity of wildlife species and the varied food and habitat needs of the species that may use wetlands. For the purposes of this rating system, wildlife includes those species of birds and mammals that may normally use wetlands but are not necessarily restricted to these habitats. Indicators of wildlife habitat are outlined in **Chart 4a** and **Chart 4b**. Please note on **Chart 4a** that wetlands such as longleaf pine savannas and mountain bogs/fens are treated as a special case. These types of wetlands are known to contain Federal or state- listed threatened or endangered species (plant and/or animal), and should, therefore, receive a 5 for wildlife habitat.

In general, the highest value wetlands in terms of wildlife habitat will have vegetation that provides wildlife both food and cover. For forested wetlands, good cover is defined as the presence of at least three of the following characteristics: (1) well-developed horizontal layers of vegetation; (2) snags with or without cavities (≥ 2 per acre); (3) mature trees (DBH ≥10 inches); (4) >80% canopy cover; and (5) dense shrub layer (e.g., pocosins). Good food is defined as the presence of four or more of the following: (1) hardwood mast trees; (2) cone bearing trees; (3) trees with fleshy fruits (e.g., black gum); and (4) shrubs with fleshy fruits.

Non-forested wetlands such as freshwater marshes must have >50% coverage by aquatic bed and emergent vegetation to meet the criterion for good cover and 4 or more species of aquatic bed and emergent species to meet the criterion for good food. Refer to **Tables 1a** and **Table 1b** for common plant species preferred by waterfowl and wetland tree species important for wildlife. These lists are by no means inclusive.

Research suggests that riparian habitats and habitats such as marshes and non-alluvial swamp forests (e.g., oxbow sloughs, ridge and swale communities) are important for a high number of wildlife species. Riparian habitats such as bottomland hardwood forests, swamp forests, bog forests, and headwater forests are heavily used by terrestrial wildlife as well as breeding birds. Riparian systems are defined as those where surface water flow is the primary source of water to the wetland. Marshes are among the most productive of all

wildlife habitats because of the availability of water and rich invertebrate life. For the purposes of this guidance for rating wetlands, freshwater marshes are defined as those that occur naturally on the coastal plain as well as man-made or beaver-made marshes throughout the state.

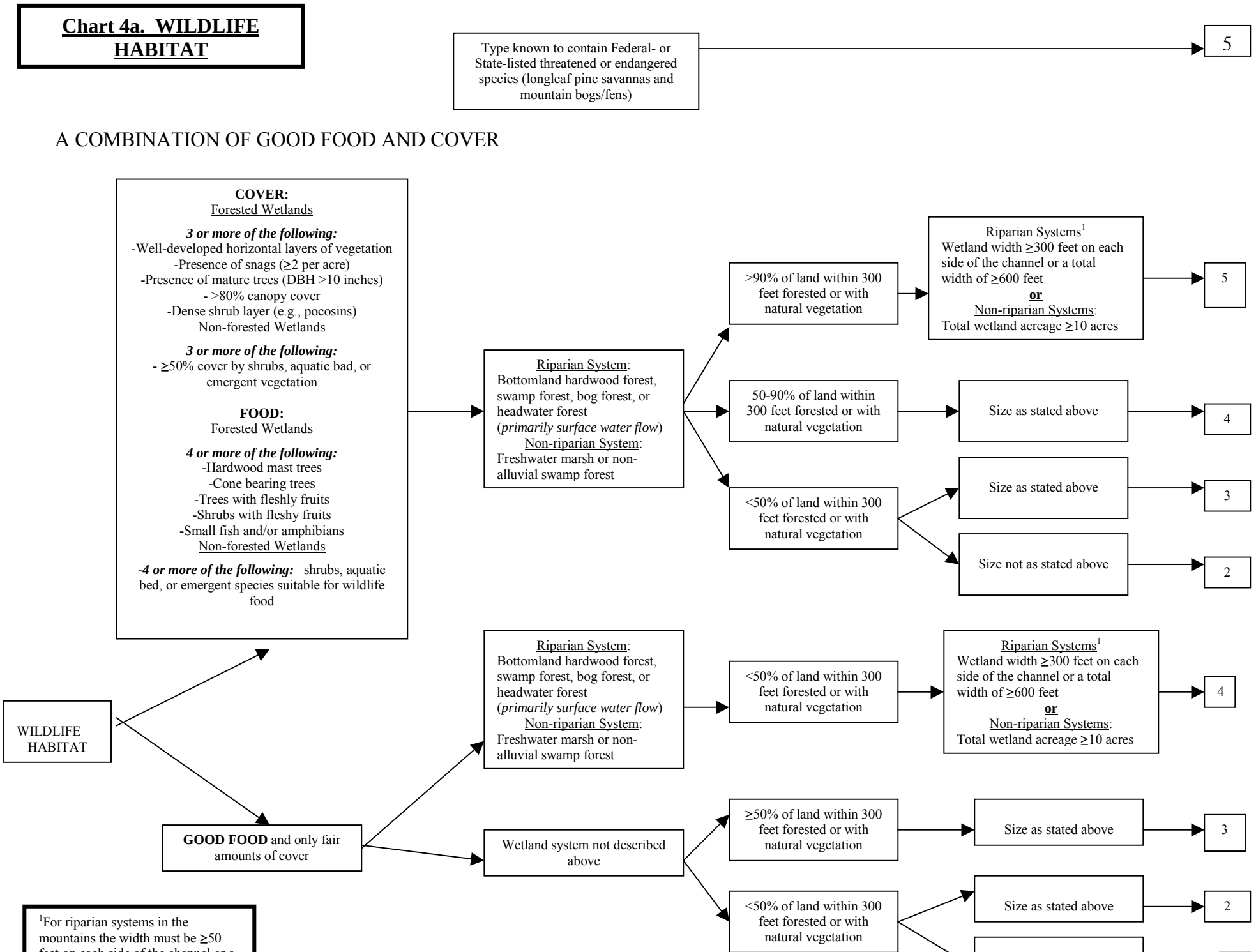
In addition, since human disturbance can adversely affect the habitat value of a wetland, those wetlands where a greater percentage of the land within 300 feet is forested or otherwise naturally vegetated are more valuable for wildlife species. **Special consideration should be made, however, for those wetland areas that may be the only remaining habitat in an urban setting.** These wetlands may not be adequately represented by this rating system and use of best professional judgment may be more appropriate.

Riparian areas in the coastal plain and piedmont should be at least 300 feet on each side of the channel or a total width of 600 feet (e.g., 400 feet on one side and 200 feet on the other side of the channel) to provide a travel corridor as well as habitat. For riparian systems in the mountains the width should be at least 50 feet on each side of the channel or a total width of 100 feet for good wildlife habitat. Non-riparian wetlands should be at least 10 acres in size to receive the higher value in the rating system.

