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APPLICATION OF THE SYNOPTIC APPROACH TO WETLAND DESIGNATION: A CASE STUDY IN LOUISIANA

APPLICATION OF THE SYNOPTIC APPROACH TO WETLAND DESIGNATION:

A CASE STUDY IN LOUISIANA

FINAL REPORT

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ERRATA

(1) Page 36 (Figure I.10) - In the key under "Annual Rate" the equation for human population growth is listed as follows:

$$([Pop80 - Pop70]/Pop70/10)$$

As written, this equation implies that (Pop80 - Pop70) is divided by Pop70 <u>and</u> by the inverse of 10; in other words, this implies that (Pop80 - Pop70)/Pop70 is <u>multiplied</u> by 10. Since the quotient (Pop80 - Pop70)/Pop70 should be divided by 10, the proper formulation of the equation is:

$$\frac{\left[\frac{Pop\ 80 - Pop\ 70}{Pop\ 70}\right]}{10}$$

The actual calculations were done correctly, using the proper equations. The error was in how the equations were represented.

(2) Page 37 (Figure I.11) - In the key under "Annual Rate" the equation for agricultural growth is listed as follows:

$$([Agr82 - Agr74]/Agr74/8)$$

This equation should be represented by the following:

$$\frac{\left[\frac{Agr\ 82 - Agr\ 74}{Agr\ 74}\right]}{8}$$

DISCLAIMER

The research described in this report has been funded wholly or in part by the United States Environmental Protection Agency (EPA) under Contract #68-C8-0006 to NSI Technology Services Corporation. It has been subjected to the Agency's peer and administrative review, and it has been approved for publication as an EPA document. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

ABSTRACT

The synoptic approach is a rapid assessment method designed to provide a context for evaluating landscape sensitivity to cumulative wetland loss and to complement the site specific information used in reviewing permit applications to alter wetlands. The objectives of this study were to: 1. test the utility of the synoptic approach in prioritizing wetland "functional uses" for the development of wetland water quality standards; 2. comparatively rank watersheds based on their wetland functional attributes and sensitivity to change; and 3. implement the transfer of the research products to state wetland managers. Readily available data were compiled for the State of Louisiana into a set of map overlays. The overlays were synthesized to produce indices of landscape input and wetland capacity for hydrologic, water quality and life support functions, cumulative impacts and future wetland losses for watersheds within the State. The synoptic approach identifies wetland functions not included in Louisiana's designated uses of surface waters. The approach may be more appropriate for a state with a more generalized set of water quality standards than Louisiana's, since synoptic results are not specific. The products of statewide assessments may be useful in regional planning and in the development of state wetland conservation plans.

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ACKNOWLEDGEMENTS

This report was submitted in fulfillment of contract #68-C8-0006 by NSI Technology Services Corporation under the sponsorship of the U.S. Environmental Protection Agency. This report covers a period from March, 1989 to July 1990; work was completed July, 1990. We wish to thank Dr. Eric M. Preston for his support as Wetlands Team Leader. We acknowledge the cooperation of staff members of the state agencies who provided data and review of the pilot study. Lori Jensen, Robert Hipple, Daren Moore and Donna Frostholm assisted in the collection of data. Jeff Irish designed and produced the maps. Kristina Heike edited the final document. Finally, we wish to thank Dr. Fred Weinman, Dr. Joan Browder, Dr. K. Koski, Ann Hairston and Lisa Ellingson for their helpful suggestions and comments in reviewing this document.

INTRODUCTION

Wetland protection under Section 404 of the Clean Water Act has typically taken a traditional approach to impact assessment. Under this approach, a permit for placement of dredged or fill material is issued if determined that significant degradation will not occur to waters of the United States. When considered together, however, the aggregate impact of individually permitted activities could cause significant degradation and damage to the environment.

The quantification of these impacts, pursuant to the Clean Water Act, has been hampered by a lack in availability of a standardized approach to cumulative impact assessment. The goal of cumulative impact assessment is to evaluate the cumulative effects of these individual impacts occurring over the entire landscape and through time (Bedford and Preston 1988, Gosselink and Lee 1989).

Compliance with the National Environmental Policy Act requires cumulative impacts to be considered. The Wetlands Research Program (WRP) of the U.S. Environmental Protection Agency (EPA) has ongoing research to examine the environmental effects of cumulative wetland loss. As part of this effort, a method is being developed that assembles generally available data into a scientific framework that ranks watersheds according to the relative importance of wetland function and wetland loss. This method provides a landscape perspective and is referred to as the synoptic approach (Abbruzzese et al. 1990). The approach is being developed as a rapid and inexpensive assessment technique for use in routine 404 permit requests.

To further development of the synoptic approach, WRP sought opportunities to conduct statewide pilot applications. Coincident with this, the Office of Wetlands Protection (OWP) expressed interest in determining whether the synoptic approach could be used in the development of state wetland water quality standards. The federal Clean Water Act grants to the states broad authority for developing standards that protect their water resources. By extending these water quality standards to include wetlands, the states can exert direct control over projects in or affecting wetlands (U.S. EPA 1989). This application of state standards requires that specific classes of wetland be assigned appropriate "designated uses".

A synoptic case study could offer insight on how a landscape perspective may influence the assignment of designated uses to wetlands. OWP selected Louisiana for this pilot study because of the State's high percentage of wetlands, relatively high wetland loss rates and concurrent EPA funded research in the State. Also, EPA presumed that data generated by the study could be used to help design new regulatory strategies for protecting the State's remaining wetlands. A similar case study is being conducted in the State of Washington.

The study described in this document was conducted to determine whether the synoptic approach could be used in the development of state water quality standards. Development of the synoptic approach is not complete; an explicit goal of this pilot project was to improve the method. The results of the synoptic analysis are not meant to be final or conclusive, and should only be taken to illustrate the utility of this method in developing state water quality standards. Thus, use of the data or maps presented in this document is not endorsed for other purposes.

OBJECTIVES

The primary objective of this research was to test the utility of the synoptic approach in prioritizing wetland "functional uses" at the watershed scale. The second objective was to demonstrate and improve this method's ability to identify wetland resources that are ecologically important or sensitive to change. A third objective was to interactively implement the transfer of the research products to state wetland managers. The specific approach was to:

1. Evaluate and comparatively rank wetland landscapes (i.e., watersheds) based on their functional attributes and sensitivity to change;

2. Identify potential wetland functions and values from maps depicting the ranked wetland landscapes;

3. Compare the potential wetland functions and values with existing adjacent or contiguous surface water use designations;

4. Identify ecologically important wetlands or those sensitive to change based on the comparative rankings; and

5. Transfer to appropriate EPA Regional and State natural resource management staff the ongoing status and technical results of the pilot project.

OVERVIEW OF THE SYNOPTIC APPROACH

The synoptic approach is a rapid, inexpensive method for assessing the cumulative effects of wetland loss on landscape function. The method was designed for use in routine wetland evaluation and management work. It should serve to complement existing management practices, including the assessment of local value and function, by providing an anticipatory approach to wetland protection.

The approach can be applied to a variety of geographic scales and regulatory issues, including: 1. the identification of priority areas for research and wetland protection at the national scale; 2. providing a context for wetland permitting and advance wetland planning at the regional or state scale; and 3. identification of sites where wetland restoration and creation efforts could be beneficial at the watershed scale.

The approach uses generally available maps and data to derive relative rankings of watersheds within a study area using indices of the ecological function wetlands perform (Preston and Bedford 1988; Leibowitz and Preston, pers. comm.). The functions are grouped into three general categories, including: 1. hydrology--the ability of wetlands to attenuate peak hydrologic flow, desynchronize floods, and stabilize shorelines; 2. water quality--the capability of wetlands to retain, remove, or detoxify pollutants; and 3. life support--the ability of wetland to supply the required habitat and food chain support of wetland dependent biota.

The assessment indices were developed as part of a conceptual landscape model (Leibowitz and Preston, pers. comm.). They provide relative measures of the functions wetlands contribute to the landscape, the risk of loss of landscape function from wetland loss or alteration, and the social significance of such loss.

The first four indices (primary indices) are based on data we have collected and interpreted. Three additional derived indices (secondary indices) are based on the primary indices and are addressed in a subsequent section of this report. The primary indices are:

1. Landscape Input--materials produced by the landscape which can potentially be processed or supported by wetlands; thus, an index of the opportunity for wetlands to contribute to landscape function within a cumulative impact area (watershed).

2. Wetland Capacity--the potential ability of wetlands to promote landscape function through processing or support of landscape inputs.

3. Cumulative Impacts--wetland losses that have occurred historically.

4. Future Loss--wetland impacts that are likely to occur in the future.

Since data are not generally available to summarize the relationships characterized by these indices, surrogate measures of the indices were chosen. For example, to calculate landscape input for hydology (i.e., hydrologic input), measures of watershed area, precipitation, runoff potential, slope and channel length were used. The following approach summarizes how the relative rankings of watersheds were produced: 1. selection of the appropriate surrogate measure for each index (Table 1 pg.10); 2. collection of mapped and tabular data; 3. analysis of the data to derive primary data layers; and 4. combination of the data layers to produce the index values.

ANALYSIS OF LOUISIANA DATA

DATA COLLECTION

One hundred twenty two watersheds were delimited using Louisiana Department of Environmental Quality's (DEQ) "water quality management units" (Figure 1) (Louisiana DEQ 1988b). Several watersheds that were dominated by greater than 90% water, such as Lake Ponchartrain and Barataria Bay, were omitted.

Data for calculating the four primary indices for each watershed were collected from a variety of federal and State agencies, including the U.S. Geological Survey, U.S. Bureau of the Census, DEQ, the Louisiana Department of Wildlife and Fisheries and Louisiana State University. In addition, existing State surface water use designations were mapped for comparison with synoptic watershed rankings.

Other State agencies were contacted for potential sources of information, including the Department of Natural Resources, Department of Culture, Recreation and Tourism and the State Planning Office. The quality assurance of the data was assessed in terms of its: 1. level of general availability (nationwide) and comparability with data sets for other states; 2. scale of resolution; 3. the degree of replication of techniques employed in obtaining the data. A 5% quality control check was performed on areal, linear and elevation measurements taken from maps and data recorded from other sources. An error level less than 5% was the target. A person, other than the original data collector, replicated every twentieth measurement to check for accuracy. The result of the check was that the 5% accuracy criterion was always met.

MAP DEVELOPMENT

To produce a map for a particular index, it was first necessary to produce maps of the index components (Appendix I). Following is a brief description of the components and data sources for these maps (maps were produced using the ARC/INFO Geographic Information System):

Water Management Unit Index

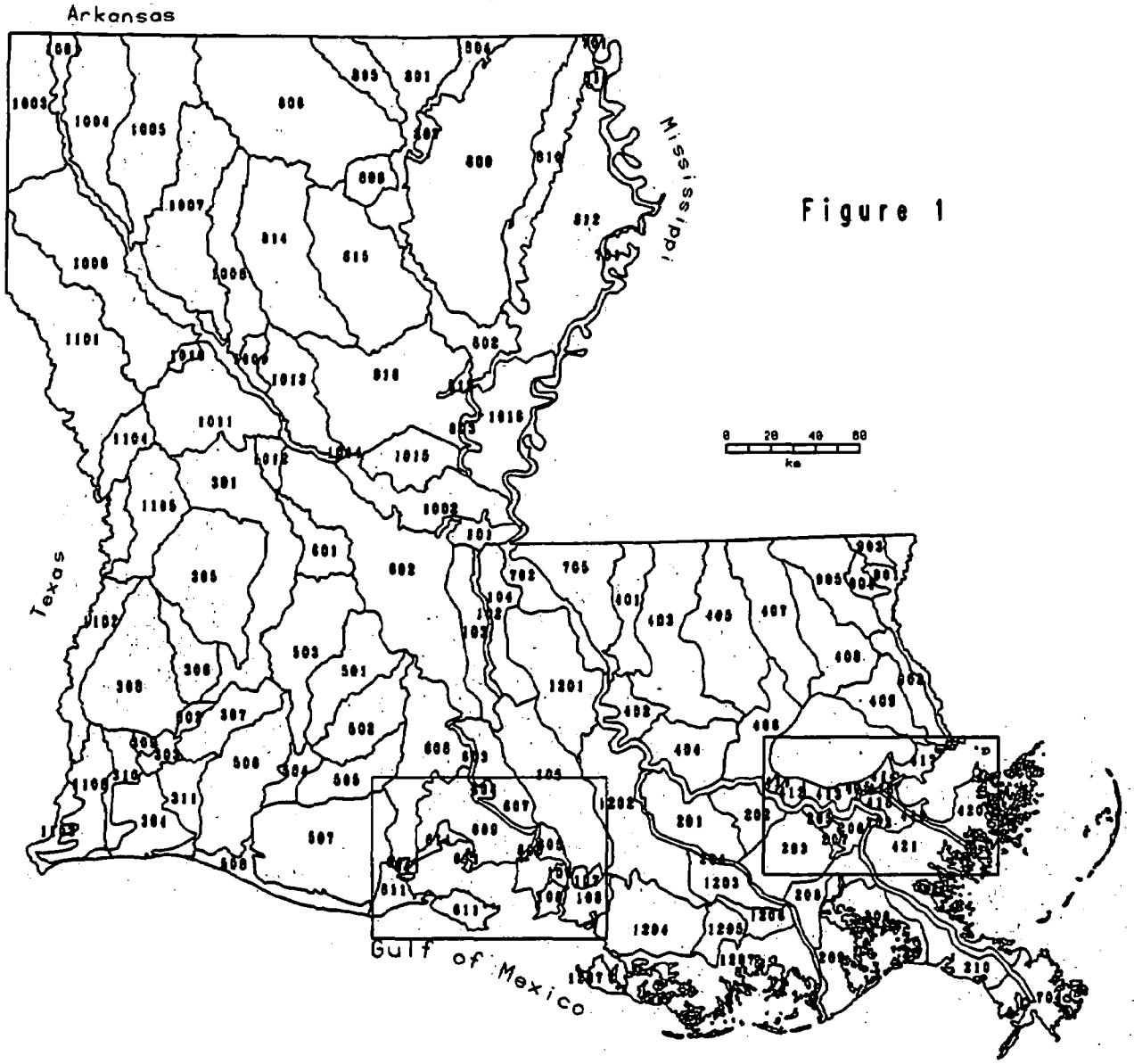
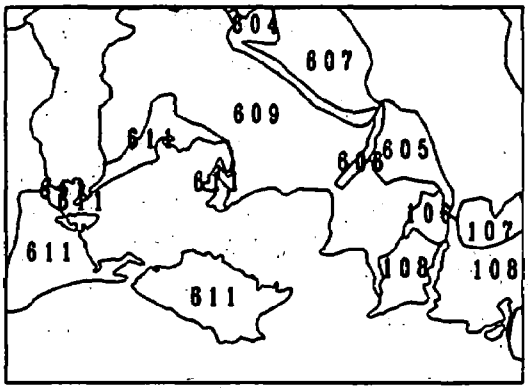
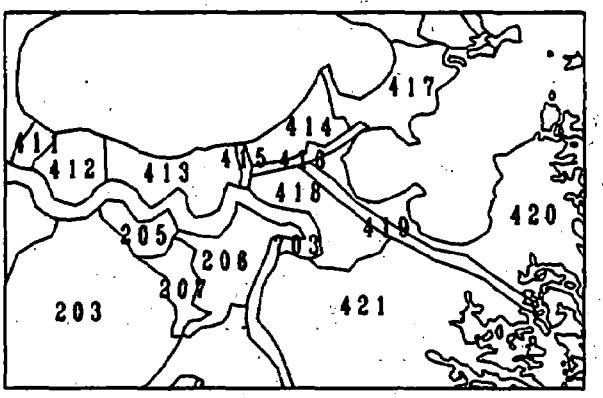


Figure 1





Hydrologic Input

The estimate of hydrologic input (peak discharge) has both a spatial and temporal dimension; it is calculated as the product of precipitation, watershed area, runoff potential, and stream channel slope divided by channel length (Figure 2).

Mean annual precipitation contours (Lee 1985) were digitized and then pro-rated to watershed units. An estimate of the volume of water entering the system is obtained by multiplying precipitation by drainage area for each watershed.

Runoff potential is derived from a modification of the Soil Conservation Service's (SCS) curve number (Rawls et al. 1981; SCS 1986). The percent runoff for a drainage unit is calculated as the weighted average of the runoff value for each pairwise combination of hydrologic soil group (Lytle and Sturgis 1962) and land use (Louisiana DEQ 1988b). Runoff values for these combinations (Table 2) were adapted from Rawls et al. (1981); the joint percentage of the soil and land use areas is used as weights. Thus runoff is given by:

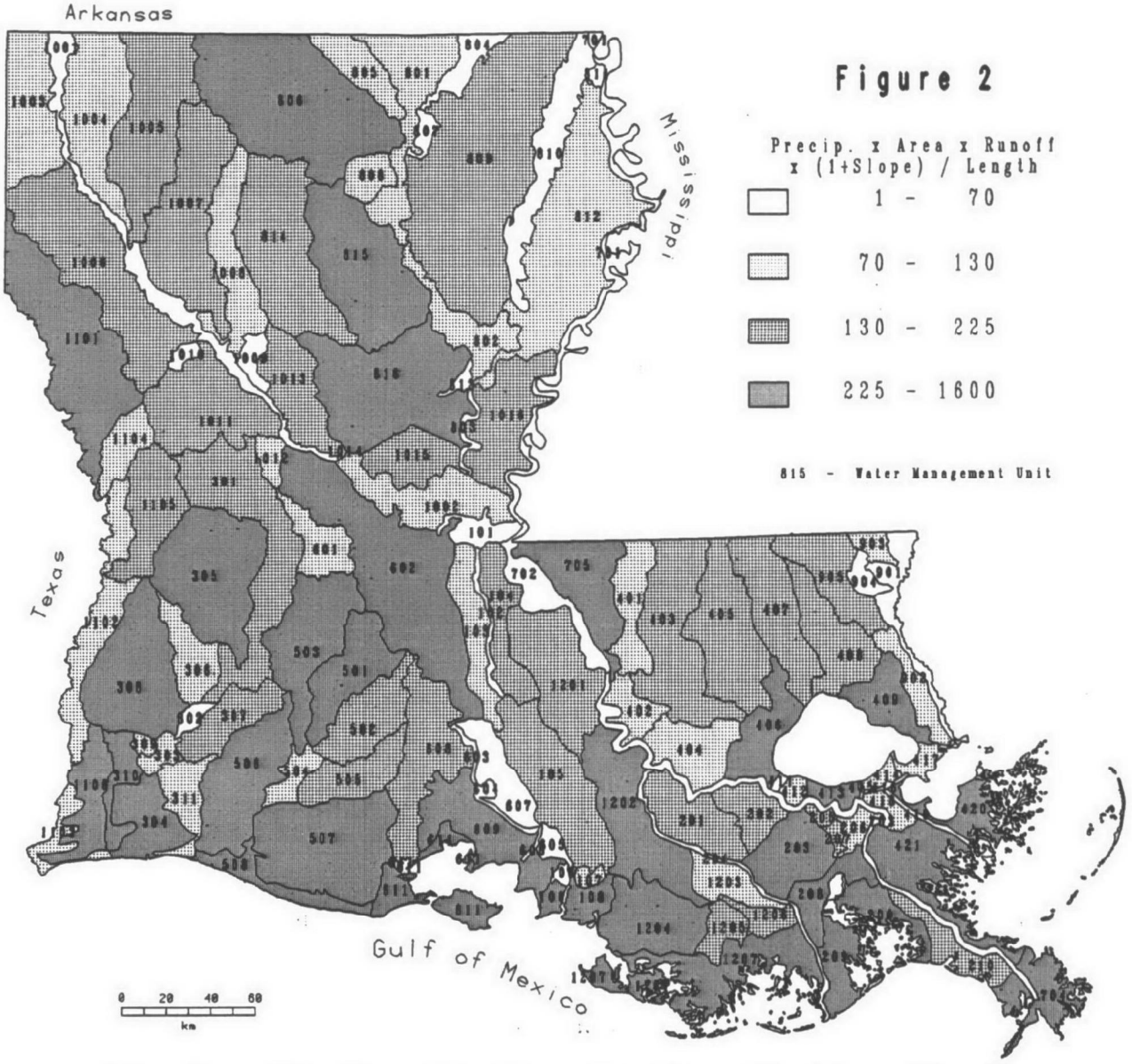
$$\text{Runoff}_{total} = \sum_i \sum_j \text{Runoff}_{i,j} \times \text{Weight}_{i,j}$$

$$= \sum_i \sum_j \text{Runoff}_{i,j} \times \text{Area}_i/\text{Area}_{total} \times \text{Area}_j/\text{Area}_{total}$$

where i is an index for the four soil groups and j is an index for the six land uses. As an example, assume a drainage unit with half of all soils belonging to group A and the other half to group C, and with agriculture representing 25% of total land use and the remaining 75% in forest. Using Table 2 to obtain the pairwise runoff values, percent runoff for that unit would then be (63 × [0.5 × 0.25]) + (43 × [0.5 × 0.75]) + (77 × [0.5 × 0.25]) + (75 × [0.5 × 0.75]) = 61.75.