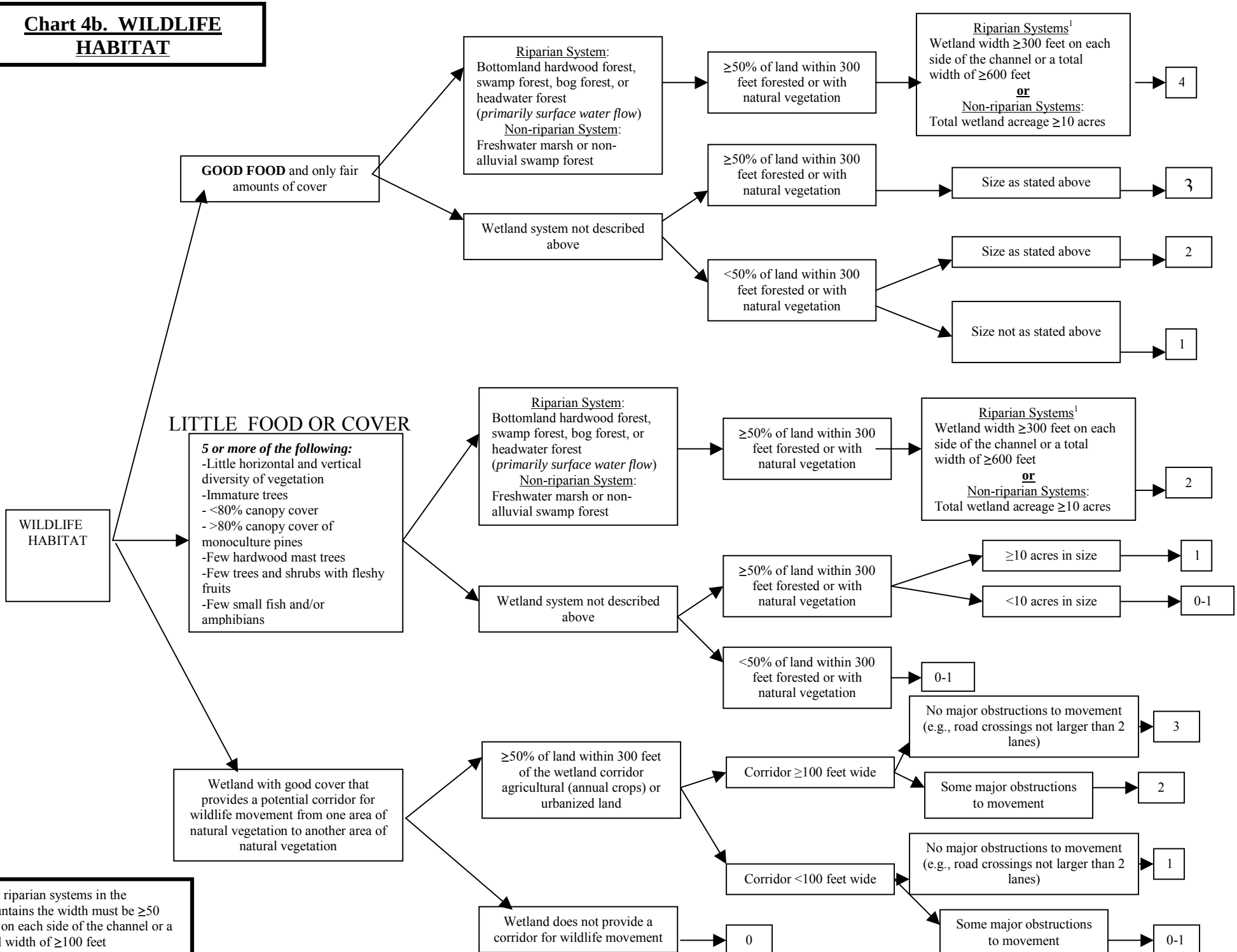
Those wetlands (1) with vegetation that is important for wildlife food and cover, (2) with small fish and/or amphibians present that are important for wildlife food, (3) that are riparian systems or freshwater marshes, (4) that are relatively undisturbed, and (5) that meet the minimum size criteria can receive a maximum score of 5. Wetlands that have good food or good cover can receive a range of scores from 0 to 4 depending on the other criteria. Those wetlands that have marginal vegetation for food and cover can receive a maximum score of 2.

A wetland may not provide significant wildlife habitat, but it may serve as a significant travel corridor for wildlife movement form one area of natural vegetation to another area of natural vegetation. A wetland can receive a maximum score of 3 if it (1) provides a corridor whereby ≥50% of the land within 30 feet of the wetland corridor is agricultural (annual crops) or urbanized land; (2) is at least 100 feet wide; and (3) has no major obstructions to movement (e.g., road crossings not larger than 2 lanes). If the score a wetland receives for travel corridor is higher than for wildlife habitat, this higher score should be recorded on the rating sheet.

# Chart 4a. WILDLIFE HABITAT



# Chart 4b. WILDLIFE HABITAT




[1]For riparian systems in the mountains the width must be ≥50 feet on each side of the channel or a total width of ≥100 feet

**Table 1a**. Common Plant Species Preferred by Waterfowl (from Marble 1992)

| Species | Common Name |
|---|---|
| **Aquatic Bed Species** | |
| *Brasenia schreberi* | watershield |
| *Ceratophyllum demersum* | coontail |
| *Lemna spp.* | duckweeds |
| *Najas spp.* | naiads |
| *Nuphar spp.* | spatterdocks |
| *Nymphaea spp.* | water lillies |
| *Potamogeton spp.* | pondweeds |
| *Rorippa spp.* | water cress |
| *Ruppia maritime* | wigeongrass |
| *Spirodela spp.* | big duckweeds |
| *Vallisneria americana* | wild celery |
| *Wolffia spp.* | watermeals |
| *Zostera marina* | eelgrass |
| | |
| **Emergent Species** | |
| *Acnida cannabinus* | water hemp |
| *Carex spp.* | sedges |
| *Echinochola spp.* | wild millet |
| *Eleocharis spp.* | spikerushes |
| *Equisetum spp.* | horsetails |
| *Juncus spp.* | rushes |
| *Leersia spp.* | rice cutgrass |
| *Panicum spp.* | panic grass |
| *Paspalum boscianum* | bull paspalum |
| *Peltandra virginica* | arrow arum |
| *Polygonum spp.* | smartweeds |
| *Salicornia virginica* | woody glasswort |
| *Scirpus spp.* | bulrushes |
| *Setaria spp.* | bristle grasses |
| *Sparganium spp.* | burreeds |
| *Zizania aquatica* | annual wild rice |