The temporal component of hydrologic input was derived by dividing the product of precipitation, area, runoff and channel slope by channel length (peak discharge for a given event increases with slope and shorter channel length). Slope was calculated by subtracting the elevation at 10% of the channel length from elevation at 85% of the channel length, then dividing the difference by 75% of the total channel length (Lee 1985). Length of the main channel was measured using an electronic planimeter.

HYDROLOGIC INPUT



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307 - 172	308 - 276	309 - 72	310 - 264	311 - 124	401 - 112
402 - 107	403 - 212	404 - 93	405 - 218	406 - 564	407 - 169
408 - 176	409 - 229	411 - 56	412 - 126	413 - 312	414 - 74
415 - 9	416 - 10	417 - 128	418 - 106	419 - 11	420 - 626
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506 - 268	507 - 407	508 - 708	601 - 122	602 - 242	603 - 1
604 - 7	605 - 62	606 - 10	607 - 55	608 - 148	609 - 503
611 - 1596	701 - 25	702 - 66	703 - 15	704 - 422	705 - 287
801 - 83	802 - 74	803 - 13	804 - 1	805 - 84	806 - 274
807 - 25	808 - 105	809 - 141	810 - 25	811 - 13	812 - 71
813 - 43	814 - 201	815 - 276	816 - 460	901 - 67	902 - 95
903 - 84	904 - 60	905 - 145	1001 - 26	1002 - 89	1003 - 129
1004 - 113	1005 - 185	1006 - 223	1007 - 176	1008 - 105	1009 - 61
1010 - 60	1011 - 198	1012 - 108	1013 - 131	1014 - 80	1015 - 187
1016 - 189	1101 - 280	1102 - 111	1103 - 95	1104 - 114	1105 - 155
1106 - 226	1201 - 171	1202 - 400	1203 - 116	1204 - 310	1205 - 175
1206 - 136	1207 - 1310				

[Water Management Unit - Value]

Prepared by USEPA Wetlands Research Program, USEPA Environmental Research Lab, Corvallis, Oregon

Table 1. Summary of measures used to estimate landscape indices.

Landscape Index	Function	Measure
Landscape Input	Hydrologic	$\frac{\text{Precipitation x area x runoff x slope}}{\text{Length}}$
	Water quality	"Partially supporting" and "nonsupporting" stream length
	Life support	Number of rare, threatened and endangered wetland dependent species
Wetland Capacity	All	Wetland area
Cumulative Impacts	All	Percent difference in area of hydric soils and wetland area
Future Loss	All	Weighted average of annual agricultural and population growth

Table 2. Curve number (percent runoff) for pairwise combinations of hydrologic soil groups and land uses (adapted from Rawls et al. 1981).

	Hydrologic Soil Group			
Land Use	A	B	C	D
Agricultural Land	63	69	77	82
Forest Land	43	64	75	81
Miscellaneous/ Barren Land	68	78	84	86
Urban or Built-up Land	55	71	83	88
Water	100	100	100	100
Wetland	45	66	77	83

It should be emphasized here that this method provides an estimate. The units of measurement were arbitrarily chosen. Also, since we do not currently have a method for calculating water retention by upstream wetlands, the estimate does not include the import of water from upstream units.

Water Quality Input

Water quality input (Figure 3), or the degree of point and nonpoint source pollution, was estimated from State water quality data, since data on pollutant loading rates are not readily available. Input was calculated as the length of streams inventoried that were listed as "partially supporting" or "nonsupporting" of State and federal designated uses (such as "public water supply" or "fish and wildlife propagation") in the State's 305B Report (La. DEQ 1988a). Miles of polluted streams is the surrogate used; however we do not know what proportion of all streams this represents, since the intensity of stream sampling is not known.

Life Support Input

We used the number of rare, threatened or endangered wetland dependent species present (Appendix II) as a surrogate for life support input (Figure 4). This is based on the assumption that these species represent the portion of biota using wetlands that are most sensitive to habitat destruction. Since these data are reported by parish (Louisiana Department of Wildlife and Fisheries 1988), the parish data were prorated to the watershed units using the weighting factors in Appendix III.

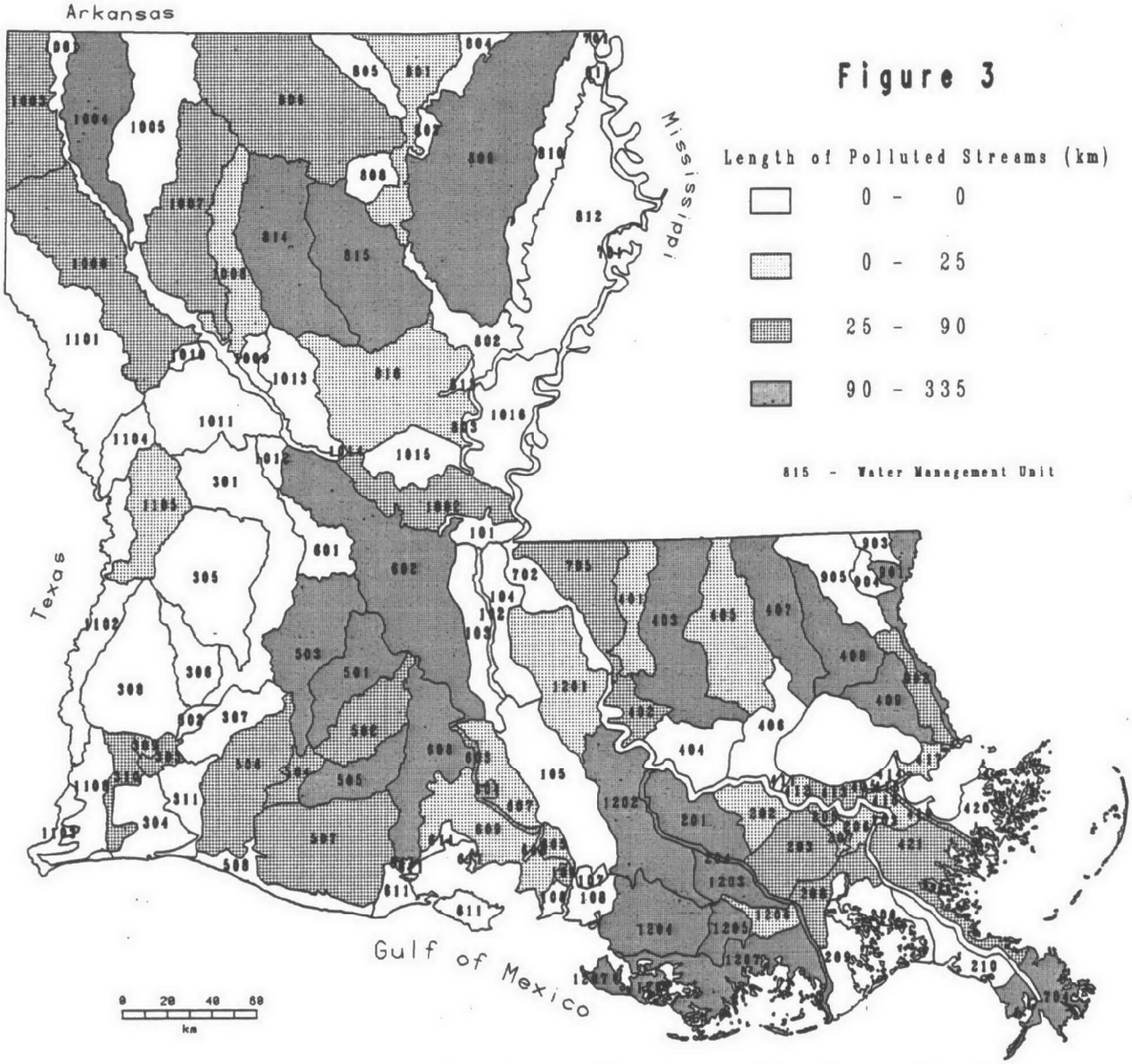
Wetland Capacity

Wetland capacity (Figure 5) is a measure of the ability of wetlands to attenuate peak hydrologic flow, process pollutants and provide habitat. These complex relationships are difficult to evaluate because of a lack of existing data; therefore, wetland area (La. DEQ 1988b) is used as a surrogate for wetland capacity.

Cumulative Impacts

Wetland impacts that have occurred in the past were estimated as the amount of original wetland area lost (Figure 6). Area of hydric soils was used as a surrogate for historic wetland area, using county soil surveys and the SCS hydric soils list (Hydric Soils Committee 1987). Current wetland area was obtained as described above. It should be noted that some areas, especially around lakes and estuaries, show a net wetland gain using this method. This is probably an error caused by inconsistencies in the classification of wetlands and open water in county soil surveys and the U.S. Geological Survey land use/land cover maps (the source of DEQ's land use/land cover data).

WATER QUALITY INPUT (NON-NORMALIZED)



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807 - 0	808 - 0	809 - 92	810 - 0	811 - 0	812 - 0
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1004 - 126	1005 - 0	1006 - 32	1007 - 80	1008 - 8	1009 - 0
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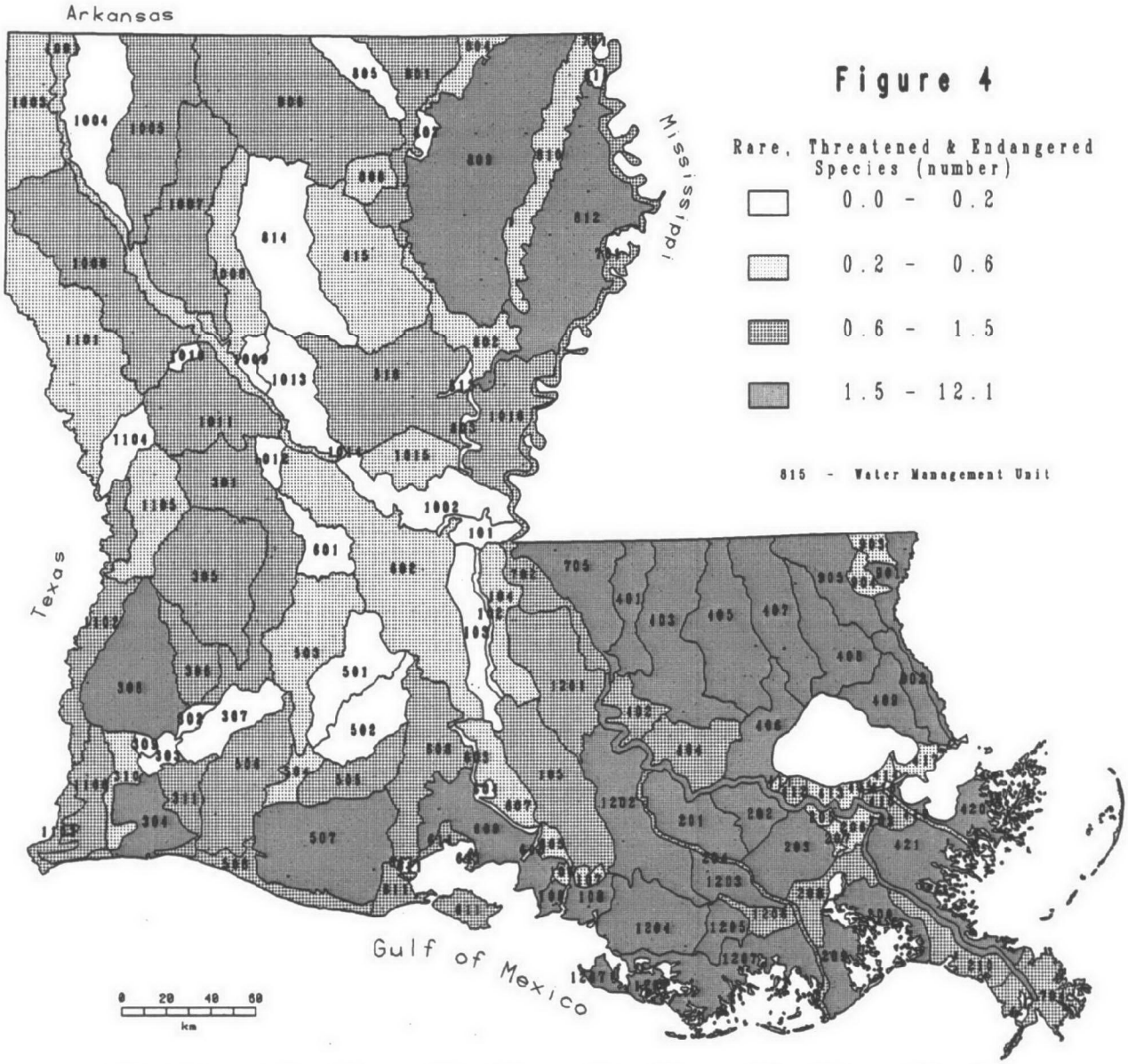
1016 - 0	1101 - 0	1102 - 0	1103 - 0	1104 - 0	1105 - 24
1106 - 0	1201 - 19	1202 - 183	1203 - 134	1204 - 95	1205 - 122
1206 - 19	1207 - 166				

[Water Management Unit - Value]

Prepared by USEPA Wetlands Research Program, USEPA Environmental Research Lab, Corvallis, Oregon

LIFE SUPPORT INPUT



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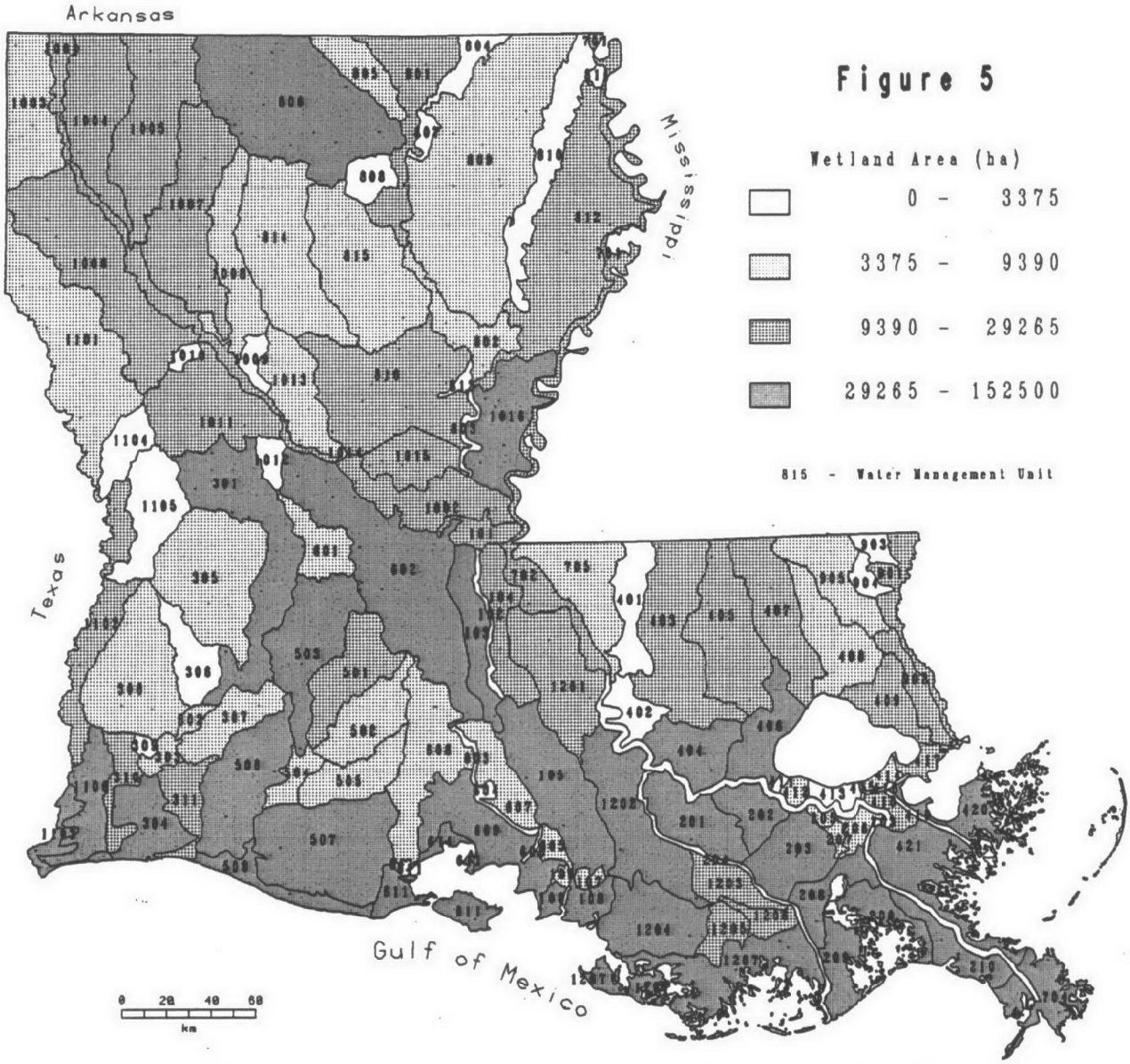
1016 - 0.7	1101 - 0.5	1102 - 0.9	1103 - 0.7	1104 - 0.0	1105 - 0.4
1106 - 1.0	1201 - 1.2	1202 - 4.7	1203 - 2.1	1204 - 10.2	1205 - 3.0
1206 - 1.3	1207 - 12.1				

[Water Management Unit - Value]

Prepared by USEPA Wetlands Research Program, USEPA Environmental Research Lab, Corvallis, Oregon

WETLAND CAPACITY



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[Water Management Unit - Value]

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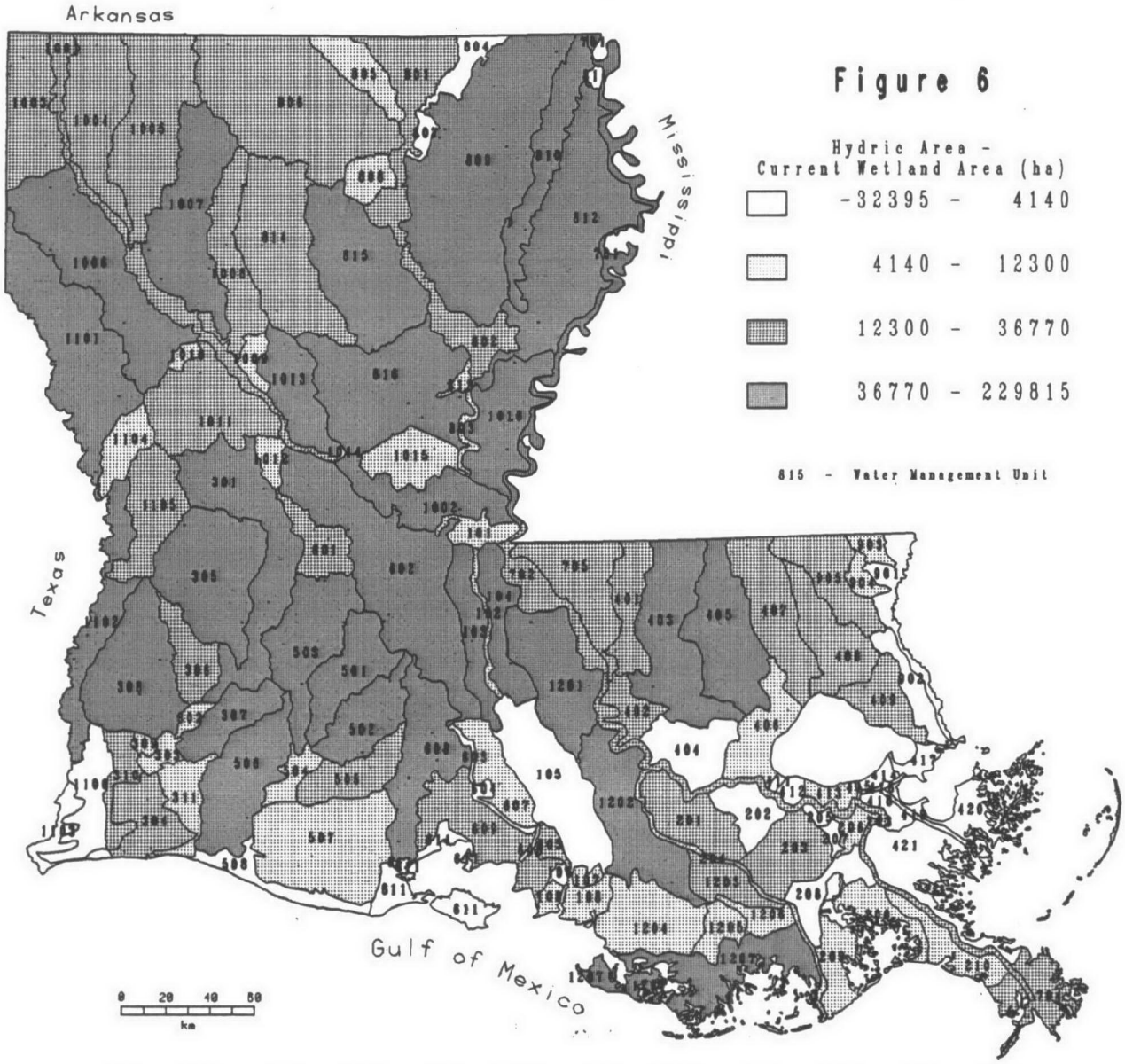
CUMULATIVE IMPACTS (NON-NORMALIZED)



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801 - 17960	802 - 32068	803 - 4318	804 - 221	805 - 6926	806 - 34768
807 - 3185	808 - 12247	809 - 122292	810 - 37209	811 - 715	812 - 136836
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1016 - 97929	1101 - 47619	1102 - 40365	1103 - -3067	1104 - 7216	1105 - 18343
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1206 - 5897	1207 - 77525				

[Water Management Unit - Value]

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Future Loss

Agricultural conversion and urban expansion have historically accounted for 85 and 10% of national wetland loss, respectively (Tiner 1984). Thus, risk of future wetland loss was based on recent trends in agricultural and population growth. We derived a risk factor by using a weighted average of the annual rate of agricultural growth between 1974 and 1982 (U.S. Bureau of the Census 1974, 1982a) and population growth between 1970 and 1980 (U.S. Bureau of the Census 1972, 1982b) (Appendix II). Parish data were prorated to watershed units as described under "life support input." The proportions of wetland loss reported by Tiner (1984) were used as weights. The risk factor was multiplied by current wetland area to derive future loss (Figure 7).

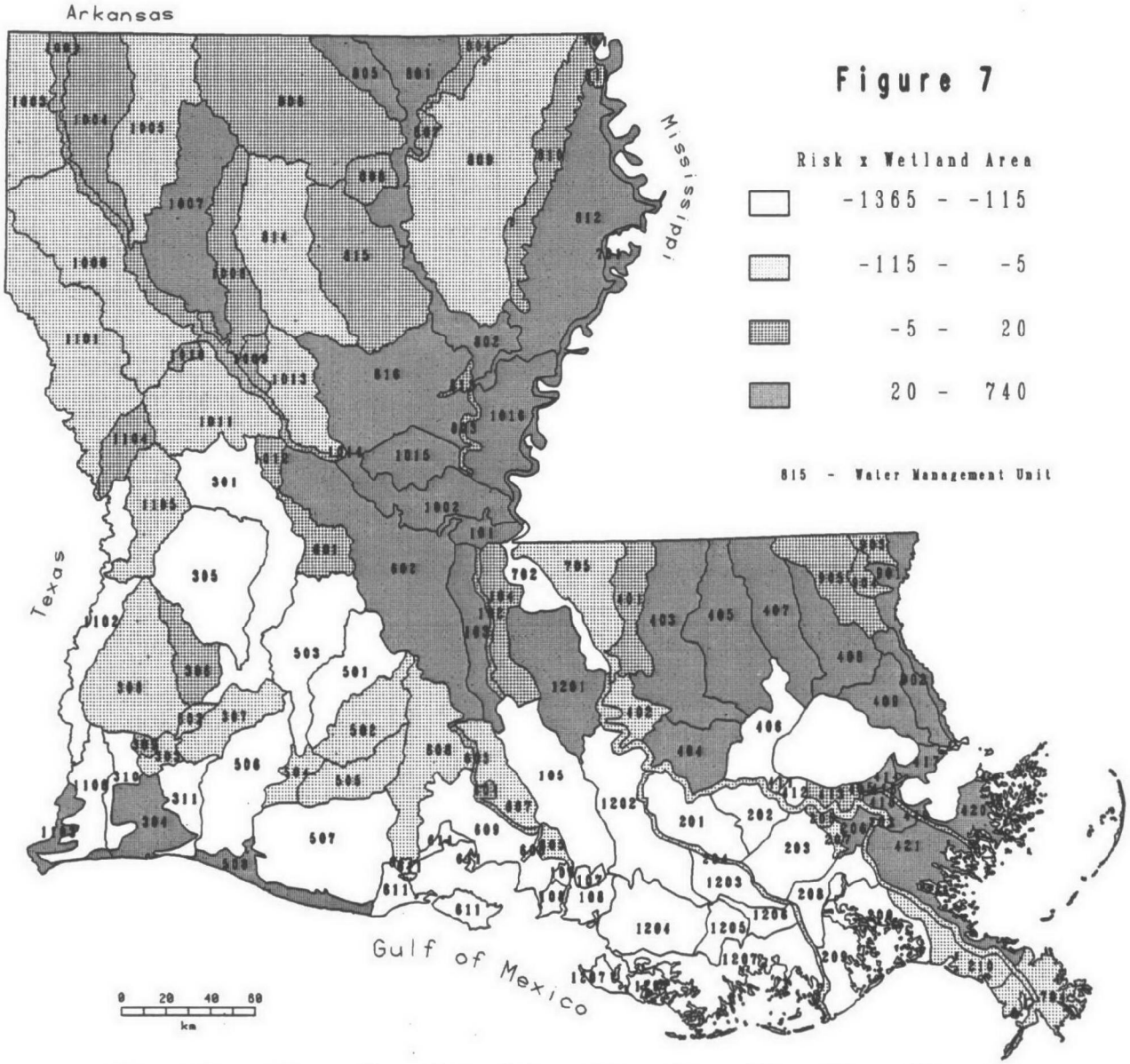
Designated Uses of Surface Waters

Five use categories were derived from State wetland water quality standards (Louisiana Office of State Register 1989): 1. fish and wildlife (includes recreation); 2. public water supply; 3. oyster propagation; 4. agriculture; and 5. outstanding natural resource waters . Surface waters assigned to the above uses were mapped (Figure 8) according to their water body code number (Louisiana DEQ 1988a).

TECHNICAL INFORMATION TRANSFER

Information transfer to EPA Region 6 and Louisiana resource agency staff was accomplished through technical seminars. Fundamental to this strategy was the participation of EPA and State technical staff in the preparation and review of map products and narrative reports. Three technical seminars were attended by EPA regional staff and representatives from Louisiana's DEQ and Department of Natural Resources. The objectives of these seminars were to: 1. introduce the synoptic approach (April 1989); 2. present preliminary results of the Louisiana analysis (October 1989); and 3. present final results (May 1990). As a result of discussions at the October 1989 meeting, some adjustments were made to the study design, in order to accommodate the interests of State resource agencies.

FUTURE LOSS



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307 - -42	308 - -40	309 - -4	310 - -194	311 - -128	401 - 3
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408 - 58	409 - 195	411 - -85	412 - -293	413 - 8	414 - UNDEFINED
415 - UNDEFINED	416 - 21	417 - 165	418 - 109	419 - 17	420 - 481
421 - 139	501 - -159	502 - -75	503 - -252	504 - -35	505 - -61
506 - -188	507 - -610	508 - 28	601 - -3	602 - 190	603 - 0
604 - 0	605 - -102	606 - -15	607 - -22	608 - -69	609 - -691
611 - -345	701 - 128	702 - -148	703 - -15	704 - -63	705 - -23
801 - 54	802 - 193	803 - 17	804 - 0	805 - 21	806 - 13
807 - 5	808 - 10	809 - -38	810 - -1	811 - 0	812 - 151
813 - 4	814 - -55	815 - 4	816 - 740	901 - 83	902 - 449
903 - 0	904 - 0	905 - 8	1001 - -3	1002 - 483	1003 - -64
1004 - 13	1005 - -50	1006 - -85	1007 - 89	1008 - 17	1009 - -4
1010 - 0	1011 - -13	1012 - 0	1013 - -73	1014 - 0	1015 - 538
1016 - 722	1101 - -38	1102 - -379	1103 - 321	1104 - 0	1105 - -42
1106 - -473	1201 - 38	1202 - -646	1203 - -208	1204 - -1056	1205 - -118
1206 - -186	1207 - -1003				

[Water Management Unit - Value]

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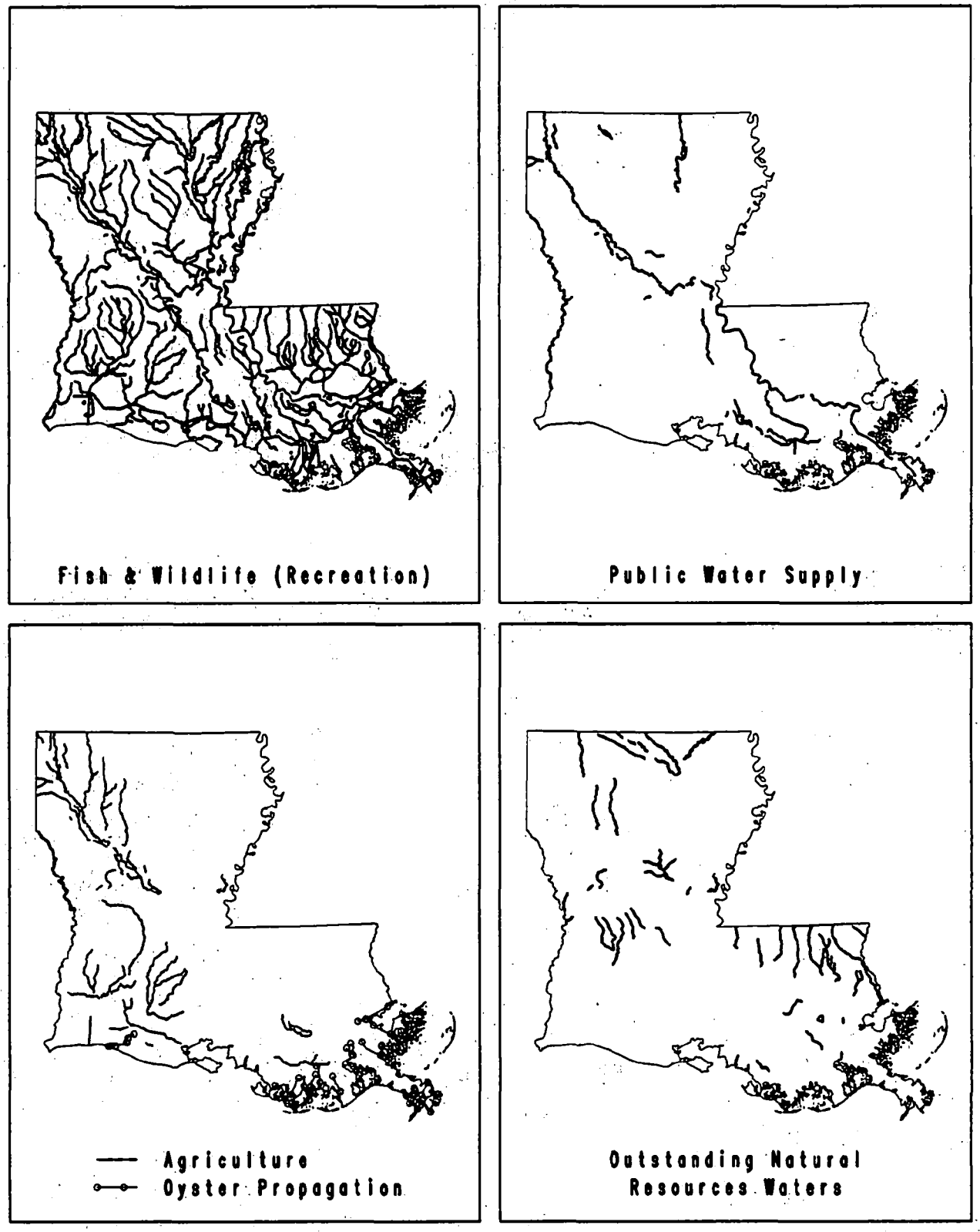
LOUISIANA DESIGNATED USES OF SURFACE WATERS

Figure 8



FINAL PRODUCTS

The final products of this pilot study are the following:

1. Maps, generated with the ARC/INFO Geographic Information System, depicting rankings of Louisiana's "water quality management units" according to the synoptic indices and the component data layers for each index, including:

   - Hydrologic input

     --mean annual precipitation
     --total drainage area
     --potential runoff
     --stream channel slope
     --channel length

   - Water quality input

     --nonpoint water quality input

   - Life support input

   - Wetland capacity

   - Cumulative impacts

   - Future risk

     --agricultural growth (1974-1982)
     --human population growth (1970-1980)

   - Future loss

2. Map of Louisiana's "designated uses" of surface waters

3. Floppy diskette with all data collected for the study

4. ARC/INFO data tapes (for use with a Geographic Information System)

DISCUSSION

It is appropriate to introduce the derived (secondary) indices, (mentioned in the "Overview of the Synoptic Approach" section of this report) in the discussion of wetland functions and sensitivity to change. The concepts incorporated in the indices are central to the synoptic approach, although methods to measure the indices are still in the development stage. The derived indices are defined here and the some of the maps generated for them (Appendix IV) are used for illustrative purposes:

> Landscape Sensitivity--landscape input into wetlands divided by wetland capacity. This is an index of the potential for landscape inputs to be processed by wetlands.
>
> Cumulative Effects--the likelihood of changes in landscape function caused by wetland impacts, estimated as the product of sensitivity and cumulative impacts.
>
> Wetland Significance--the significance of wetland loss to potential beneficiaries of wetland function, calculated by multiplying cumulative effects by some specific use (i.e., a population of interest or area of some land use).

The identification of relative wetland function can be achieved by comparing landscape inputs with wetland capacity for a given function. For example, hydrologic inputs in unit 801 (Figure 2) are relatively low compared to inputs in unit 815 in the Ouachita River Basin. On the other hand, wetland capacity in unit 801 (Figure 5) is relatively high, compared to wetland capacity in unit 815. This suggests that unit 815 is relatively more sensitive than unit 801 to the hydrologic effects of wetland loss, as illustrated by the "hydrologic sensitivity" map (Appendix IV).

The addition of the cumulative impacts component to the indices for wetland function provides a tool for identifying landscapes that have potentially suffered from wetland loss. Cumulative impacts for unit 815 (Figure 6) are relatively high compared to those for unit 801; high sensitivity and high impacts suggests greater loss of landscape function as illustrated by the map for "hydrologic effects" (Appendix IV). In addition, a relatively high human population density in unit 815 implies high social significance, as illustrated by the "hydrologic significance to humans" map (Appendix IV).

The products of the Louisiana statewide assessment can be used to identify functions (or "uses") and areas sensitive to impacts not captured in existing surface water designations. The most obvious illustration of this is that the State's "designated uses" do not include an indicator of the hydrologic function provided by wetlands. Additional protection for wetlands could be provided by designating watersheds for "hydrologic use" where the relative sensitivity is high. The same principle could be applied to water quality and life support functions where existing "use" designations do not appear to provide

adequate protection for the wetland functions identified by the synoptic maps. It should be emphasized that the synoptic approach is not intended to make value judgements, or management decisions, with respect to which wetland functions are most important to protect within a geographic area. The index or suite of indices used for designating wetland "use" or assessing cumulative impacts must be determined by the regulatory agencies involved.

To designate candidate wetlands and wetland complexes for "Outstanding State Resource Waters" a protocol could be developed by combining existing surface water designated uses with synoptic wetland function identification or cumulative effects ranking. For example, Appendix V summarizes the rankings of watersheds for hydrology, water quality and life support cumulative effects. Those units with low rankings for a particular function, e.g. a rank of 1 through 10, are likely to have a high potential for processing landscape inputs for that function and are likely to be relatively unimpacted. Watersheds that have low cumulative effects rankings for all functions, i.e., units 207, 417, 418, 421, and 902, might be considered to have wetlands of relatively high functional value and therefore identified for special protection as "Outstanding State Resource Waters." The rankings could be further refined by weighting the watersheds by wetland patch size or the existence of state wetland heritage sites.

CONCLUSION

The synoptic approach is a framework for assessing the cumulative effects of wetland loss on landscape function, designed to complement existing management practices. The approach can be applied to a variety of spatial scales and regulatory issues and can be modified according to the concerns of a particular regulatory agency. An assessment can be completed in a matter of months at a relatively low cost.

The synoptic approach does provide a landscape perspective on wetland function and identifies wetland functions not included in Louisiana's designated uses of surface waters. Additional protection could be afforded to Louisiana's wetlands by using the synoptic approach to differentiate functions (uses) performed by wetlands, which may be quite different from adjacent lakes and streams due to differences in hydrology and biotic composition. However, the approach may be more appropriate for a state, such as Washington, with a more generalized set of water quality standards than Louisiana's since synoptic results are not specific (Louisiana's designated use categories include specific uses such as "oyster propagation," "public water supply," and "agriculture" while Washington includes general categories such as "extraordinary," "excellent," and "fair"). A pilot application of the approach in Washington, which is nearing completion, will test the utility of the synoptic approach in a state which has no specific wetland designated use classes, i.e., does not specifically include wetlands in its definition of surface waters of the state. The most appropriate use of the Louisiana assessment may be in regional planning, the development of State Wetlands Conservation Plans in accordance with recommendations of the National Wetlands Policy Forum (National Wetlands Policy Forum 1988), or as a tool for nonpoint source pollution assessment. Ultimately, the utility of the synoptic approach in providing information useful to the development of wetland water quality standards and the strategy for wetland "use designation" in the study area must be decided by resource management agencies.

In conclusion, the synoptic approach was developed to provide a tool, in addition to existing management practices, for evaluating the cumulative effects of wetland loss in regulatory decisions that must be made quickly and with limited resources. The method is still developmental. For example, hydrologic input does not currently include upstream imports, and therefore downstream input is underestimated. Future research strategies, including upstream import, validation of the assumptions, establishment of confidence levels for the surrogates, and additional data will be incorporated as they are developed. The final product of the research will be the completion of a Cumulative Impact Assessment manual in 1991.