**Table 1b**. Wetland Tree and Shrub Species Important for Wildlife Food (from Pozzanghera 1992)

| Species | Common Name |
|---|---|
| *Alnus serrulata* | tag alder |
| *Amelanchier arborea* | downy service-berry |
| *Carya spp.* | hickory |
| *Celtis occidentalis* | hackberry |
| *Celtis laevigata* | sugar-berry |
| *Cephalanthus occidnetalis* | buttonbush |
| *Chamaecyparis thyoides* | Atlantic white cedar |
| *Crataegus spp.* | hawthorn |
| *Diospyros virginiana* | persimmon |
| *Fraxinus caroliniana* | Carolina ash |
| *Fraxinus pennsylvanica* | green ash |
| *Ilex decidua* | deciduous holly |
| *Ilex myrtifolia* | myrtle holly |
| *Ilex opaca* | American holly |
| *Nyssa aquatica* | swamp tupelo |
| *Nyssa sylvatica* | black gum |
| *Pinus palustris* | long-leaf pine |
| *Pinus serotina* | pond pine |
| *Quercus spp.* | oak |
| *Salix babylonica* | *w*eeping willow |
| *Salix nigra* | black willow |
| *Viburnum dentatum* | arrow-wood |
| *Viburnum lentago* | nannyberry |

## AQUATIC LIFE

Aquatic life refers to the ability of a wetland to support fish, amphibians, reptiles, and invertebrates. For the purposes of this rating system, aquatic life is dependent on or spend some phase of their life in the water. This value refers specifically to the aquatic life in wetlands, not the aquatic life in adjacent streams or lakes.

The aquatic life value of a wetland is determined primarily by the presence of water, vegetation, and surrounding land use as indicated on **Chart 5a** and **Chart 5b**. The highest value wetlands are: (1) ephemeral wetlands, (2) wetlands with standing water present in some areas all year, (3) bottomland hardwood systems with seasonal flooding, (4) mountain bogs/fens, and (5) bog forests. Each of these categories of wetlands represents habitat for various assemblages of aquatic life.

The category for ephemeral wetlands refers specifically to habitat suitable for amphibian reproduction. In general, these areas should have standing water from late fall to spring and dry up completely by mid-summer. This condition allows amphibians to successfully reproduce without fish predation. Those wetlands with the capacity to hold water at a depth of at least 2 feet will generally provide the best habitat for these organisms. A relatively undisturbed buffer (>90% of the upland forested or in natural vegetation) of at least 300 feet is also important for the dispersal of amphibians after reproduction.

Wetlands that are permanently flooded over at least 10% of their area (generally these wetlands are freshwater marshes) are important for both fish and aquatic invertebrates. Those wetlands with well interspersed patches or diffuse open stands of vegetation provide the best aquatic habitat. The most valuable wetlands in terms of habitat have from 25 to 75% coverage by at least 4 species of emergent plants. An undisturbed upland buffer is also beneficial for these types of wetland systems.

Bottomland hardwood forests that flood during the spring provide essential spawning, feeding, and nursery areas for fish. Generally, these wetlands are associated with 2$^{nd}$ or higher order permanent streams. Primary indicators that determine flooding frequency include: water marks on trees, buttresses, mossy trunks, wrack lines, microtopographic relief, scoured areas, and shallow banks.

The absence of known impediments to upstream movement increases the value of a bottomland hardwood forest for fish. The keystone wetland spawners in North Carolina are blueback herring and alewife. Neither of these species can easily navigate road culverts placed above the level of the stream bottom, and, therefore, these structures are the most common impediments to movement. Dams are also major impediments to fish migration. Depth, however, is not a barrier to movement since blueback herring and alewife are known to swim in extremely shallow waters.

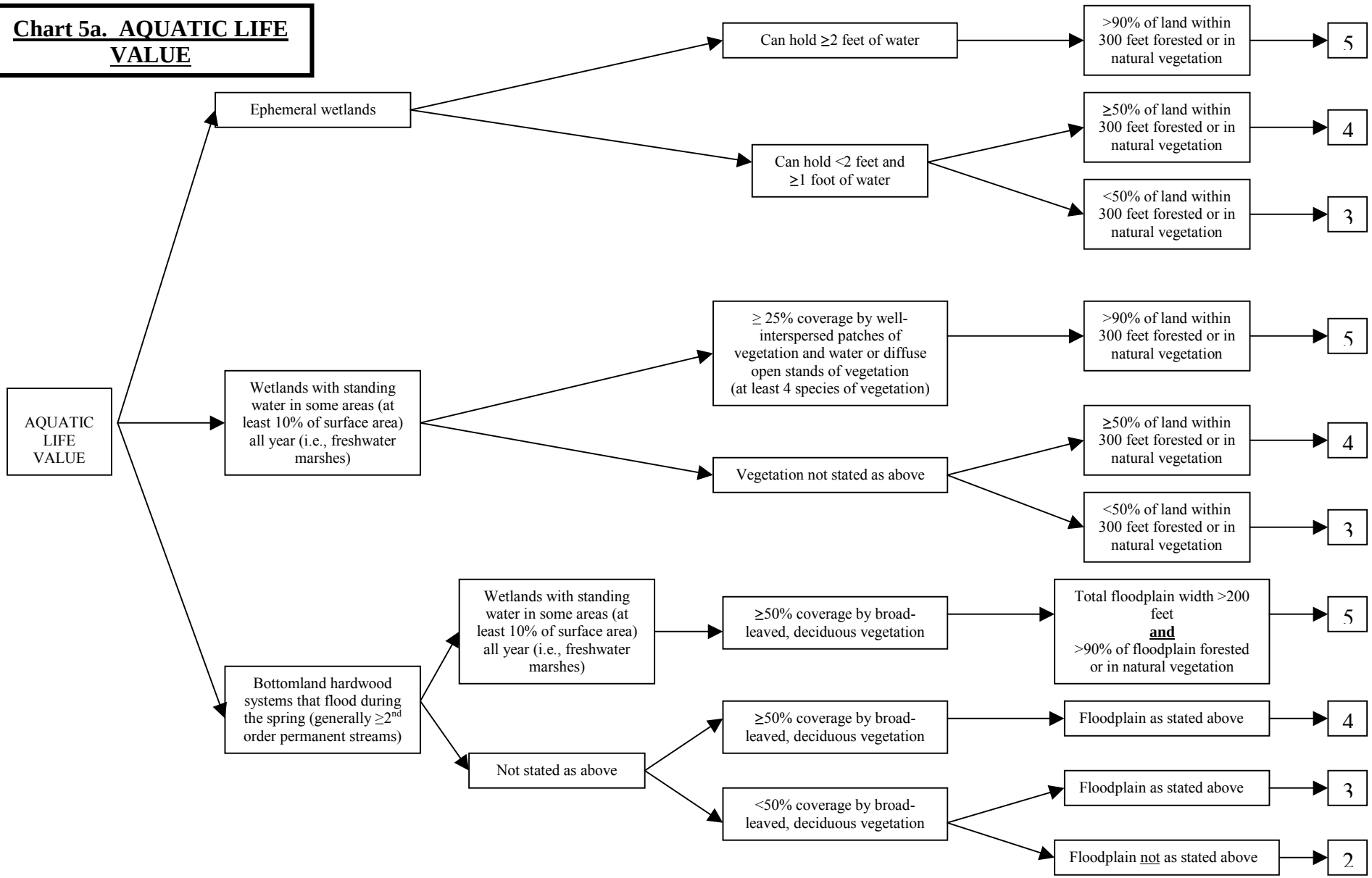
Broad-leaved, deciduous, wooded wetlands are high detritus producers and can therefore support high densities of feeding fish if flooding occurs. Wetlands with ≥50% coverage by broad-leaved deciduous trees and an undisturbed floodplain at least 200 feet wide (not including the width of the channel) will receive higher scores for this value.

Riparian systems that are identified by the North Carolina Division of Marine Fisheries or the North Carolina Wildlife Resources Commission as providing habitat for anadromous fish should not be given a score of less than 3 for aquatic life value. Ignore the charts if these systems receive a score of 0-2 and record a 3 for this value.

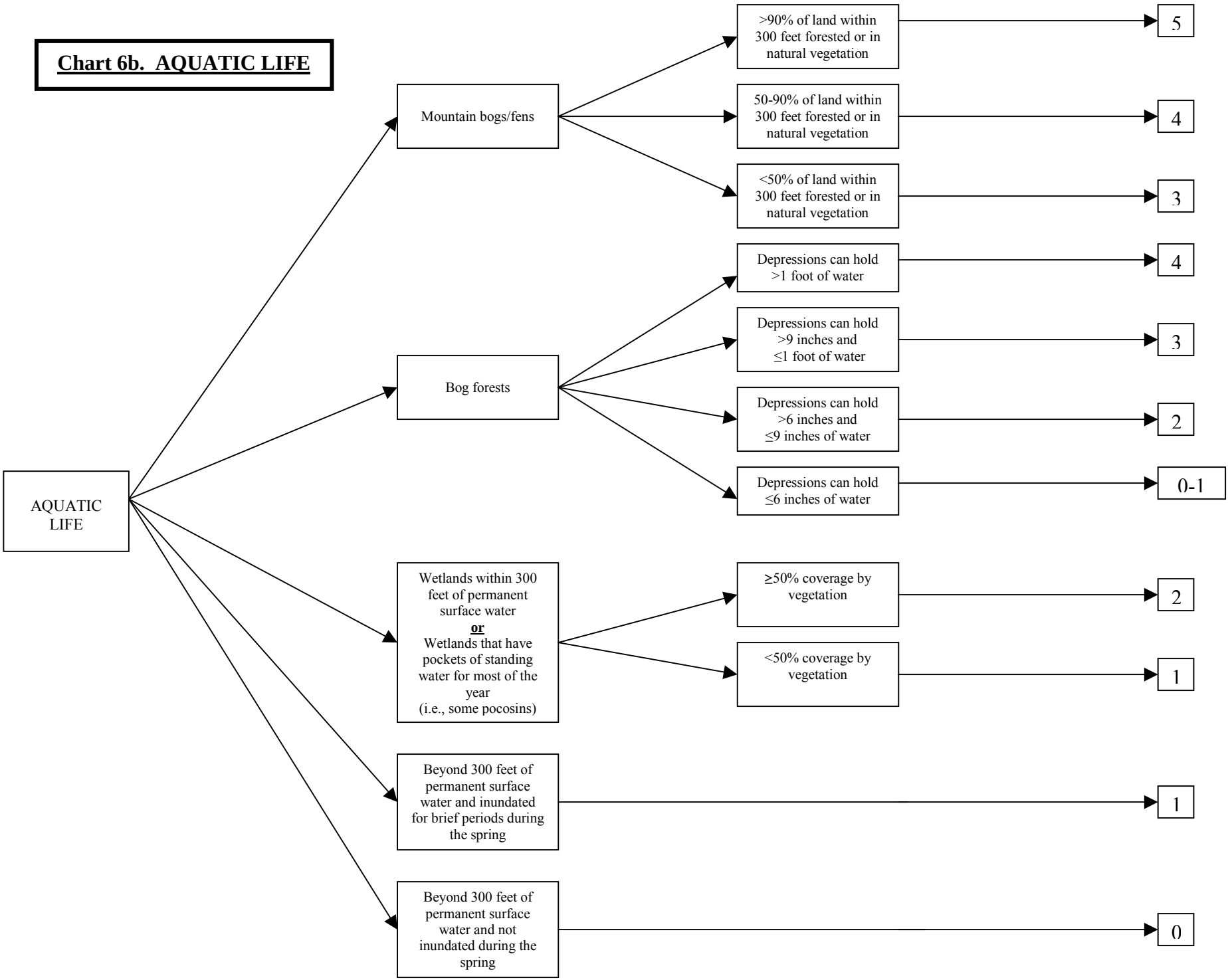
Mountain bogs are essential habitat for mountain bog turtles, which are listed by the state as a threatened species. An undisturbed upland buffer is an essential component for the integrity of these wetlands as ecologically unique habitat.

Mountain bog forests should be given a maximum score of 4 depending on their capacity to hold water. Please note that those mountain bog forests that are documented habitat for bog turtles should be given a score of 5 for aquatic life value. Wetlands that are not permanently or seasonally flooded but that are contiguous to and within 300 feet of surface water or that have pockets of standing water for most of the year (i.e., some pocosins) can receive scores of up to 2 for aquatic life. Those wetlands that are beyond 300 feet of permanent surface water and are inundated for brief periods during the spring can receive a rating of 1. Wetlands that are beyond 30 feet of permanent surface water and are not inundated during the spring should receive a score of 0.