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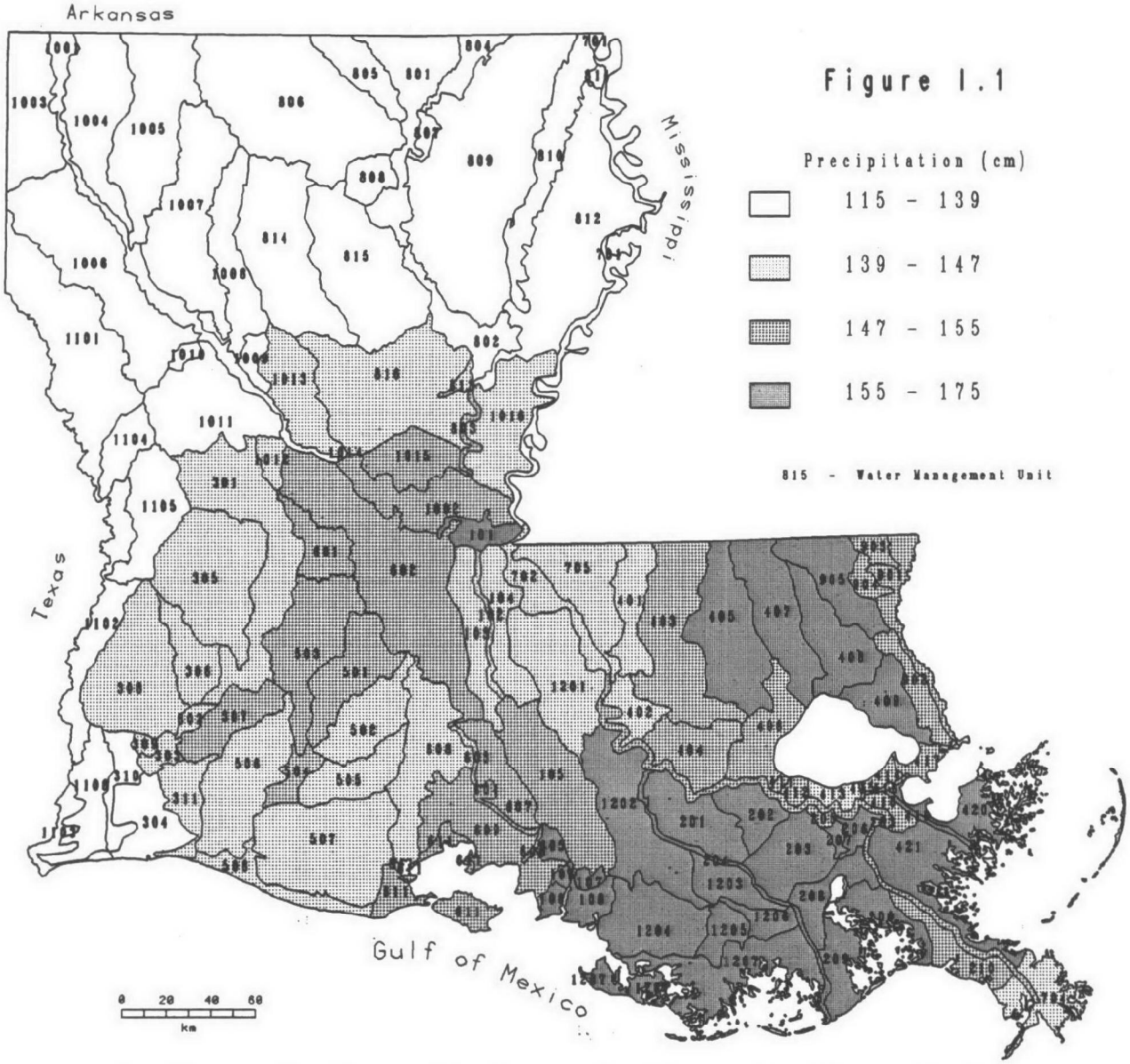
APPENDIX I. Maps of overlay components used for deriving synoptic indices.

MEAN ANNUAL PRECIPITATION



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307 - 147	308 - 140	309 - 140	310 - 138	311 - 140	401 - 145
402 - 142	403 - 148	404 - 151	405 - 156	406 - 149	407 - 158
408 - 159	409 - 157	411 - 151	412 - 149	413 - 147	414 - 150
415 - 149	416 - 150	417 - 154	418 - 154	419 - 157	420 - 156
421 - 160	501 - 149	502 - 144	503 - 154	504 - 150	505 - 143
506 - 147	507 - 145	508 - 145	601 - 150	602 - 148	603 - 146
604 - 152	605 - 158	606 - 155	607 - 150	608 - 143	609 - 154
611 - 153	701 - 133	702 - 141	703 - 153	704 - 145	705 - 142
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807 - 128	808 - 130	809 - 132	810 - 135	811 - 135	812 - 133
813 - 144	814 - 137	815 - 138	816 - 146	901 - 153	902 - 155
903 - 155	904 - 155	905 - 157	1001 - 124	1002 - 153	1003 - 116
1004 - 122	1005 - 126	1006 - 120	1007 - 127	1008 - 131	1009 - 135
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1016 - 144	1101 - 127	1102 - 138	1103 - 135	1104 - 133	1105 - 138
1106 - 135	1201 - 141	1202 - 160	1203 - 172	1204 - 168	1205 - 165
1206 - 166	1207 - 160				

[Water Management Unit - Value]

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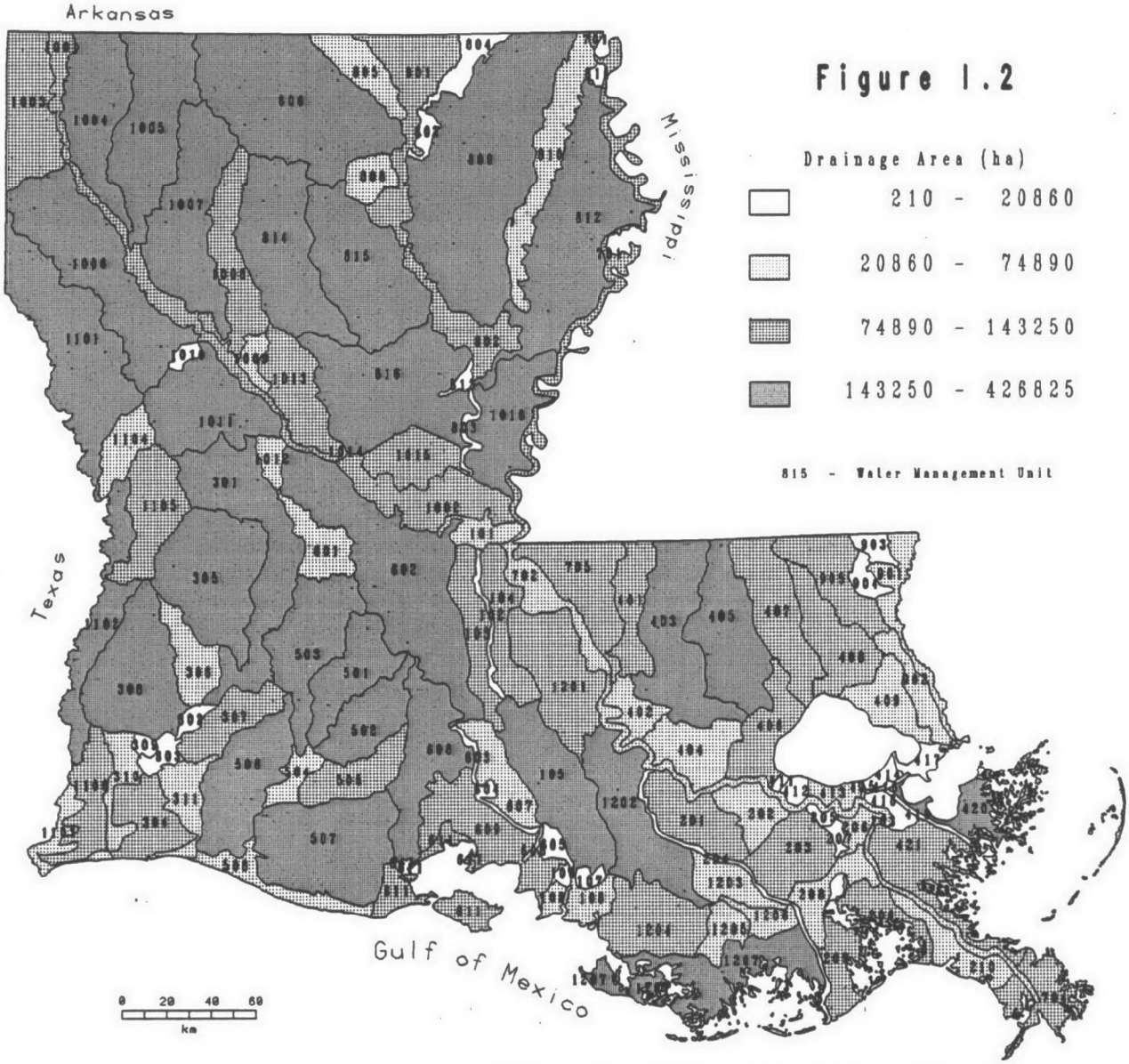
TOTAL DRAINAGE AREA



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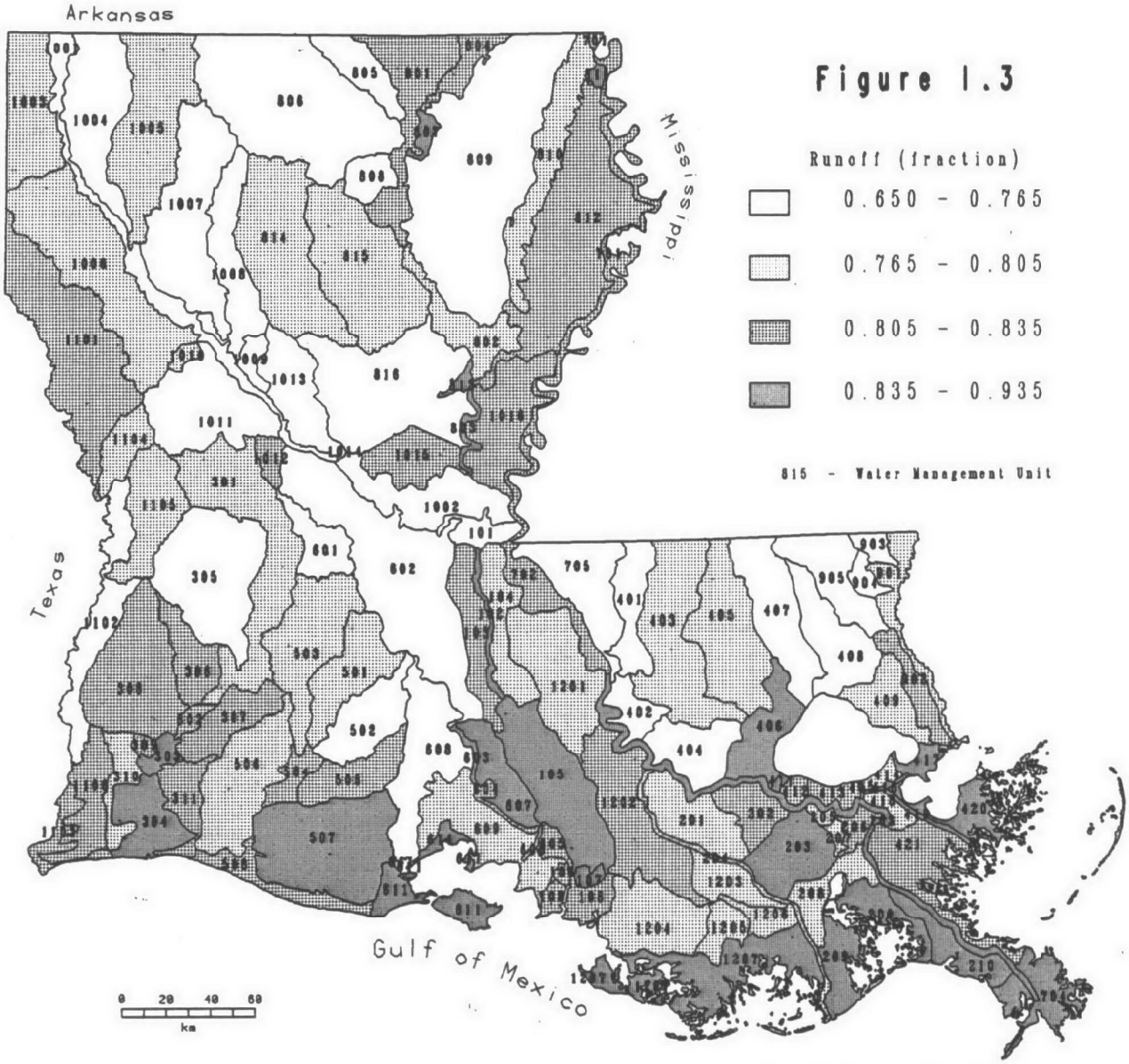
POTENTIAL RUNOFF (CURVE NUMBER)



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205 - 0.785	206 - 0.826	207 - 0.776	208 - 0.794	209 - 0.846	210 - 0.863
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402 - 0.752	403 - 0.774	404 - 0.752	405 - 0.800	406 - 0.878	407 - 0.763
408 - 0.750	409 - 0.801	411 - 0.845	412 - 0.811	413 - 0.829	414 - 0.739
415 - 0.871	416 - 0.858	417 - 0.845	418 - 0.805	419 - 0.883	420 - 0.934
421 - 0.832	501 - 0.777	502 - 0.756	503 - 0.792	504 - 0.811	505 - 0.821
506 - 0.801	507 - 0.836	508 - 0.810	601 - 0.651	602 - 0.712	603 - 0.845
604 - 0.833	605 - 0.830	606 - 0.834	607 - 0.851	608 - 0.762	609 - 0.781
611 - 0.879	701 - 0.832	702 - 0.820	703 - 0.933	704 - 0.904	705 - 0.743
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[Water Management Unit - Value]

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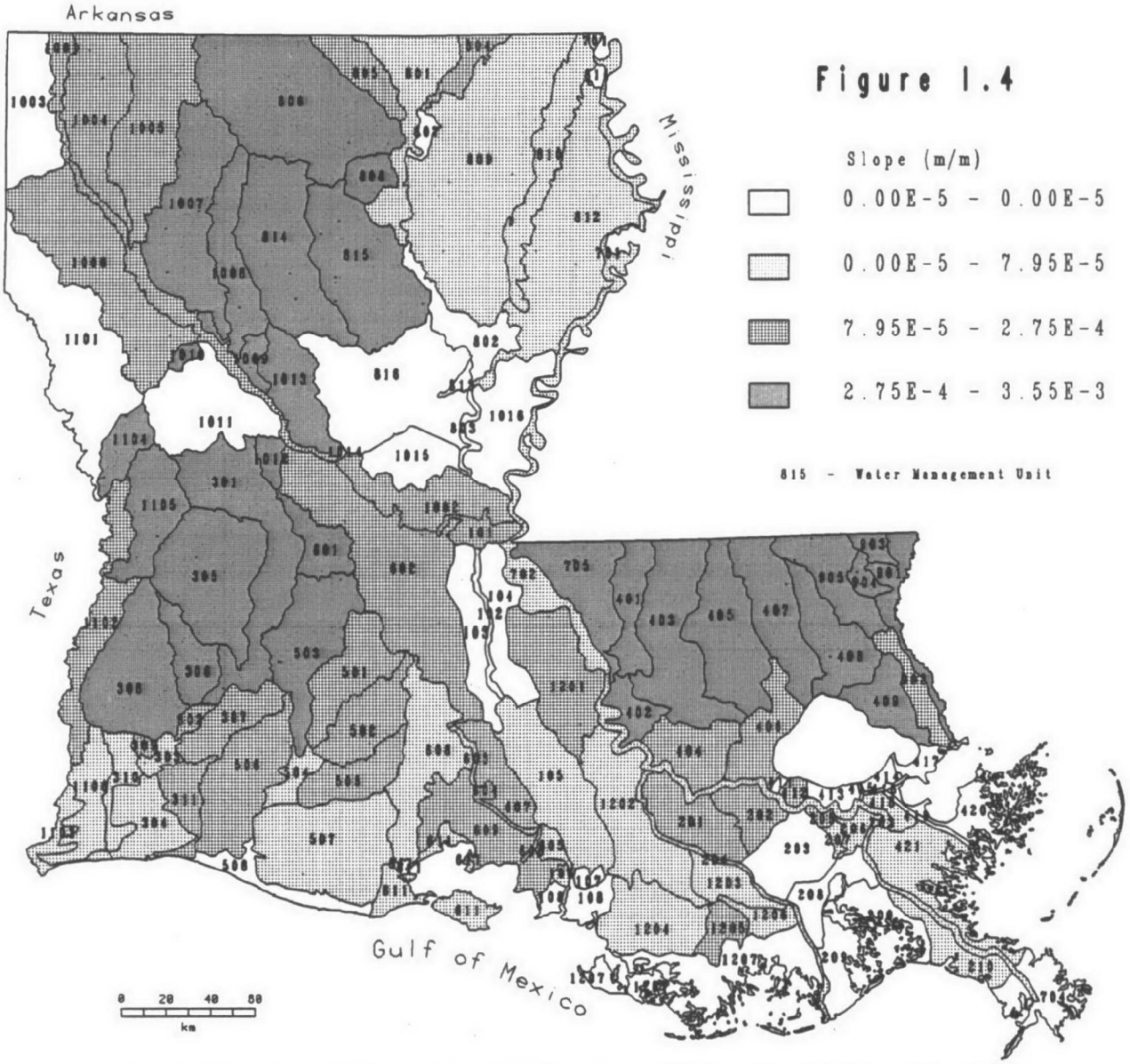
STREAM CHANNEL SLOPE



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205 - 0.25E-3	206 - 0.59E-4	207 - 0.51E-4	208 - 0.00E+0	209 - 0.00E+0	210 - 0.29E-4
301 - 0.49E-3	302 - 0.10E-3	303 - 0.41E-4	304 - 0.11E-4	305 - 0.78E-3	306 - 0.76E-3
307 - 0.17E-3	308 - 0.61E-3	309 - 0.14E-3	310 - 0.27E-4	311 - 0.89E-4	401 - 0.79E-3
402 - 0.34E-3	403 - 0.39E-3	404 - 0.92E-4	405 - 0.78E-3	406 - 0.18E-3	407 - 0.84E-3
408 - 0.10E-2	409 - 0.58E-3	411 - 0.00E+0	412 - 0.14E-3	413 - 0.00E+0	414 - 0.00E+0
415 - 0.00E+0	416 - 0.00E+0	417 - 0.00E+0	418 - 0.18E-4	419 - 0.00E+0	420 - 0.00E+0
421 - 0.23E-4	501 - 0.23E-3	502 - 0.21E-3	503 - 0.30E-3	504 - 0.52E-4	505 - 0.13E-3
506 - 0.13E-3	507 - 0.17E-4	508 - 0.00E+0	601 - 0.12E-2	602 - 0.16E-3	603 - 0.61E-4
604 - 0.86E-4	605 - 0.23E-4	606 - 0.93E-4	607 - 0.15E-3	608 - 0.75E-4	609 - 0.25E-3
611 - 0.36E-4	701 - 0.59E-4	702 - 0.73E-4	703 - 0.27E-4	704 - 0.00E+0	705 - 0.92E-3
801 - 0.61E-4	802 - 0.00E+0	803 - 0.00E+0	804 - 0.11E-3	805 - 0.16E-3	806 - 0.48E-3
807 - 0.00E+0	808 - 0.97E-3	809 - 0.56E-4	810 - 0.50E-4	811 - 0.00E+0	812 - 0.36E-4
813 - 0.00E+0	814 - 0.32E-3	815 - 0.40E-3	816 - 0.00E+0	901 - 0.42E-3	902 - 0.27E-3
903 - 0.35E-2	904 - 0.23E-2	905 - 0.58E-3	1001 - 0.90E-4	1002 - 0.14E-3	1003 - 0.00E+0
1004 - 0.15E-3	1005 - 0.19E-3	1006 - 0.17E-3	1007 - 0.50E-3	1008 - 0.57E-3	1009 - 0.86E-3
1010 - 0.11E-2	1011 - 0.00E+0	1012 - 0.85E-3	1013 - 0.48E-3	1014 - 0.00E+0	1015 - 0.00E+0
1016 - 0.00E+0	1101 - 0.00E+0	1102 - 0.18E-3	1103 - 0.56E-5	1104 - 0.12E-2	1105 - 0.12E-2
1106 - 0.73E-4	1201 - 0.84E-4	1202 - 0.52E-5	1203 - 0.27E-4	1204 - 0.70E-5	1205 - 0.11E-3
1206 - 0.45E-4	1207 - 0.00E+0				