# Chart 5a. AQUATIC LIFE VALUE



# Chart 6b. AQUATIC LIFE

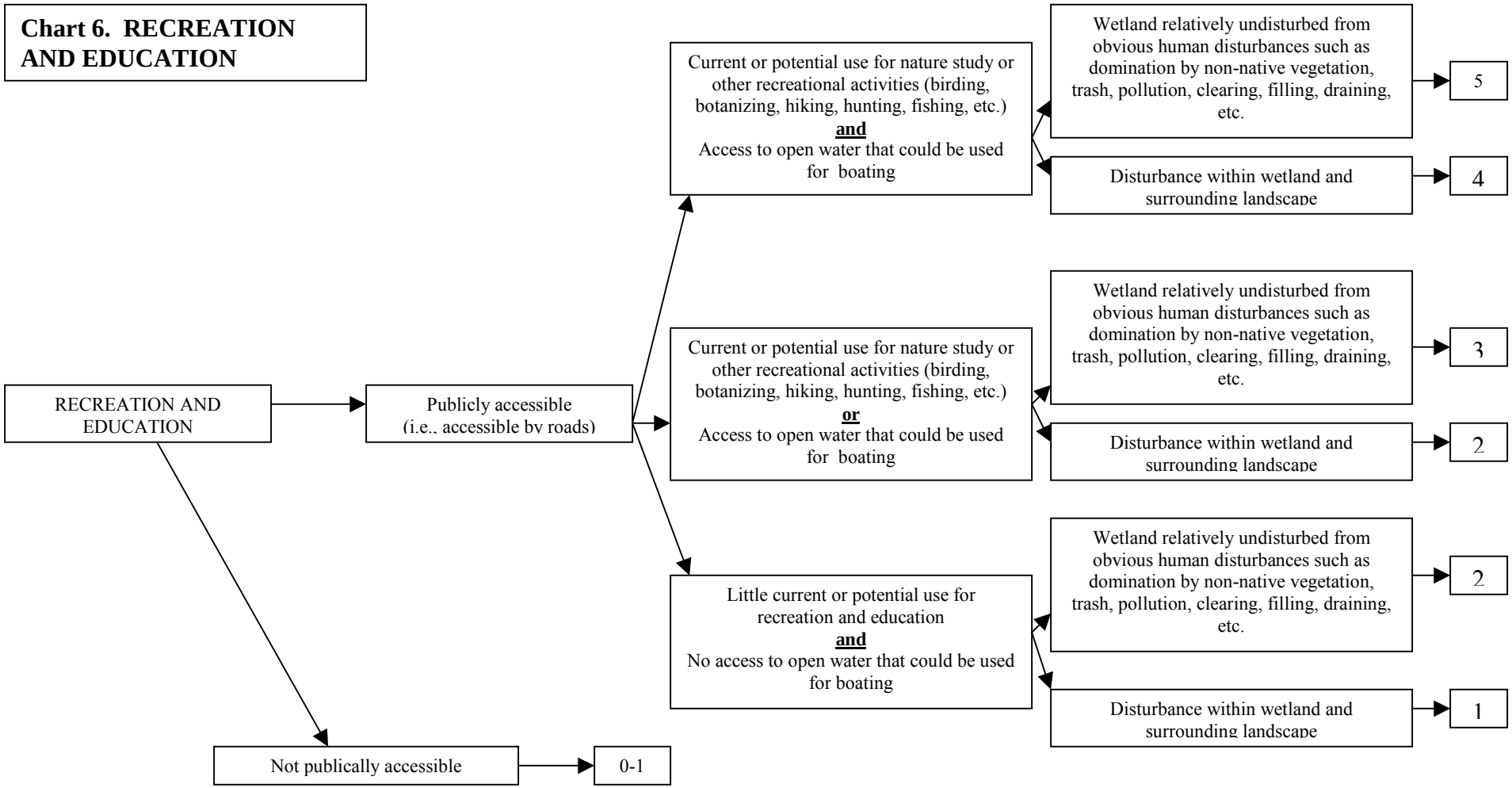


## RECREATION AND EDUCATION

This value refers to the use of a wetland for both consumptive (hunting, fishing) and nonconsumptive (birding, botanizing, canoeing, aesthetics) forms of recreation and education that occur in either an incidental or obligatory manner on wetlands. The value, as indicated on **Chart 6**, is based on the quality of the wetland as well as public access to the wetland. Public access is defined as those wetland areas accessible by public roads.

Those publicly accessible wetlands with current or potential use for nature study or other recreational activities (birding, botanizing, hiking, hunting, fishing, etc.) **and** that provide access to open water that could be used for boating can receive a maximum score of 5 for this value depending on the level of disturbance in the area. Disturbance is defined as domination by non-native vegetation, trash, pollution, clearing, filling, draining, etc. within the wetland. Publicly accessible wetlands with current or potential use for nature study or other recreation activities **or** access to open water that could be used for boating can receive a score of 2-3. Areas with little current or potential use for recreation and education **and** no access to open water suitable for boating could receive a maximum score of 2. wetlands with no public access could only receive a score of 1. This score reflects the value of a wetland for recreation and education that a private landowner may enjoy.

**Chart 6. RECREATION AND EDUCATION**



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**APPENDIX I**

## CITATIONS FOR NUMBERS IN RATING SYSTEM

| Section | Characteristic | Citation |
|---|---|---|
| **Water Storage** | Contiguous to and within 300 feet of surface water | Best professional judgment |
| | Total wetland width 100 feet | Best professional judgment |
| | 70% coverage by upright, woody vegetation; persistent, upright emergents; or other obstructions | Adamus, et al. (1987) |
| | 2 acres in size | Adamus, et al. (1987) |
| | 20 acres in size | Best professional judgment |
| **Bank/Shoreline Stabilization** | Within 50 feet and 50-100 feet of surface water | Best professional judgment |
| | 10% impervious surface | Adamus, et al. (1987) |
| | Total width of vegetation: 40 feet | Adamus, et al. (1987) |
| **Pollutant Removal** | Contiguous to and within 300 feet of surface water | Best professional judgment |
| | Contiguous to and within 50 feet of the edge of linear depression, canal, or ditch | Best professional judgment |
| | 10% urban, agricultural, or otherwise disturbed watershed within 1 mile radius | Best professional judgment |
| | 80 cover by trees, shrubs, or upright, persistent emergents | Reppert, et al. (1979) |
| | Permanent body of water : Total wetland with 100 feet<br>Intermittent body of water: Total wetland width 50 feet | Trimble and Sartz (1979)<br>Howard and Allen (1989)<br>Neiswald, et al. (1990)<br>Bud, et al. (1987) |
| | 2 acres in size | Best professional judgment |
| | 20 acres in size | Best professional judgment |