[Water Management Unit - Value]

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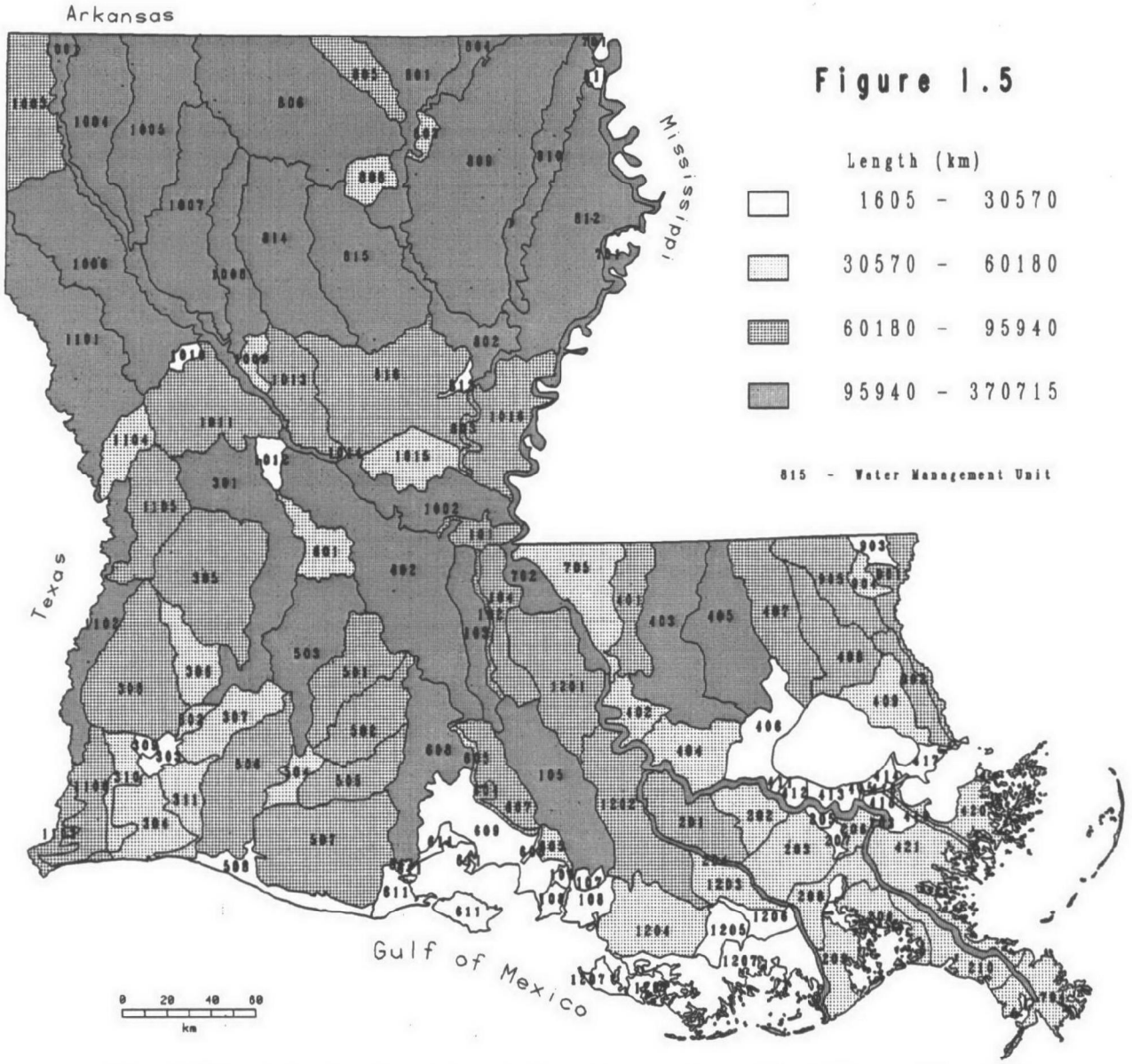
CHANNEL LENGTH



101 - 61142	102 - 75623	103 - 101850	104 - 88012	105 - 102654	106 - 14803
107 - 22204	108 - 27353	201 - 72405	202 - 33628	203 - 37007	204 - 168945
205 - 6597	206 - 34272	207 - 8045	208 - 32502	209 - 41834	210 - 42639
301 - 172968	302 - 32180	303 - 30088	304 - 38133	305 - 88656	306 - 54708
307 - 57924	308 - 85760	309 - 14642	310 - 30571	311 - 54706	401 - 72566
402 - 32663	403 - 144810	404 - 48592	405 - 99436	406 - 20756	407 - 95414
408 - 76910	409 - 36203	411 - 8045	412 - 11907	413 - 8689	414 - 23009
415 - 7562	416 - 22526	417 - 19308	418 - 23009	419 - 48592	420 - 34754
421 - 35237	501 - 82864	502 - 79646	503 - 98632	504 - 46661	505 - 67578
506 - 78037	507 - 73210	508 - 10941	601 - 50684	602 - 186000	603 - 33467
604 - 61464	605 - 35398	606 - 17538	607 - 80820	608 - 118583	609 - 29808
611 - 11263	701 - 345131	702 - 127916	703 - 370714	704 - 30571	705 - 46339
801 - 148419	802 - 115848	803 - 83716	804 - 96540	805 - 67578	806 - 128078
807 - 48270	808 - 31376	809 - 180208	810 - 204343	811 - 8045	812 - 279966
813 - 20434	814 - 126467	815 - 98632	816 - 71601	901 - 95736	902 - 61142
903 - 23009	904 - 34594	905 - 77393	1001 - 340464	1002 - 149315	1003 - 82703
1004 - 137248	1005 - 116653	1006 - 119549	1007 - 121158	1008 - 106194	1009 - 30571
1010 - 17699	1011 - 91713	1012 - 23974	1013 - 84955	1014 - 1609	1015 - 53741
1016 - 94448	1101 - 106194	1102 - 165244	1103 - 72405	1104 - 49557	1105 - 83668
1106 - 61142	1201 - 87369	1202 - 78519	1203 - 59533	1204 - 57924	1205 - 27031
1206 - 27353	1207 - 24135				

[Water Management Unit - Value]

Prepared by USEPA Wetlands Research Program, USEPA Environmental Research Lab, Corvallis, Oregon

WATER QUALITY INPUT (NORMALIZED)

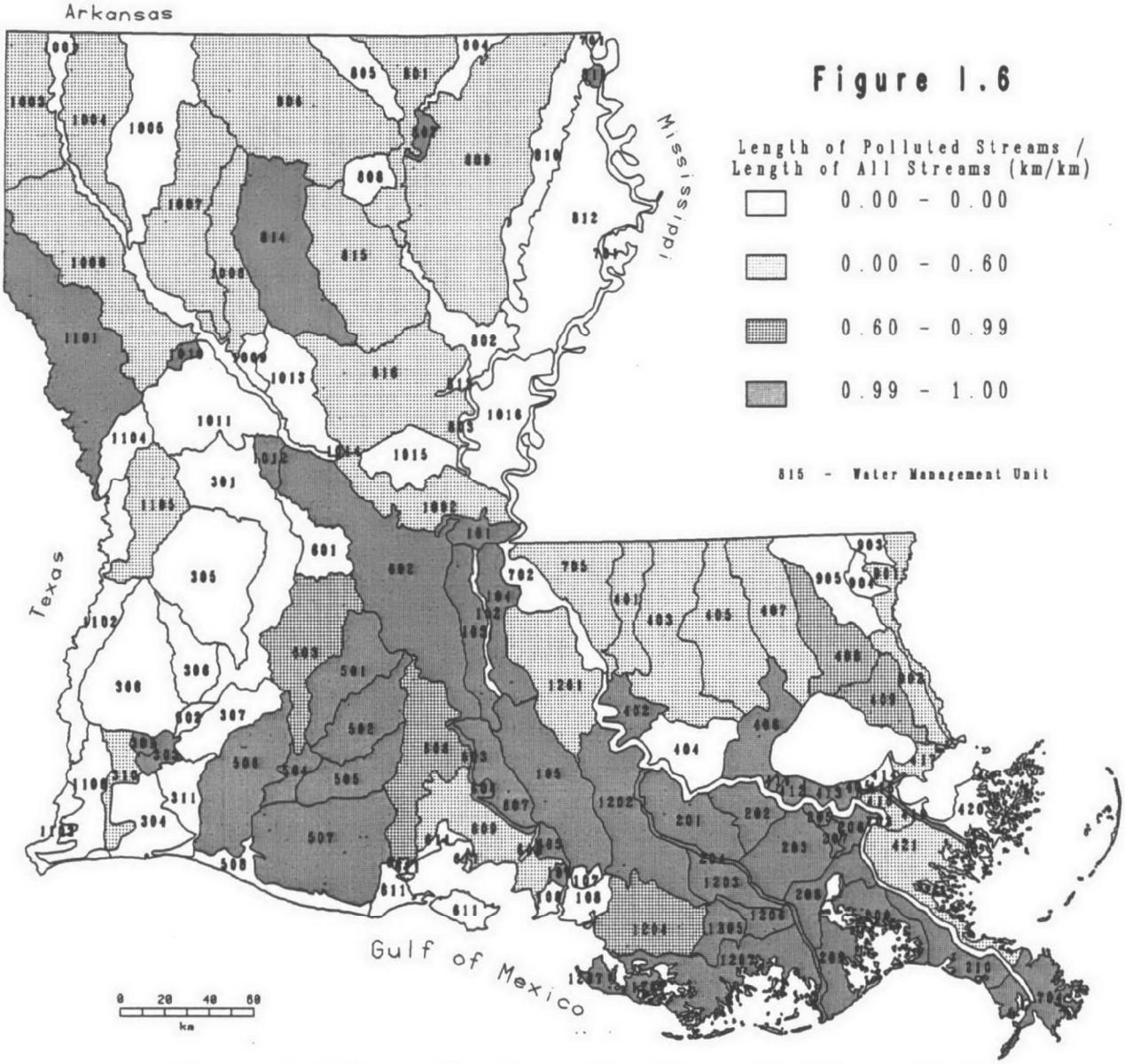


Figure 1.6

Length of Polluted Streams / Length of All Streams (km/km)

- 0.00 - 0.00
- 0.00 - 0.60
- 0.60 - 0.99
- 0.99 - 1.00

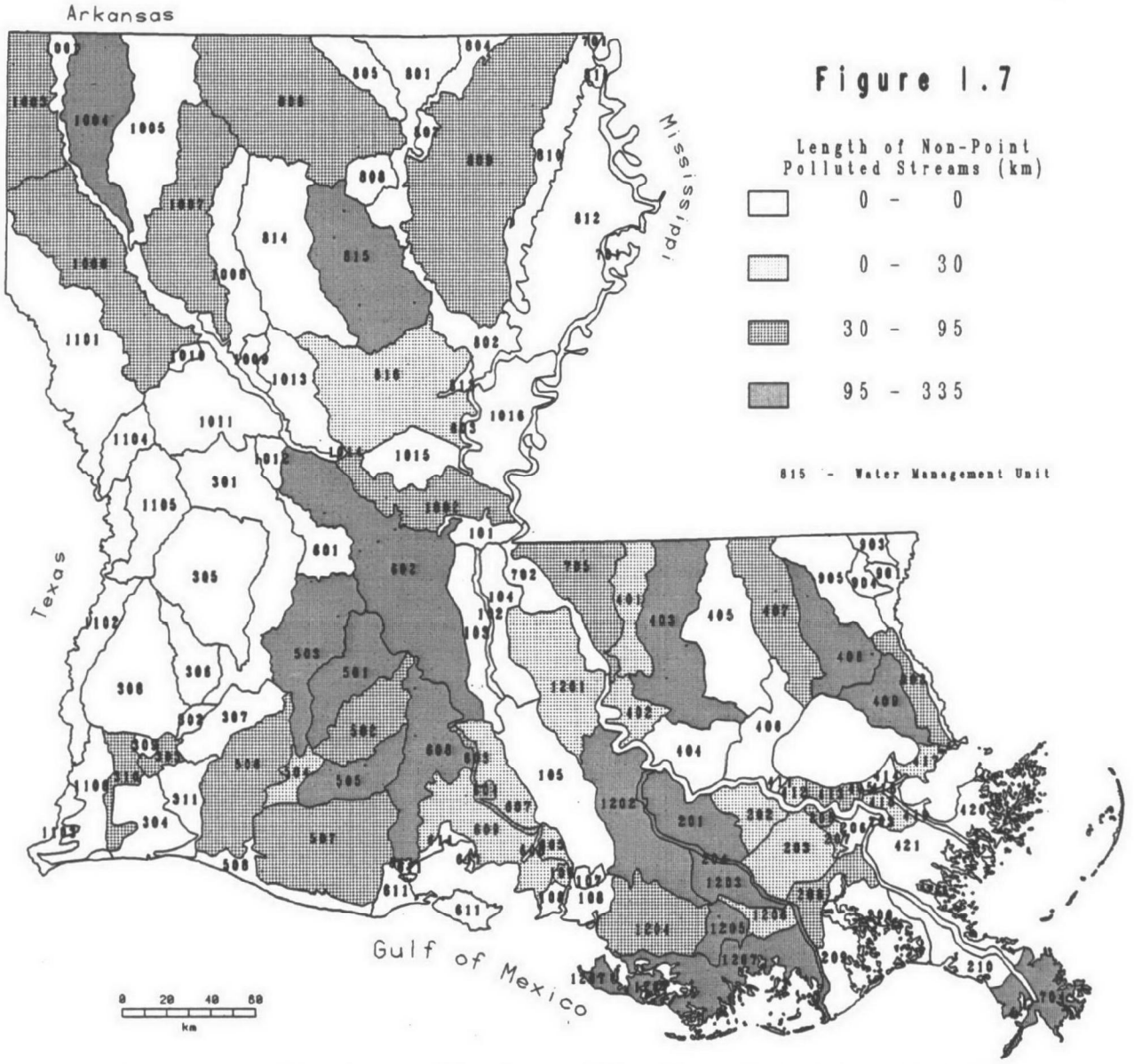
815 - Water Management Unit

101 - 1.00	102 - 0.00	103 - 1.00	104 - 1.00	105 - 1.00	106 - 1.00
107 - 0.00	108 - 0.00	201 - 1.00	202 - 1.00	203 - 1.00	204 - 1.00
205 - 1.00	206 - 1.00	207 - 1.00	208 - 1.00	209 - 1.00	210 - 1.00
301 - 0.00	302 - 0.00	303 - 1.00	304 - 0.00	305 - 0.00	306 - 0.00
307 - 0.00	308 - 0.00	309 - 1.00	310 - 0.56	311 - 0.00	401 - 0.19
402 - 1.00	403 - 0.44	404 - 0.00	405 - 0.08	406 - 1.00	407 - 0.51
408 - 0.69	409 - 0.95	411 - 1.00	412 - 1.00	413 - 1.00	414 - 0.00
415 - 1.00	416 - 1.00	417 - 0.21	418 - 0.30	419 - 1.00	420 - 0.00
421 - 0.50	501 - 1.00	502 - 1.00	503 - 0.94	504 - 1.00	505 - 1.00
506 - 1.00	507 - 1.00	508 - 0.00	601 - 0.00	602 - 1.00	603 - 1.00
604 - 1.00	605 - 1.00	606 - 0.00	607 - 1.00	608 - 0.84	609 - 0.21
611 - 0.00	701 - 0.00	702 - 0.00	703 - 0.00	704 - 1.00	705 - 0.56
801 - 0.06	802 - 0.00	803 - 0.00	804 - 0.00	805 - 0.00	806 - 0.10
807 - 1.00	808 - 0.00	809 - 0.13	810 - 0.00	811 - 1.00	812 - 0.00
813 - 0.00	814 - 1.00	815 - 0.58	816 - 0.06	901 - 0.54	902 - 0.31
903 - 0.00	904 - 0.00	905 - 0.00	1001 - 0.00	1002 - 0.18	1003 - 0.42
1004 - 0.36	1005 - 0.00	1006 - 0.18	1007 - 0.28	1008 - 0.06	1009 - 0.00
1010 - 1.00	1011 - 0.00	1012 - 1.00	1013 - 0.00	1014 - 1.00	1015 - 0.00
1016 - 0.00	1101 - 1.00	1102 - 0.00	1103 - 0.00	1104 - 0.00	1105 - 0.19
1106 - 0.00	1201 - 0.08	1202 - 1.00	1203 - 1.00	1204 - 0.89	1205 - 1.00
1206 - 1.00	1207 - 1.00				

[Water Management Unit - Value]

Prepared by USEPA Wetlands Research Program, USEPA Environmental Research Lab, Corvallis, Oregon

NON-POINT WATER QUALITY INPUT (NON-NORMALIZED)

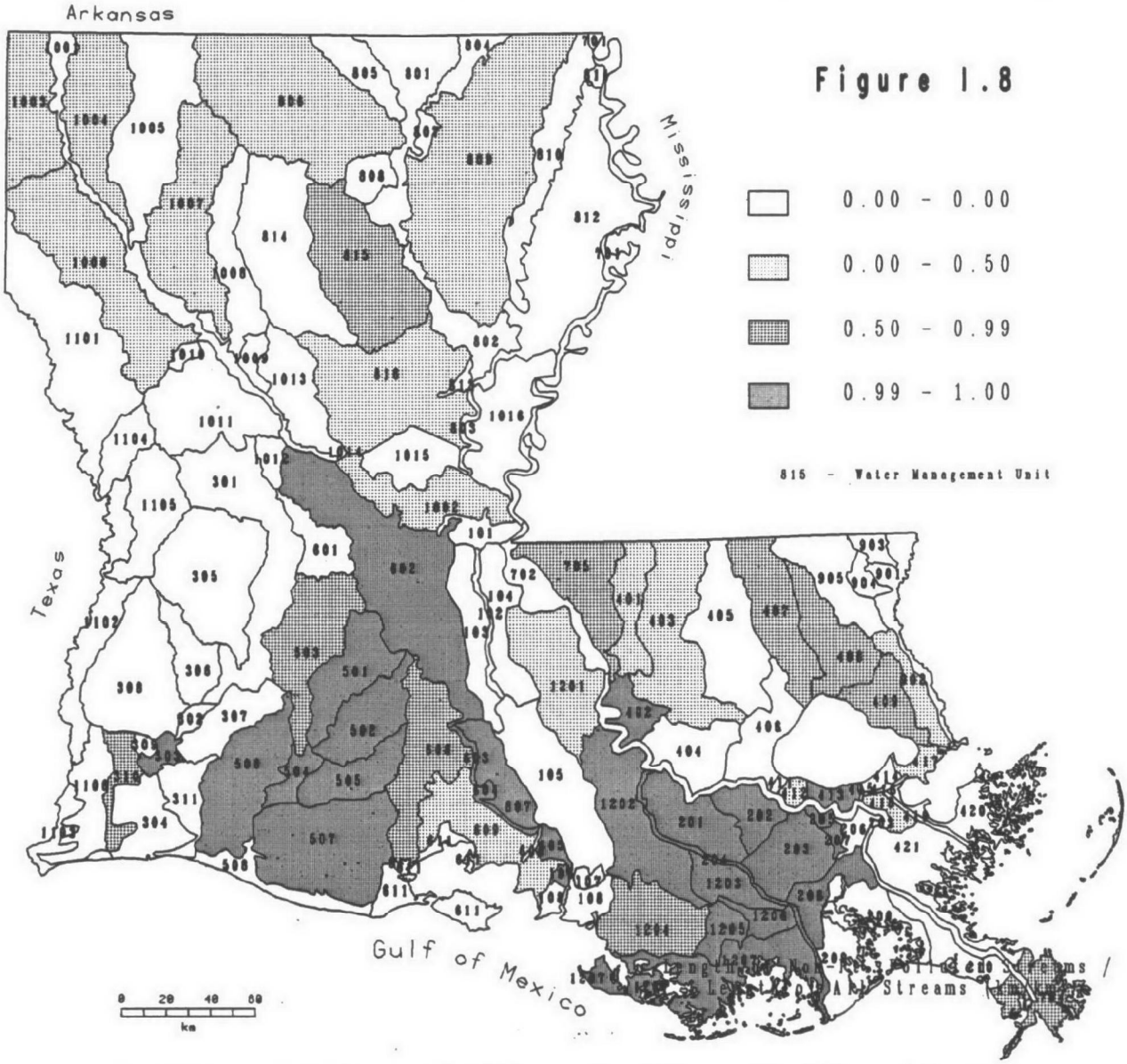


101 - 0	102 - 0	103 - 0	104 - 0	105 - 0	106 - 29
107 - 0	108 - 0	201 - 116	202 - 11	203 - 29	204 - 159
205 - 42	206 - 0	207 - 19	208 - 64	209 - 0	210 - 0
301 - 0	302 - 0	303 - 43	304 - 0	305 - 0	306 - 0
307 - 0	308 - 0	309 - 0	310 - 32	311 - 0	401 - 19
402 - 29	403 - 154	404 - 0	405 - 0	406 - 0	407 - 90
408 - 105	409 - 100	411 - 0	412 - 6	413 - 55	414 - 0
415 - 0	416 - 0	417 - 5	418 - 11	419 - 0	420 - 0
421 - 0	501 - 138	502 - 80	503 - 105	504 - 27	505 - 98
506 - 68	507 - 64	508 - 0	601 - 0	602 - 335	603 - 34
604 - 64	605 - 16	606 - 0	607 - 14	608 - 130	609 - 10
611 - 0	701 - 0	702 - 0	703 - 0	704 - 129	705 - 64
801 - 0	802 - 0	803 - 0	804 - 0	805 - 0	806 - 32
807 - 0	808 - 0	809 - 92	810 - 0	811 - 0	812 - 0
813 - 0	814 - 0	815 - 103	816 - 13	901 - 0	902 - 47
903 - 0	904 - 0	905 - 0	1001 - 0	1002 - 35	1003 - 82
1004 - 126	1005 - 0	1006 - 32	1007 - 60	1008 - 0	1009 - 0
1010 - 0	1011 - 0	1012 - 0	1013 - 0	1014 - 0	1015 - 0
1016 - 0	1101 - 0	1102 - 0	1103 - 0	1104 - 0	1105 - 0
1106 - 0	1201 - 19	1202 - 183	1203 - 134	1204 - 95	1205 - 122
1206 - 19	1207 - 166				