**APPENDIX I (continued)**

| Section | Characteristic | Citation |
|---|---|---|
| **Wildlife Habitat** | ≥ 80 % canopy cover (forested) | Marble (1992) |
| | > 50% cover (non-forested) | Kaminski and Prince (1981)<br>Murking, et.al (1982) |
| | Riparian Systems | Brinson, et.al. (1981) |
| | Marshes | Weller (1986) |
| | >90% of land within 300 feet forested or with natural vegetation<br>50-90% of land within 300 feet forested or with natural vegetation<br><50% of land within 30 feet forested or with natural vegetation | Golet (1976) |
| | Total width = 600 feet | Brown, et.al. (1990) |
| | Total width = 100 feet (mountains) | Best professional judgement |
| | 10 acres in size | Brown and Dinsmore (1986)<br>Golet (1978) |
| **Aquatic Life** | Ephemeral wetlands:<br>≥2 feet of water<br>1-2 feet of water | Braswell (1992) |
| | Wetlands with standing water in at least 10% of surface area all year | Marble (1992) |
| | Hydrologically connected and within 300 feet of surface water | Best professional judgment |
| | 25% coverage by well interspersed patches of vegetation and water or diffuse, open strands of vegetation | Weller (1978)<br>Bradshaw (1991)<br>Marble (1992) |
| | 50% coverage by broad-leaved, deciduous vegetation | Best professional judgment |
| | Bottomland hardwood systems:<br>Total floodplain width<br>>200 feet | Best professional judgment |
| | Bog forests:<br>>1 foot of water, >9 inches and ≤ 1 foot of water; >6 inches and ≤ 9 inches of water; ≤ 6 inches of water | Best professional judgment |

APPENDIX II

# GLOSSARY

ability: The characteristics of a wetland that determine whether it can provide a particular value. Plant structure, hydrologic regime, and topographic position are examples of characteristics that relate to the ability of a wetland to provide value.

aquatic bed: Wetland habitats dominated by plants that grow principally on or below the surface of the water during most of the growing season in most years.

bog: Open wet areas underlain with *Sphagnum* moss in hummocks or in the form of a dome or blanket. Found in the western piedmont and mountains, these areas are usually no larger than one to five acres.

contiguous: A wetland that borders surface water. Refer to **Figure 1a** and **Figure 1b** for examples of contiguous and noncontiguous wetlands

emergent vegetation: Erect, rooted, herbaceous vegetation excluding mosses and lichens

ephemeral wetland: Small wetlands (usually) found within floodplains or in upland areas that are inundated during the winter to late spring or early spring and are often completely dry during the fall. These areas can be critical for amphibian reproduction.

forested: A wetland class characterized by woody vegetation that is 20 feet or taller.

gradient: The inclination or slope of the topography

gradual topography: A wetland is in an area of gradual topography if both the wetland and the associated stream (for riparian wetlands) are on a relatively flat gradient.

**APPENDIX II (continued)**

High Quality Waters (HQW): Waters which are rated as excellent based on biological and physical/chemical characteristics through division monitoring or special studies and accordingly classified by the Environmental Management Commission.

impervious surface: Surfaces where water infiltration is impeded by impermeable materials on top of the soil (e.g., concrete, asphalt, roof tops)

intermittently flooded: Flooded from an adjoining body of water or channel for at least ten consecutive days at least once every ten years, and dry for at least ten consecutive days every growing season.

interspersion: The degree of intermingling of different cover types, regardless of the number of types or their relative proportions. Vegetation interspersion with water refers to the degree of intermingling of different vegetation types with water.

irregularly flooded: Tidal water floods the land surface less often than daily.

landscape position: The location of a wetland in the watershed. Headwater streams, for example, are in the upper reaches of a watershed and are usually adjacent to first and second order streams. Bottomland systems are lower in the watershed and are usually adjacent to fairly major (third and fourth order) rivers.

linear depression: Linear depressions are topographic depressions within the landscape where there is predominantly groundwater flow and little to no evidence of surface flow.

marsh: Semi-permanently to permanently flooded wetlands that are dominated by herbaceous vegetation.

mast: The nuts of forest trees.

**APPENDIX II (continued)**

microtopographic relief: Depressional storage capacity of a wetland that refers to subtle changes (generally less than one foot) on the surface of a wetland.

non-persistent emergent vegetation: Emergent vegetation that falls to the surface of the substrate, or below the surface of the water at the end of the growing season, so that at certain seasons of the year there is no sign of emergent vegetation.

Nutrient Sensitive Waters (NSW): Waters subject to growths of microscopic or macroscopic vegetation and have limitations on nutrient inputs from point and non-point sources and accordingly classified by the Environmental Management Commission.

opportunity: The chance a wetland has to perform a function. For example, a wetland may have the physical attributes required to remove sediments, but unless the wetland is positioned in the watershed where it will receive sediment, it will not have the opportunity to perform this function.

order (stream): A system of ranking streams based on their tributaries. For example, a first order (located higher in the watershed) stream has no tributaries and is referred to as a "lower order" stream, and a second order (located lower in the watershed) stream begins where two first order tributaries come together. Usually major rivers are fourth and fifth order streams and are referred to as "higher order" streams. Refer to **Figure 2** for a diagrammatic representation of stream order.

Outstanding Resource Waters (ORW): Unique and special waters of exceptional state or national recreational or ecological significance which require special protection to maintain existing uses and are accordingly classified by the Environmental Management Commission.

permanently flooded: Surface water covers the land surface throughout the year in all years.

**APPENDIX II (continued)**

persistent emergent vegetation: Vegetation species that normally remain standing until the beginning of the next growing season.

pocosin: Wetlands with dense, nearly-impenetrable thickets of evergreen shrubs and vines. These areas are found on the coast plain in poorly-drained interstream divides or shallow depressions fed by precipitation.

primary nursery areas (PNA): Tidal saltwaters which provide essential habitat for the early development of commercially important fish and shellfish designated by the Marine Fisheries Commission

regularly flooded: Tidal water alternately floods and exposes the land surface at least once daily

riparian wetlands: Linear wetlands adjacent to streams and rivers

scrub-shrub: A wetland class usually dominated by woody vegetation less than 20 feet tall

seasonally flooded: Surface water persists throughout the growing season in most years

secondary nursery areas (SNA): Tidal saltwaters which provide essential habitat for the later developmental stages of commercially important fish and shellfish designated by the Marine Fisheries Commission

shellfishing waters (SA): Saltwaters suitable for commercial shellfishing and other tidal saltwater uses as classified by the Environmental Management Commission

snag: A standing, dead tree with a DBH of at least 10 inches

**APPENDIX II (continued)**

steep topography: A wetland is in an area of steep topography if the associated stream (riparian wetlands) is on a gradient

surface water: Water above the surface of the ground that is in channels, diffuse flow, or standing. Not necessarily permanent.