[Water Management Unit - Value]

Prepared by USEPA Wetlands Research Program, USEPA Environmental Research Lab, Corvallis, Oregon

NON-POINT WATER QUALITY INPUT (NORMALIZED)

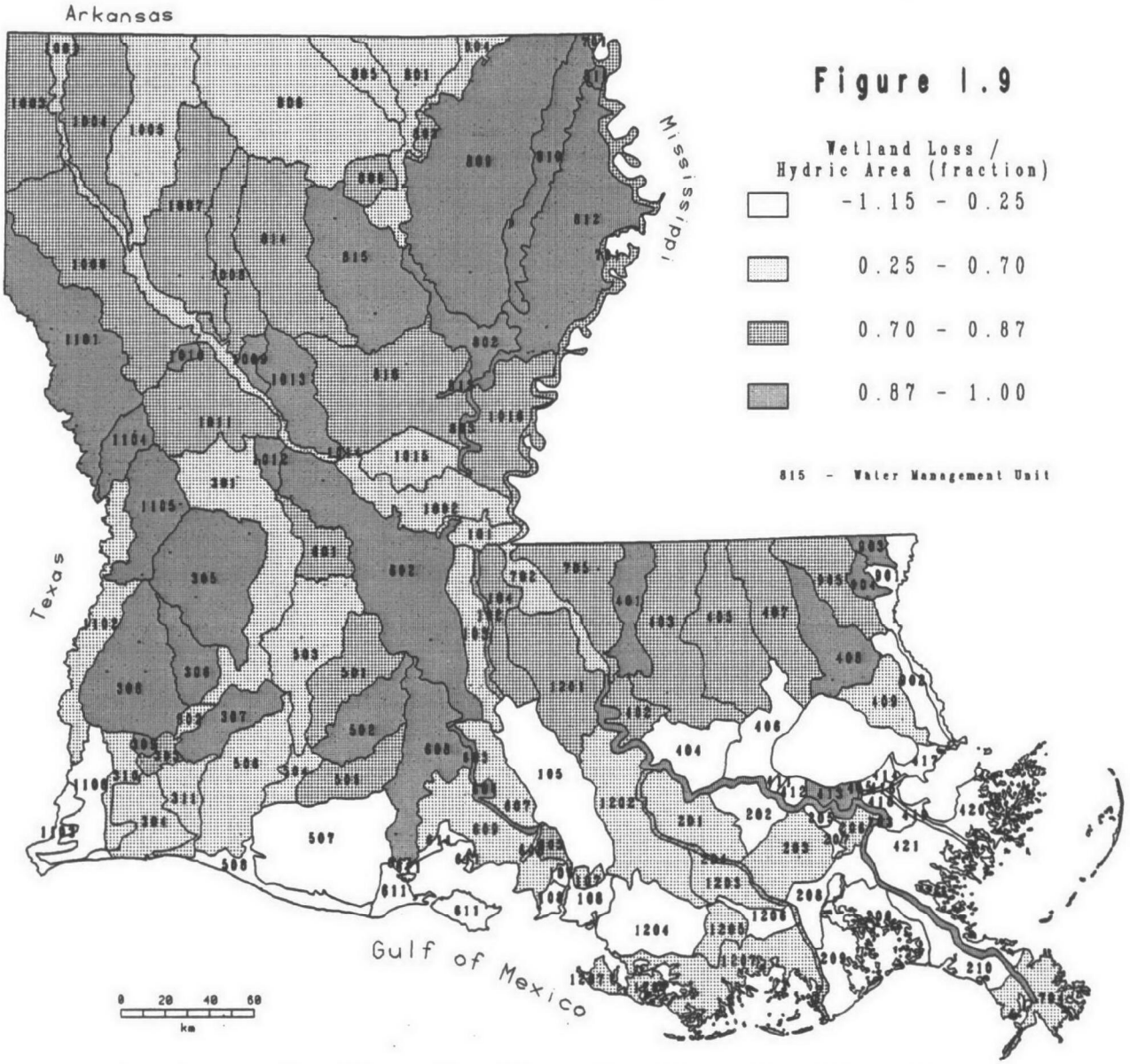


101 - 0.00	102 - 0.00	103 - 0.00	104 - 0.00	105 - 0.00	106 - 1.00
107 - 0.00	108 - 0.00	201 - 1.00	202 - 1.00	203 - 1.00	204 - 1.00
205 - 1.00	206 - 0.00	207 - 1.00	208 - 1.00	209 - 0.00	210 - 0.00
301 - 0.00	302 - 0.00	303 - 1.00	304 - 0.00	305 - 0.00	306 - 0.00
307 - 0.00	308 - 0.00	309 - 0.00	310 - 0.56	311 - 0.00	401 - 0.19
402 - 1.00	403 - 0.44	404 - 0.00	405 - 0.00	406 - 0.00	407 - 0.51
408 - 0.69	409 - 0.95	411 - 0.00	412 - 0.50	413 - 1.00	414 - 0.00
415 - 0.00	416 - 0.00	417 - 0.21	418 - 0.30	419 - 0.00	420 - 0.00
421 - 0.00	501 - 1.00	502 - 1.00	503 - 0.94	504 - 1.00	505 - 1.00
506 - 1.00	507 - 1.00	508 - 0.00	601 - 0.00	602 - 1.00	603 - 1.00
604 - 1.00	605 - 1.00	606 - 0.00	607 - 1.00	608 - 0.84	609 - 0.09
611 - 0.00	701 - 0.00	702 - 0.00	703 - 0.00	704 - 0.81	705 - 0.56
801 - 0.00	802 - 0.00	803 - 0.00	804 - 0.00	805 - 0.00	806 - 0.10
807 - 0.00	808 - 0.00	809 - 0.13	810 - 0.00	811 - 0.00	812 - 0.00
813 - 0.00	814 - 0.00	815 - 0.58	816 - 0.06	901 - 0.00	902 - 0.31
903 - 0.00	904 - 0.00	905 - 0.00	1001 - 0.00	1002 - 0.18	1003 - 0.42
1004 - 0.36	1005 - 0.00	1006 - 0.18	1007 - 0.28	1008 - 0.00	1009 - 0.00
1010 - 0.00	1011 - 0.00	1012 - 0.00	1013 - 0.00	1014 - 0.00	1015 - 0.00
1016 - 0.00	1101 - 0.00	1102 - 0.00	1103 - 0.00	1104 - 0.00	1105 - 0.00
1106 - 0.00	1201 - 0.08	1202 - 1.00	1203 - 1.00	1204 - 0.89	1205 - 1.00
1206 - 1.00	1207 - 1.00				

[Water Management Unit - Value]

Prepared by USEPA Wetlands Research Program, USEPA Environmental Research Lab, Corvallis, Oregon

CUMULATIVE IMPACTS (NORMALIZED)



101 - 0.44	102 - 0.86	103 - 0.59	104 - 0.77	105 - -0.03	106 - 0.21
107 - 0.57	108 - 0.10	201 - 0.28	202 - 0.10	203 - 0.25	204 - 0.79
205 - -0.26	206 - 0.33	207 - -0.68	208 - -0.16	209 - 0.09	210 - 0.18
301 - 0.69	302 - 0.57	303 - 0.77	304 - 0.37	305 - 0.90	306 - 0.98
307 - 0.90	308 - 0.97	309 - 0.97	310 - 0.68	311 - 0.41	401 - 0.98
402 - 0.85	403 - 0.85	404 - 0.02	405 - 0.79	406 - 0.09	407 - 0.77
408 - 0.88	409 - 0.61	411 - -0.03	412 - -0.02	413 - 0.95	414 - -0.12
415 - 1.00	416 - -0.10	417 - -0.28	418 - -1.15	419 - -0.73	420 - -0.25
421 - -0.56	501 - 0.84	502 - 0.94	503 - 0.63	504 - 0.64	505 - 0.87
506 - 0.54	507 - 0.07	508 - -0.52	601 - 0.88	602 - 0.89	603 - 1.00
604 - 0.98	605 - 0.78	606 - 0.60	607 - 0.57	608 - 0.93	609 - 0.27
611 - -0.01	701 - 0.80	702 - 0.45	703 - 0.90	704 - 0.38	705 - 0.86
801 - 0.48	802 - 0.88	803 - 0.91	804 - 0.49	805 - 0.60	806 - 0.51
807 - 0.78	808 - 0.86	809 - 0.94	810 - 1.00	811 - 0.95	812 - 0.90
813 - 0.98	814 - 0.79	815 - 0.93	816 - 0.77	901 - -0.14	902 - -0.25
903 - 1.00	904 - 0.98	905 - 0.85	1001 - 0.67	1002 - 0.64	1003 - 0.86
1004 - 0.74	1005 - 0.54	1006 - 0.87	1007 - 0.75	1008 - 0.84	1009 - 0.90
1010 - 0.99	1011 - 0.77	1012 - 0.93	1013 - 0.92	1014 - 0.97	1015 - 0.31
1016 - 0.77	1101 - 0.90	1102 - 0.58	1103 - -0.08	1104 - 0.99	1105 - 0.93
1106 - 0.04	1201 - 0.84	1202 - 0.57	1203 - 0.51	1204 - 0.07	1205 - 0.33
1206 - 0.21	1207 - 0.34				

[Water Management Unit - Value]

Prepared by USEPA Wetlands Research Program, USEPA Environmental Research Lab, Corvallis, Oregon

HUMAN POPULATION GROWTH (1970-1980)

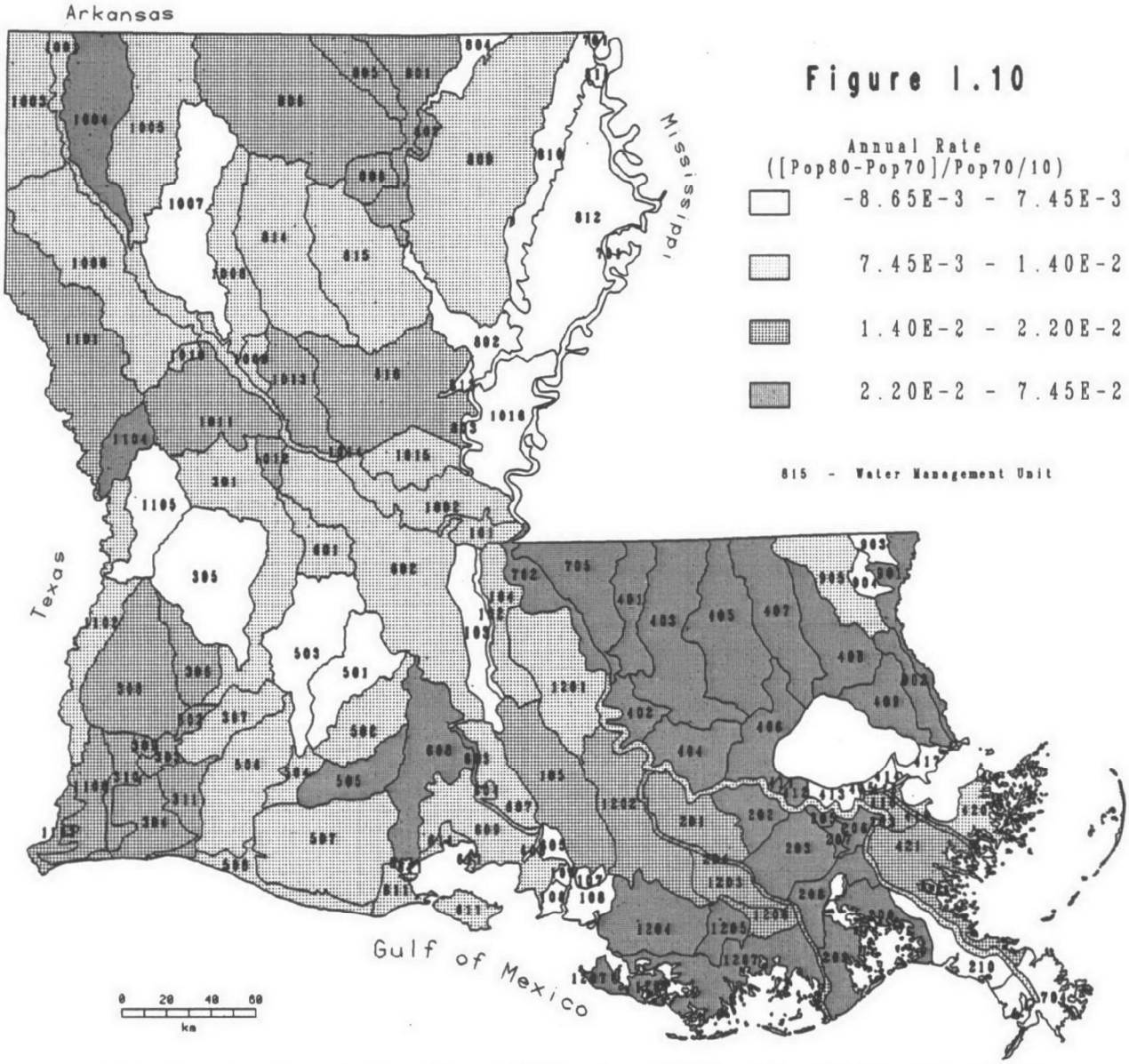


Figure 1.10

Annual Rate
([Pop80-Pop70]/Pop70/10)

- -8.65E-3 - 7.45E-3
- 7.45E-3 - 1.40E-2
- 1.40E-2 - 2.20E-2
- 2.20E-2 - 7.45E-2

815 - Water Management Unit

101	-	0.86E-2	102	-	0.70E-2	103	-	0.66E-2	104	-	0.95E-2	105	-	0.14E-1	106	-	0.58E-2
107	-	0.58E-2	108	-	0.61E-2	201	-	0.18E-1	202	-	0.27E-1	203	-	0.28E-1	204	-	0.19E-1
205	-	0.35E-1	206	-	0.23E-1	207	-	0.35E-1	208	-	0.33E-1	209	-	0.32E-1	210	-	0.33E-2
301	-	0.77E-2	302	-	0.15E-1	303	-	0.15E-1	304	-	0.15E-1	305	-	0.64E-2	306	-	0.18E-1
307	-	0.13E-1	308	-	0.18E-1	309	-	0.15E-1	310	-	0.15E-1	311	-	0.15E-1	401	-	0.27E-1
402	-	0.28E-1	403	-	0.32E-1	404	-	0.31E-1	405	-	0.35E-1	406	-	0.32E-1	407	-	0.24E-1
408	-	0.59E-1	409	-	0.74E-1	411	-	0.26E-1	412	-	0.26E-1	413	-	0.73E-2	414	-	-0.60E-2
415	-	-0.60E-2	416	-	-0.50E-2	417	-	-0.59E-2	418	-	0.15E-1	419	-	0.20E-1	420	-	0.13E-1
421	-	0.18E-1	501	-	0.53E-2	502	-	0.78E-2	503	-	0.51E-2	504	-	0.90E-2	505	-	0.24E-1
506	-	0.12E-1	507	-	0.13E-1	508	-	0.13E-1	601	-	0.13E-1	602	-	0.95E-2	603	-	0.24E-1
604	-	0.98E-2	605	-	0.58E-2	606	-	0.58E-2	607	-	0.14E-1	608	-	0.32E-1	609	-	0.12E-1
611	-	0.11E-1	701	-	-0.32E-2	702	-	0.22E-1	703	-	0.86E-2	704	-	0.33E-2	705	-	0.25E-1
801	-	0.18E-1	802	-	0.57E-2	803	-	0.34E-2	804	-	0.72E-2	805	-	0.15E-1	806	-	0.14E-1
807	-	0.21E-1	808	-	0.21E-1	809	-	0.91E-2	810	-	-0.14E-2	811	-	-0.86E-2	812	-	-0.21E-2
813	-	0.44E-2	814	-	0.88E-2	815	-	0.12E-1	816	-	0.19E-1	901	-	0.29E-1	902	-	0.74E-1
903	-	0.53E-2	904	-	0.53E-2	905	-	0.13E-1	1001	-	0.14E-1	1002	-	0.11E-1	1003	-	0.96E-2
1004	-	0.25E-1	1005	-	0.12E-1	1006	-	0.11E-1	1007	-	0.74E-2	1008	-	0.75E-2	1009	-	0.12E-1
1010	-	0.13E-1	1011	-	0.15E-1	1012	-	0.15E-1	1013	-	0.18E-1	1014	-	0.15E-1	1015	-	0.14E-1
1016	-	0.18E-2	1101	-	0.22E-1	1102	-	0.14E-1	1103	-	0.14E-1	1104	-	0.31E-1	1105	-	0.54E-3
1106	-	0.16E-1	1201	-	0.95E-2	1202	-	0.15E-1	1203	-	0.21E-1	1204	-	0.22E-1	1205	-	0.24E-1
1206	-	0.21E-1	1207	-	0.23E-1												

[Water Management Unit - Value]

Prepared by USEPA Wetlands Research Program, USEPA Environmental Research Lab, Corvallis, Oregon

AGRICULTURAL GROWTH (1974-1982)

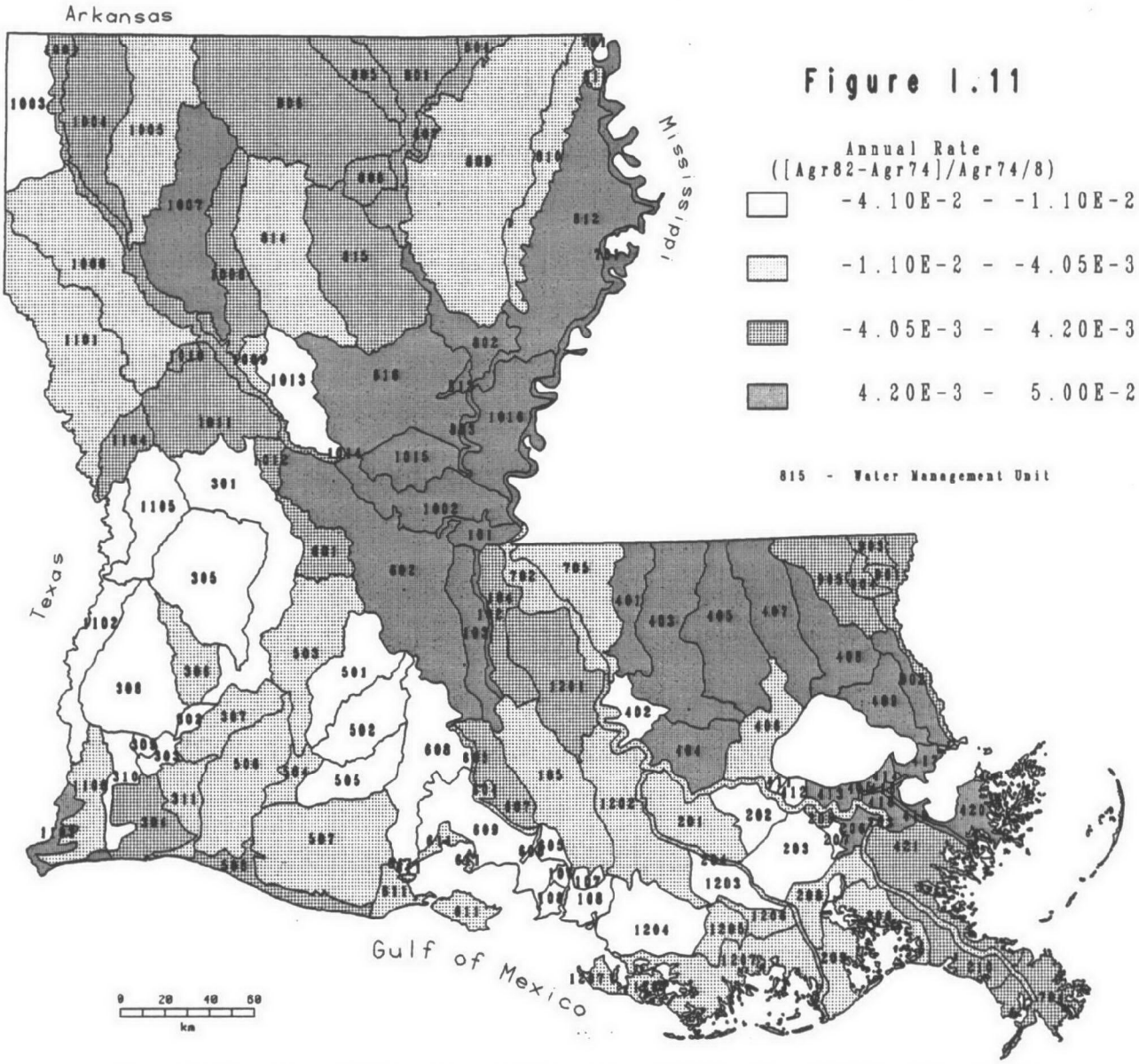


Figure 1.11

Annual Rate
([Agr82-Agr74]/Agr74/8)

- -4.10E-2 - -1.10E-2
- -1.10E-2 - -4.05E-3
- -4.05E-3 - 4.20E-3
- 4.20E-3 - 5.00E-2

815 - Water Management Unit

101 - 0.16E-1	102 - 0.44E-2	103 - 0.76E-2	104 - -0.25E-3	105 - -0.85E-2	106 - -0.32E-1
107 - -0.32E-1	108 - -0.32E-1	201 - -0.52E-2	202 - -0.26E-1	203 - -0.26E-1	204 - -0.93E-2
205 - -0.25E-2	206 - 0.94E-2	207 - -0.18E-1	208 - -0.98E-2	209 - -0.94E-2	210 - -0.21E-2
301 - -0.13E-1	302 - -0.19E-1	303 - -0.20E-1	304 - 0.40E-2	305 - -0.17E-1	306 - -0.84E-2
307 - -0.97E-2	308 - -0.14E-1	309 - -0.20E-1	310 - -0.15E-1	311 - -0.92E-2	401 - 0.71E-2
402 - -0.24E-1	403 - 0.53E-2	404 - 0.73E-2	405 - 0.59E-2	406 - -0.11E-1	407 - 0.43E-2
408 - 0.75E-2	409 - 0.13E-1	411 - -0.41E-1	412 - -0.41E-1	413 - 0.14E-1	414 - UNDEFINED
415 - UNDEFINED	416 - 0.33E-1	417 - 0.15E-1	418 - 0.11E-1	419 - 0.11E-1	420 - 0.11E-1
421 - 0.76E-4	501 - -0.12E-1	502 - -0.20E-1	503 - -0.68E-2	504 - -0.87E-2	505 - -0.18E-1
506 - -0.46E-2	507 - -0.69E-2	508 - -0.59E-3	601 - -0.20E-2	602 - 0.61E-2	603 - -0.22E-2
604 - -0.73E-2	605 - -0.32E-1	606 - -0.32E-1	607 - -0.40E-2	608 - -0.16E-1	609 - -0.14E-1
611 - -0.64E-2	701 - 0.10E-1	702 - -0.87E-2	703 - -0.82E-2	704 - -0.21E-2	705 - -0.84E-2
801 - 0.14E-2	802 - 0.47E-1	803 - 0.43E-1	804 - -0.13E-2	805 - 0.38E-2	806 - -0.90E-3
807 - 0.39E-2	808 - 0.37E-2	809 - -0.65E-2	810 - -0.96E-2	811 - -0.77E-2	812 - 0.12E-1
813 - 0.50E-1	814 - -0.73E-2	815 - -0.11E-3	816 - 0.29E-1	901 - 0.17E-2	902 - 0.13E-1
903 - -0.35E-3	904 - -0.35E-3	905 - 0.38E-3	1001 - -0.16E-2	1002 - 0.19E-1	1003 - -0.16E-1
1004 - -0.11E-2	1005 - -0.41E-2	1006 - -0.10E-1	1007 - 0.55E-2	1008 - 0.28E-2	1009 - -0.98E-2
1010 - -0.29E-2	1011 - -0.27E-2	1012 - -0.17E-2	1013 - -0.13E-1	1014 - -0.17E-2	1015 - 0.24E-1
1016 - 0.26E-1	1101 - -0.97E-2	1102 - -0.15E-1	1103 - 0.73E-2	1104 - -0.18E-2	1105 - -0.35E-1
1106 - -0.93E-2	1201 - 0.12E-2	1202 - -0.84E-2	1203 - -0.11E-1	1204 - -0.12E-1	1205 - -0.76E-2
1206 - -0.11E-1	1207 - -0.93E-2				

[Water Management Unit - Value]

Prepared by USEPA Wetlands Research Program, USEPA Environmental Research Lab, Corvallis, Oregon

FUTURE RISK

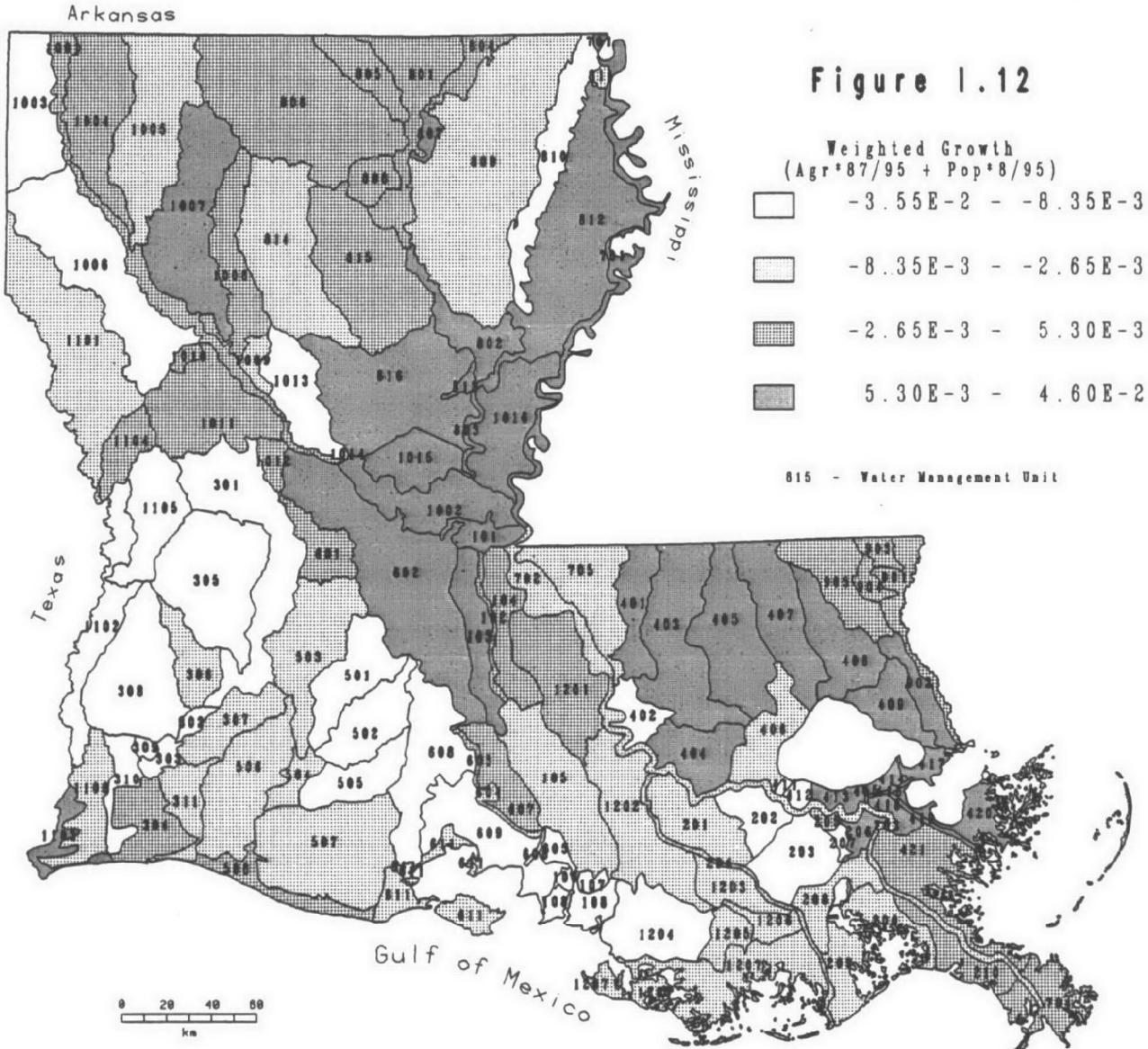


Figure 1.12

Weighted Growth
(Agr*87/95 + Pop*8/95)

- -3.55E-2 - -8.35E-3
- -8.35E-3 - -2.65E-3
- -2.65E-3 - 5.30E-3
- 5.30E-3 - 4.60E-2

815 - Water Management Unit

101 - 0.15E-1	102 - 0.46E-2	103 - 0.75E-2	104 - 0.56E-3	105 - -0.66E-2	106 - -0.29E-1
107 - -0.29E-1	108 - -0.29E-1	201 - -0.34E-2	202 - -0.21E-1	203 - -0.22E-1	204 - -0.69E-2
205 - 0.65E-3	206 - 0.11E-1	207 - -0.14E-1	208 - -0.62E-2	209 - -0.59E-2	210 - -0.16E-2
301 - -0.11E-1	302 - -0.17E-1	303 - -0.17E-1	304 - 0.49E-2	305 - -0.15E-1	306 - -0.62E-2
307 - -0.78E-2	308 - -0.11E-1	309 - -0.17E-1	310 - -0.12E-1	311 - -0.72E-2	401 - 0.88E-2
402 - -0.19E-1	403 - 0.75E-2	404 - 0.94E-2	405 - 0.83E-2	406 - -0.71E-2	407 - 0.59E-2
408 - 0.12E-1	409 - 0.18E-1	411 - -0.35E-1	412 - -0.35E-1	413 - 0.14E-1	414 - UNDEFINED
415 - UNDEFINED	416 - 0.30E-1	417 - 0.13E-1	418 - 0.11E-1	419 - 0.12E-1	420 - 0.11E-1
421 - 0.16E-2	501 - -0.10E-1	502 - -0.18E-1	503 - -0.58E-2	504 - -0.73E-2	505 - -0.14E-1
506 - -0.32E-2	507 - -0.52E-2	508 - 0.55E-3	601 - -0.69E-3	602 - 0.64E-2	603 - 0.33E-5
604 - -0.59E-2	605 - -0.29E-1	606 - -0.29E-1	607 - -0.25E-2	608 - -0.12E-1	609 - -0.12E-1
611 - -0.49E-2	701 - 0.93E-2	702 - -0.61E-2	703 - -0.68E-2	704 - -0.16E-2	705 - -0.56E-2
801 - 0.28E-2	802 - 0.43E-1	803 - 0.40E-1	804 - -0.54E-3	805 - 0.47E-2	806 - 0.39E-3
807 - 0.53E-2	808 - 0.52E-2	809 - -0.52E-2	810 - -0.89E-2	811 - -0.77E-2	812 - 0.10E-1
813 - 0.46E-1	814 - -0.60E-2	815 - 0.94E-3	816 - 0.28E-1	901 - 0.40E-2	902 - 0.18E-1
903 - 0.12E-3	904 - 0.12E-3	905 - 0.15E-2	1001 - -0.29E-3	1002 - 0.18E-1	1003 - -0.14E-1
1004 - 0.10E-2	1005 - -0.28E-2	1006 - -0.84E-2	1007 - 0.57E-2	1008 - 0.32E-2	1009 - -0.79E-2
1010 - -0.15E-2	1011 - -0.12E-2	1012 - -0.32E-3	1013 - -0.10E-1	1014 - -0.32E-3	1015 - 0.24E-1
1016 - 0.24E-1	1101 - -0.70E-2	1102 - -0.13E-1	1103 - 0.79E-2	1104 - 0.11E-2	1105 - -0.32E-1
1106 - -0.73E-2	1201 - 0.19E-2	1202 - -0.64E-2	1203 - -0.83E-2	1204 - -0.88E-2	1205 - -0.49E-2
1206 - -0.82E-2	1207 - -0.68E-2				

[Water Management Unit - Value]

Prepared by USEPA Wetlands Research Program, USEPA Environmental Research Lab, Corvallis, Oregon

APPENDIX II. Human population[1] (1970 and 1980), agricultural acreage[2] (1974 and 1982), and rare, threatened and endangered species[3] (RTE), by parish.

Parish	Population		Agricultural Acreage		RTE
	1970	1980	1974	1982	
Acadia	52109	56427	335658	275069	0
Allen	20794	21390	149060	132440	1
Ascension	37086	50068	56446	61025	1
Assumption	19654	22084	76634	73255	3
Avoyelles	37751	41393	261261	305128	0
Beauregard	22888	29692	159518	154349	4
Bienville	16024	16387	60979	68209	0
Bossier	64519	80721	130397	129471	0
Caddo	230184	252358	251413	219616	1
Calcasieu	145415	167223	408088	344320	0
Caldwell	9354	10761	60419	68427	0
Cameron	8194	9336	245323	260012	8
Catahoula	11769	12287	206581	288700	1
Claiborne	17024	17095	90191	87429	1
Concordia	22578	22981	219190	264548	1
Desoto	22764	25727	187547	166066	1
E. Baton Rouge	285167	366191	123485	89330	3
E. Carroll	12884	11772	228719	214717	0
E. Feliciana	17657	19015	155047	190789	4
Evangeline	31932	33343	206803	203792	0
Franklin	23946	24141	304928	262300	0
Grant	13671	16703	55498	48285	0
Iberia	57397	63752	110391	111002	1
Iberville	30746	32159	110719	97554	0
Jackson	15963	17321	38449	27299	0
Jefferson	337568	454592	7606	8591	3
Jefferson Davis	29554	32168	328212	315138	0
Lafayette	109716	150017	111550	86948	0
Lafourche	68941	82483	203876	185126	6
La Salle	13295	17004	17382	23128	1
Lincoln	33800	39763	65011	65091	0
Livingston	36511	58806	43336	43888	3
Madison	15065	15975	238239	252847	4
Morehouse	32463	34803	280722	277903	2
Natchitoches	35219	39863	251628	245788	3
Orleans	593471	557927	0	13	1

APPENDIX II (cont.)

Parish	Population		Agricultural Acreage		RTE
	1970	1980	1974	1982	
Ouachita	115387	139241	90754	93827	1
Plaquemines	25225	26049	38169	37543	3
Pointe Coupee	22002	24045	196567	199190	1
Rapides	118078	135282	213628	210741	1
Red River	9226	10433	119984	128964	0
Richland	21774	22187	274107	264340	1
Sabine	18638	25280	64414	65071	0
St. Bernard	51185	64097	7488	8155	4
St. Charles	29550	37259	57073	38412	7
St. Helena	9937	9827	68008	72927	0
St. James	19733	21495	46997	48560	1
St. John	23813	31924	26881	20879	4
St. Landry	80364	84128	309073	320063	0
St. Martin	32453	40214	91458	89853	1
St. Mary	60752	64253	117530	87262	6
St. Tammany	63585	110869	64969	71787	28
Tangipahoa	65875	80698	149800	154448	3
Tensas	9732	8525	228876	275288	1
Terrebonne	76049	94393	60392	56743	29
Union	18447	21167	76064	78373	0
Vermilion	43071	48458	374523	342652	6
Vernon	53794	53475	91337	63198	1
Washington	41987	44207	125926	125569	2
Webster	39939	43631	82648	77874	1
W. Baton Rouge	16864	19086	37498	42970	1
W. Carroll	13028	12922	184493	169227	0
W. Feliciana	11376	12186	125109	108155	1
Winn	16369	17253	29165	29163	0

Data Sources:

[1]U.S. Bureau of the Census 1972, 1982b.
[2]U.S. Bureau of the Census 1974, 1982a.
[3]Louisiana Dept. Wildlife and Fisheries 1988.

APPENDIX III. Hydrologic unit composition of parishes. Total area is given for each parish, along with the partial area for each component hydrologic unit (a hydrologic unit need not be entirely contained within one parish, but may cross several). The percent is the proportion of total parish area found in that hydrologic unit.