Temporarily flooded: Surface water is present during brief periods during the growing season, but the water table usually lies well below the soil surface for most of the season.

Toxicants: Any substance present in water, wastewater, or runoff that may kill aquatic life, or could be harmful to public health

travel corridor: An area that is used by wildlife to move from one place of suitable habitat to another.

trout waters (DWQ): Freshwaters protected for natural trout propagation and survival of stocked trout designated by the Environmental Management Commission.

trout waters (WRC): Wild trout waters (and their tributaries) designated by the Wildlife Resources Commission.

water supplies: Sources of water supply for drinking, culinary, or food-processing purposes as designated by the Environmental Management Commission.

wrack lines: Debris such as sticks and leaves that get washed into small piles or lines as a result of surface flow or scour.

**APPENDIX III**

**Rare Plant Species in North Carolina (Schafale and Weakley 1990; Sutter 1990)**

| Wetland Type | Species | Common name | NC Status | Federal Status |
|---|---|---|---|---|
| **Muck/Peat Swamp** | *Lilaeopsis carolinensis* | Carolina lilaeopsis | T | C3 |
| **First Terrace Bottomland Hardwood** | *Carex projecta* | necklace sedge | C | |
| | *Cirsium carolinianum* | Carolina thistle | C | |
| | *Phacelia ranunculacea* | buttercup phacelia | C | |
| **Second Terrace Bottomland Hardwood** | *Amorpha schwerini* | Schwerin's leadplant | C | |
| | *Carya laciniosa* | big shellbark hickory | C | |
| | *Ilex amelandhier* | sarvis holly | C | |
| | *Phacelia ranunculacea* | buttercup phacelia | C | |
| **Wet Flat** | *Hypericum adpressum* | Bog St. Johns-wort | C | |
| | *Lysimachia asperulaefolia* | rough-leaved loosestrife | E | E |
| | *Tofieldia glabra* | glabrous false asphodel | C | |
| **High Pocosin** | *Amphicarpum purshii* | Pursh's goober grass | C | |
| | *Calamovilfa brevipilis* | pine barrens sandreed | E | |
| | *Kalmia cuneata* | white wicky | E | C2 |
| | *Lysimachia asperulaefolia* | rough-leaf loosestrife | E | E |
| **Low Pocosin** | *Kalmia cuneata* | white wicky | E | C2 |
| | *Lysimachia asperulaefolia* | rough-leaved loosestrife | E | E |
| | *Rhynchospora alba* | white beakrush | C | |

**APPENDIX III (continued)**

| Wetland Type | Species | Common name | NC Status | Federal Status |
|---|---|---|---|---|
| **Pine Savanna** | *Agalinis aphylla* | scale-leaf gerardia | C | |
| | *Agalinis vergata* | virgate gerardia | C | |
| | *Amorpha georgina var. confusa* | savanna indigo-bush | C | C2 |
| | *Amphicarpum purshii* | Pursh's goober grass | C | |
| | *Andropogon mohrii* | bog bluestem | C | |
| | *Aristida palustris* | longleaf three-awn | C | |
| | *Asclepias pedicellata* | stalked milkweed | C | |
| | *Balduina atropurpurea* | honeycomb head | C | |
| | *Calamovilfa brevipilis* | pine barrens sandreed | E | C2 |
| | *Helenium brevifolium* | littleleaf sneezeweed | C | |
| | *Hypericum adpressum* | bog St. John's-wort | C | |
| | *Hypoxis sessilis* | sessile-flowered yellow stargrass | C | |
| | *Lophiola aurea* | golden-crest | C | |
| | *Lysimachia asperulaefolia* | rough-leaf loosestrife | E | E |
| | *Macbridea caroliniana* | Carolina bogmint | C | C2 |
| | *Oxypolis ternate* | savanna cowbane | C | C2 |
| | *Parnassia caroliniana* | Carolina grass-of-parnassus | E | C2 |
| | *Pinguicula pumila* | small butterwort | C | |
| | *Plantago sparsiflora* | pineland plantain | E | |
| | *Plantanthera integra* | Yellow fringeless orchid | T | |
| | *Polygala hookeri* | Hooker's milkwort | C | |

**APPENDIX III (continued)**

| Wetland Type | Species | Common name | NC Status | Federal Status |
|---|---|---|---|---|
| **Pine savanna (continued)** | *Rhexia aristosa* | awned meadow-beauty | T | C2 |
| | *Rhynchospora oligantha* | few-flowered beakrush | C | |
| | *Rhynchospora pallida* | pale beakrush | C | |
| | *Rhynchospora stenophylla* | littleleaf beakrush | C | |
| | *Schwalbea americana* | Chaffseed | E | E |
| | *Scleria georgiana* | Georgia nutrush | C | |
| | *Scleria verticillata* | savanna nutrush | C | |
| | *Solidago pulchra* | savanna goldenrod | E | C2 |
| | *Solidago verna* | spring-flowering goldenrod | E | C2 |
| | *Spiranthes longilabris* | long-lip ladies' tresses | C | |
| | *Sporobolus teretifolius* | wireleaf dropseed | T | C2 |
| | *Thalictrum cooleyi* | Cooley's meadowrue | E | E |
| | *Tofieldia glabra* | glabrous false asphodel | C | |
| | *Trillium pusillum* | Carolina least trillium | E | C2 |
| | *Xyris flabelliformis* | savanna yellow-eyed grass | C | |
| **Perched Forest** | *Trillium pusillum* | Carolina least trillium | E | C2 |
| **Freshwater Marsh** | *Aeschynomene virginica* | sensitive joint vetch | E | T |
| | *Cyperus dentatus* | tooth-leaf flatsedge | C | |
| | *Lilaeopsis carolinensis* | Carolina lilaeopsis | T | C2 |
| | *Limosella australis* | awl-leaf mudwort | C | |
| | *Ranunculus hederaceus* | ivy buttercup | C | |

**APPENDIX III (continued)**

| Wetland Type | Species | Common name | NC Status | Federal Status |
|---|---|---|---|---|
| **Lake/Pond/Sound Shoreline** | *Myriophyllum laxum* | loose watermilfoil | T | C2 |
| | *Myriophyllum tenellum* | leafless watermilfoil | C | |
| | *Utricularia olivacea* | dwarf bladderwort | T | |
| **Brackish Marsh** | *Cyperus dentatus* | toothed-leaf flatsedge | C | |
| | *Eleocharis halophila* | salt spikerush | T | |
| **Mountain Bog** | *Arethusa bulbosa* | bog rose | E | |
| | *Botrychium oneidense* | blunt-lobed grapefern | C | |
| | *Carex barrattii* | Barratt's sedge | E | |
| | *Carex buxbaumii* | Buxbaum's sedge | C | |
| | *Carex collinsii* | Collins's sedge | C | |
| | *Carex oligosperma* | few-seeded sedge | C | |
| | *Carex projecta* | necklace sedge | C | |
| | *Carex schweinitzii* | Schweinitz's sedge | E | C2 |
| | *Chelone cuthbertii* | Cuthbert's turtlehead | C | |
| | *Cladium mariscoides* | twig rush | C | |
| | *Epilobium leptophyllum* | narrowleaf willowherb | C | |
| | *Filipendula rubra* | queen-of-the-prairie | C | |
| | *Geum aleppicum* | yellow avens | C | |
| | *Helenium brevifolium* | littleleaf sneezeweed | C | |
| | *Helonias bullata* | Swamp pink | T | T |
| | *Hierochloe odorata* | holy grass | C | |
| | *Ilex collina* | long-stalked holly | T | |
| | *Juncus gymnocarpus* | naked-fruited rush | C | |

**APPENDIX III (continued)**

| Wetland Type | Species | Common name | NC Status | Federal Status |
|---|---|---|---|---|
| **Mountain Bog (continued)** | *Lilium grayi* | Gray's lily | T | C2 |
| | *Marshallia grandiflora* | large-flowered Barbara's buttons | C | C2 |
| | *Menyanthes trifoliate* | buckbean | T | |
| | *Myrica gale* | sweet gale | C | |
| | *Narthecium americanum* | bog asphodel | E | C1 |
| | *Platanthera integrilabia* | white fringeless orchid | E | C2 |
| | *Platanthera peramoena* | Purple fringeless orchid | C | |
| | *Poa paludigena* | bog bluegrass | C | C2 |
| | *Rhynchospora alba* | white beakrush | C | |
| | *Sagittaria fasciculate* | bunched arrowhead | E | E |
| | *Sarracenia jonesii* | mountain sweet pitcher plant | E | E |
| | *Sarracenia oreophila* | green pitcher plant | E | E |
| | *Saxifraga pennsylvanica* | swamp saxifrage | C | |
| | *Schlotheimia lancifolia* | highlands moss | T | |
| | *Thelypteris simulata* | bog fern | T | |
| | *Tofieldia glutinosa* | Sticky bog asphodel | C | |
| | *Utricularia minor* | lesser bladderwort | C | |
| **Mountain Fen** | *Carex buxbaumii* | Buxbaum's sedge | C | |
| | *Carex conoidea* | cone-shaped sedge | T | |
| | *Carex oligosperma* | few-seeded sedge | C | |
| | *Cladium mariscoides* | twig-rush | C | |
| | *Lilium grayi* | Gray's lily | T | C2 |

**APPENDIX III (continued)**

| Wetland Type | Species | Common name | NC Status | Federal Status |
|---|---|---|---|---|
| **Mountain Fen (continued)** | *Muhlenbergia glomerata* | bristly muhly | C | |
| | *Parnassia grandiflora* | large-leaved grass-of-parnassus | C | |
| | *Rhynchosphora alba* | white beakrush | C | |
| | *Tofieldia glutinosa* | Sticky bog asphodel | C | |

**APPENDIX III (continued)**

## North Carolina Status Codes:

Endangered (E): The most critically imperiled species, those that may become extinct or disappear from a significant part of their range if they are not immediately protected.

Threatened (T): The next most critical level of imperiled species, those that may become endangered in or disappear from the state if they are not protected.

Candidate (C): Species that are under review for listing as endangered or threatened because of few populations, small populations, or occurrence in a rare and threatened habitat.

## Federal Status Codes

Endangered (E): Any species that is in danger of extinction throughout all or a significant portion of its range.

Threatened (T): Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range

C1: Candidate species presently under review for federal listing for which adequate information exists on biological vulnerability and threat(s) to list the taxa as "endangered" or "threatened."

C2: Candidate species presently under review for federal listing for which information indicates that listing as "endangered" or "threatened" is possibly appropriate, but for which adequate data on biological vulnerability and threat(s) are not currently known or on file to support proposed rules.

**APPENDIX IV**

## WETLAND RATING WORKSHEET

A worksheet for recording field data and scores is presented on the following page.

# WETLAND RATING WORKSHEET Fourth Version

Project Name _____ Nearest Road _____

County _____ Wetland area _____acres Wetland width _____feet

Name of evaluator _____ Date _____

**Wetland location**
___ on pond or lake
___ on perennial stream
___ on intermittent stream
___ within interstream divide
___ other: _____

**Adjacent land use**
(within ½ mile upstream, upslope, or radius)
___ forested/natural vegetation ____%
___ agriculture, urban/suburban ____%
___ impervious surface ____%

**Soil series:** _____
___ predominantly organic - humus, muck, or peat
___ predominantly mineral - non-sandy
___ predominantly sandy

**Dominant vegetation**
(1) _____
(2) _____
(3) _____

**Hydraulic factors**
___ steep topography
___ ditched or channelized
___ total wetland width ≥ 100 feet

**Flooding and wetness**
___ semipermanently to permanently flooded or inundated
___ seasonally flooded or inundated
___ intermittently flooded or temporary surface water
___ no evidence of flooding or surface water

**Wetland type (select one)***

___ Bottomland hardwood forest
___ Headwater forest
___ Swamp forest
___ Wet flat
___ Pocosin
___ Bog forest
___ Pine savanna
___ Freshwater marsh
___ Bog/fen
___ Ephemeral wetland
___ Carolina bay
___ Other: _____

* The rating system cannot be applied to salt or brackish marshes or stream channels

| | | | |
|---|---|---|---|
| ***R*** | Water storage | _____ x 4.00 = | |
| ***A*** | Bank/Shoreline stabilization | _____ x 4.00 = | |
| ***T*** | Pollutant removal | _____ ** x 5.00 = | |
| ***I*** | Wildlife habitat | _____ x 2.00 = | |
| ***N*** | Aquatic life value | _____ x 4.00 = | |
| ***G*** | Recreation/Education | _____ x 1.00 = | |

**Wetland rating**

** Add 1 point if in sensitive watershed and >10% nonpoint source disturbance within ½ mile upstream, upslope, or radius