Parish/Unit	Area	Percent
Acadia	1705.1	100.00
501	454.0	26.63
502	859.3	50.40
503	68.8	4.03
504	66.7	3.91
505	255.7	14.99
608	0.6	0.03
Allen	1970.0	100.00
301	815.9	41.42
305	348.5	17.69
306	203.0	10.30
307	16.2	0.82
503	574.7	29.17
601	11.7	0.59
Ascension	803.5	100.00
201	20.9	2.60
204	9.1	1.14
402	79.6	9.90
403	57.4	7.15
404	486.2	60.51
406	0.1	0.01
703	76.1	9.47
1202	74.1	9.22
Assumption	970.6	100.00
105	0.0	0.00
201	219.7	22.63
204	66.7	6.87
1202	655.3	67.52
1204	28.8	2.97

Parish/Unit	Area	Percent
Avoyelles	2247.4	100.00
101	226.1	10.06
102	12.6	0.56
103	162.8	7.24
602	753.4	33.52
803	0.6	0.03
1002	873.0	38.84
1015	215.1	9.57
1016	3.8	0.17
Beauregard	3023.8	100.00
301	4.9	0.16
305	705.5	23.33
306	410.9	13.59
308	1252.7	41.43
1102	607.1	20.08
1105	42.7	1.41
Bienville	2120.0	100.00
806	8.7	0.41
814	447.2	21.10
1005	152.8	7.21
1007	974.4	45.96
1008	536.9	25.32
Bossier	2257.9	100.00
1001	272.6	12.07
1004	1625.4	71.99
1005	359.9	15.94
Caddo	2404.0	100.00
1001	210.3	8.75
1003	1398.2	58.16
1006	733.6	30.51
1101	61.9	2.58

Parish/Unit	Area	Percent
Calcasieu	2825.3	100.00
301	0.4	0.01
302	128.7	4.56
303	201.6	7.13
304	48.5	1.72
306	16.5	0.58
307	292.3	10.34
308	754.0	26.69
309	84.8	3.00
310	289.6	10.25
311	228.1	8.07
506	204.5	7.24
1102	237.0	8.39
1103	1.0	0.03
1106	338.3	11.97
Caldwell	1403.3	100.00
801	68.5	4.88
802	154.8	11.03
809	448.7	31.98
815	731.3	52.11
Cameron	4124.7	100.00
304	797.5	19.33
310	159.7	3.87
311	341.9	8.29
504	88.4	2.14
505	22.8	0.55
506	686.2	16.64
507	791.9	19.20
508	378.1	9.17
1103	358.0	8.68
1106	500.2	12.13

Parish/Unit	Area	Percent
Catahoula	1953.3	100.00
802	641.9	32.86
803	92.8	4.75
809	73.3	3.75
810	10.4	0.53
812	160.1	8.20
813	82.8	4.24
816	654.1	33.49
1002	31.4	1.61
1015	173.5	8.88
1016	32.9	1.68
Claiborne	1992.0	100.00
806	1367.3	68.64
1005	312.4	15.69
1007	312.2	15.67
Concordia	1915.8	100.00
101	47.7	2.49
701	318.0	16.60
702	27.4	1.43
802	0.0	0.00
803	32.3	1.68
812	50.5	2.64
1002	77.7	4.06
1016	1362.3	71.11
Desoto	2323.3	100.00
1006	1208.6	52.02
1101	1114.7	47.98
E. Baton Rouge	1201.5	100.00
401	305.1	25.39
402	225.6	18.78
403	337.0	28.05
702	73.0	6.08
703	25.2	2.09
705	235.6	19.61

Parish/Unit	Area	Percent
E. Carroll	1128.7	100.00
701	301.9	26.75
810	364.7	32.31
811	57.5	5.10
812	404.6	35.84
E. Feliciana	1175.5	100.00
401	457.5	38.92
403	435.1	37.02
702	5.0	0.42
705	277.9	23.64
Evangeline	1730.2	100.00
501	428.2	24.75
503	724.4	41.87
601	116.7	6.74
602	460.9	26.64
Franklin	1652.3	100.00
809	1043.3	63.14
810	423.6	25.64
812	185.3	11.22
Grant	1715.2	100.00
814	7.1	0.41
815	0.0	0.00
816	826.4	48.18
1001	53.5	3.12
1009	76.0	4.43
1013	752.1	43.85
Iberia	1660.3	100.00
105	292.8	17.63
604	88.3	5.32
607	317.6	19.13
608	2.9	0.18
609	562.5	33.88
611	382.9	23.06
1202	13.4	0.80

Parish/Unit	Area	Percent
Iberville	1675.2	100.00
104	143.3	8.55
105	347.0	20.72
402	107.5	6.42
703	116.3	6.94
1201	520.8	31.09
1202	440.3	26.28
Jackson	1495.4	100.00
801	1.9	0.13
806	126.2	8.44
808	10.0	0.67
814	623.4	41.69
815	733.9	49.08
Jefferson	802.4	100.00
203	20.2	2.52
205	68.5	8.53
206	128.8	16.05
207	63.9	7.96
208	132.2	16.47
209	214.6	26.74
412	0.2	0.02
413	106.9	13.32
703	67.3	8.38
Jefferson Davis	1703.7	100.00
301	65.3	3.83
302	0.4	0.02
306	25.1	1.48
307	462.9	27.17
503	239.7	14.07
504	139.1	8.17
506	771.1	45.26
Lafayette	681.7	100.00
505	98.2	14.40
602	1.0	0.14
603	0.0	0.00
608	554.4	81.33
609	28.1	4.13

Parish/Unit	Area	Percent
Lafourche	3055.5	100.00
201	442.5	14.48
202	115.5	3.78
203	457.1	14.96
204	221.1	7.24
208	348.5	11.41
209	557.9	18.26
1202	108.5	3.55
1203	335.4	10.98
1206	175.5	5.74
1207	293.5	9.61
La Salle	1703.0	100.00
802	1.2	0.07
814	0.1	0.01
815	366.9	21.54
816	1187.9	69.75
1015	146.9	8.62
Lincoln	1220.7	100.00
806	1016.2	83.25
814	204.1	16.72
1008	0.4	0.03
Livingston	1763.2	100.00
403	866.5	49.14
404	133.5	7.57
405	667.9	37.88
406	95.3	5.40
Madison	1618.9	100.00
701	192.2	11.87
810	152.4	9.41
812	1274.3	78.71
Morehouse	2079.0	100.00
801	426.5	20.52
804	392.9	18.90
807	3.3	0.16
809	1256.3	60.43

Parish/Unit	Area	Percent
Natchitoches	3361.2	100.00
301	96.1	2.86
1001	276.9	8.24
1006	549.6	16.35
1007	414.6	12.33
1008	414.4	12.33
1010	107.8	3.21
1011	1501.0	44.66
1012	0.2	0.01
1013	0.6	0.02
Orleans	522.5	100.00
206	18.3	3.51
413	81.5	15.60
414	116.6	22.31
415	13.8	2.64
416	35.3	6.76
417	178.2	34.11
418	3.6	0.69
419	0.7	0.14
420	12.3	2.35
703	62.1	11.89
Ouachita	1641.5	100.00
801	452.2	27.54
804	0.1	0.00
805	0.4	0.02
806	182.2	11.10
807	143.4	8.74
808	379.1	23.10
809	481.2	29.32
815	3.0	0.18

Parish/Unit	Area	Percent
Plaquemines	2899.7	100.00
206	54.9	1.89
208	69.4	2.39
209	261.7	9.02
210	581.4	20.05
418	1.4	0.05
421	875.0	30.18
703	311.5	10.74
704	744.6	25.68
Pointe Coupee	1544.4	100.00
101	28.9	1.87
102	63.5	4.11
104	587.2	38.02
702	173.1	11.21
1201	691.7	44.79
Rapides	3522.5	100.00
301	620.0	17.60
305	44.3	1.26
601	485.9	13.79
602	1177.3	33.42
816	212.2	6.02
1001	87.5	2.48
1002	280.0	7.95
1011	54.3	1.54
1012	221.7	6.30
1013	72.0	2.04
1014	12.2	0.35
1015	255.0	7.24
Red River	1046.0	100.00
1001	281.9	26.95
1004	0.3	0.03
1005	43.2	4.13
1006	221.9	21.21
1007	498.8	47.69
Richland	1457.3	100.00
809	1387.3	95.19
810	70.0	4.81

Parish/Unit	Area	Percent
Sabine	2630.1	100.00
1006	165.2	6.28
1011	216.3	8.22
1101	1712.8	65.12
1104	498.6	18.96
1105	37.3	1.42
St. Bernard	1047.7	100.00
416	0.7	0.07
417	2.5	0.24
418	171.7	16.39
419	85.8	8.19
420	469.2	44.78
421	309.8	29.57
703	8.0	0.76
St. Charles	947.6	100.00
202	191.2	20.17
203	499.5	52.71
205	5.2	0.55
206	0.0	0.00
207	15.0	1.59
208	0.0	0.00
406	9.4	1.00
411	34.2	3.61
412	116.6	12.30
413	0.6	0.07
703	75.8	8.00
St. Helena	1057.0	100.00
403	358.1	33.88
405	629.4	59.55
407	69.5	6.57
St. James	643.5	100.00
201	272.3	42.32
202	35.5	5.52
404	246.0	38.23
406	0.2	0.03
703	89.5	13.90

Parish/Unit	Area	Percent
St. John	780.8	100.00
201	18.2	2.34
202	189.1	24.21
404	15.9	2.04
406	497.5	63.71
703	60.1	7.70
St. Landry	2396.4	100.00
102	71.7	2.99
103	532.5	22.22
104	0.3	0.01
105	0.1	0.00
501	209.3	8.73
502	130.0	5.42
602	1191.3	49.71
608	261.3	10.90
St. Martin	2100.9	100.00
102	11.2	0.53
103	95.1	4.53
104	63.6	3.03
105	1034.9	49.26
602	133.0	6.33
603	70.7	3.37
604	1.4	0.06
607	313.8	14.94
608	220.0	10.47
609	36.7	1.75
1202	120.5	5.74
St. Mary	1708.0	100.00
105	197.0	11.54
106	58.2	3.41
107	101.5	5.94
108	444.1	26.00
604	27.7	1.62
605	164.1	9.61
606	28.4	1.66
607	63.7	3.73
609	502.3	29.41
611	4.0	0.23

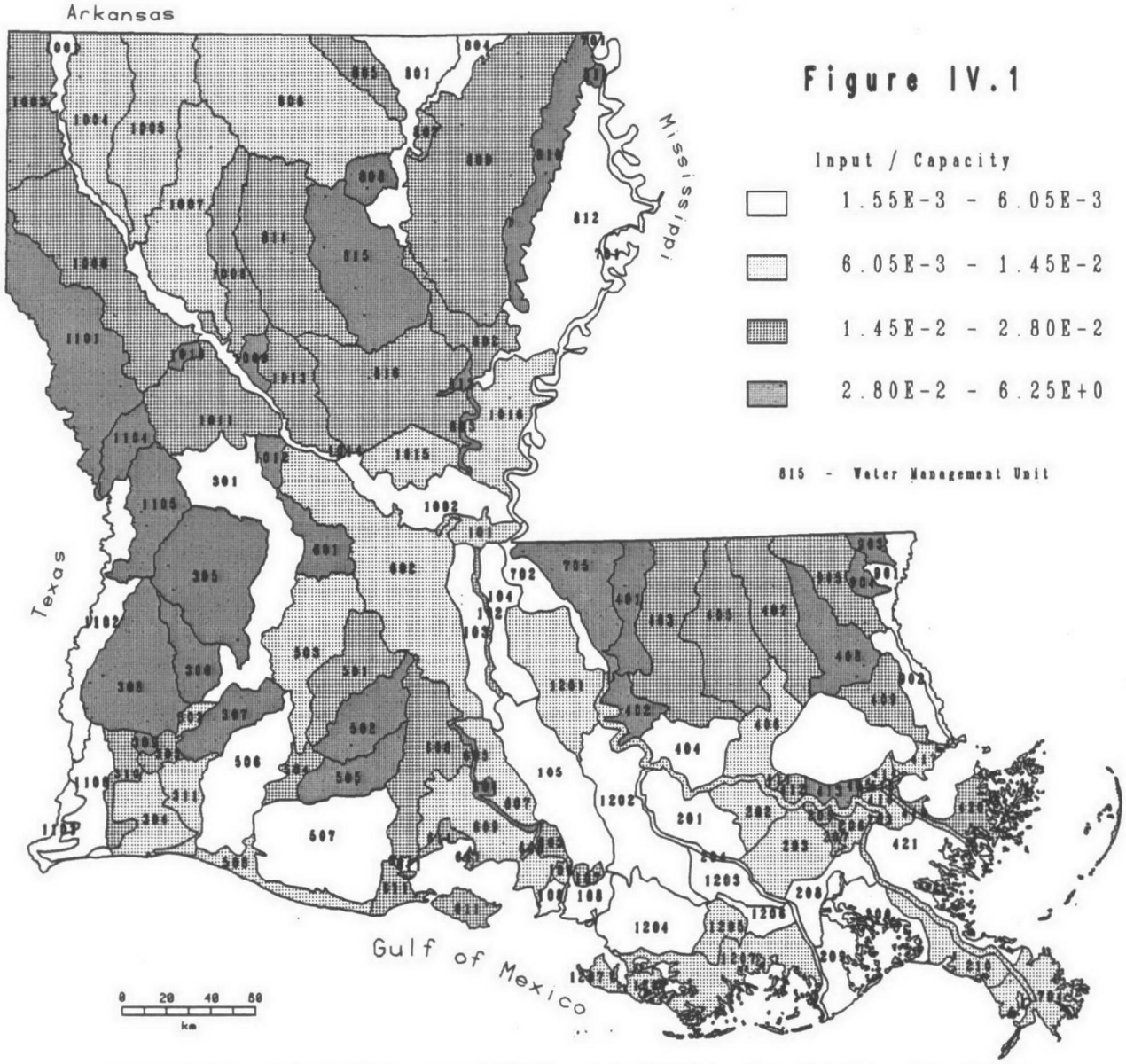
Parish/Unit	Area	Percent
St. Mary's (cont.)		
1202	48.1	2.82
1204	68.9	4.03
St. Tammany	2260.7	100.00
407	51.6	2.28
408	802.0	35.47
409	688.2	30.44
417	8.1	0.36
901	174.3	7.71
902	455.0	20.13
905	81.6	3.61
Tangipahoa	2058.7	100.00
405	393.0	19.09
406	264.4	12.84
407	1239.5	60.21
408	110.6	5.37
905	51.3	2.49
Tensas	1684.4	100.00
701	311.8	18.51
812	1369.1	81.28
1016	3.5	0.21
Terrebonne	3496.7	100.00
108	14.3	0.41
1202	262.4	7.50
1203	176.2	5.04
1204	1185.1	33.89
1205	363.8	10.40
1206	110.5	3.16
1207	1384.5	39.59
Union	2323.8	100.00
801	498.0	21.43
805	637.0	27.41
806	1188.8	51.16

Parish/Unit	Area	Percent
Vermilion	3358.2	100.00
504	23.0	0.68
505	437.5	13.03
507	1612.8	48.02
508	161.9	4.82
608	523.7	15.59
609	229.4	6.83
611	369.9	11.02
Vernon	3512.0	100.00
301	854.4	24.33
305	1160.1	33.03
1011	7.2	0.20
1102	379.9	10.82
1104	36.8	1.05
1105	1073.7	30.57
Washington	1786.4	100.00
408	177.7	9.95
901	402.7	22.54
903	185.6	10.39
904	193.6	10.84
905	826.8	46.28
Webster	1598.6	100.00
1004	71.4	4.47
1005	1393.9	87.20
1007	133.2	8.33
W. Baton Rouge	515.4	100.00
702	63.1	12.25
703	45.5	8.84
1201	406.7	78.91
W. Carroll	947.0	100.00
809	665.2	70.24
810	281.8	29.76

Parish/Unit	Area	Percent
W. Feliciana	1097.7	100.00
101	36.9	3.36
702	312.8	28.49
705	748.0	68.14
Winn	2473.1	100.00
814	1143.1	46.22
815	606.5	24.52
816	63.1	2.55
1001	17.7	0.72
1008	257.5	10.41
1009	138.3	5.59
1013	247.0	9.99

APPENDIX IV. Derived index maps.

HYDROLOGIC SENSITIVITY

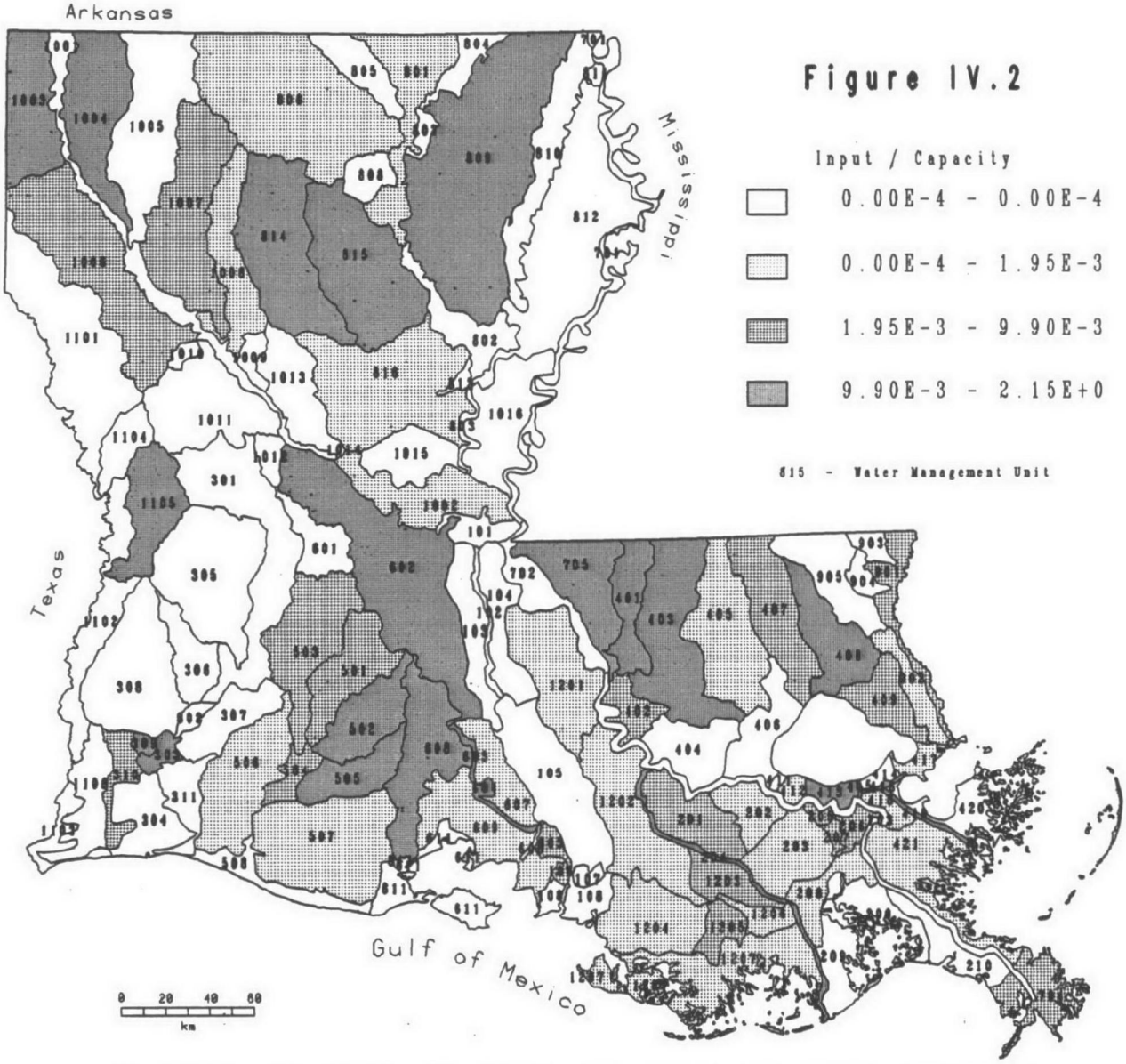


101 - 0.69E-2	102 - 0.15E-1	103 - 0.39E-2	104 - 0.60E-2	105 - 0.15E-2	106 - 0.12E-1
107 - 0.15E-1	108 - 0.57E-2	201 - 0.25E-2	202 - 0.62E-2	203 - 0.61E-2	204 - 0.37E-2
205 - 0.26E-1	206 - 0.95E-2	207 - 0.16E-1	208 - 0.55E-2	209 - 0.48E-2	210 - 0.61E-2
301 - 0.52E-2	302 - 0.11E-1	303 - 0.22E-1	304 - 0.74E-2	305 - 0.34E-1	306 - 0.19E+0
307 - 0.32E-1	308 - 0.76E-1	309 - 0.33E+0	310 - 0.16E-1	311 - 0.70E-2	401 - 0.33E+0
402 - 0.34E-1	403 - 0.15E-1	404 - 0.29E-2	405 - 0.17E-1	406 - 0.12E-1	407 - 0.18E-1
408 - 0.38E-1	409 - 0.21E-1	411 - 0.23E-1	412 - 0.15E-1	413 - 0.52E+0	414 - 0.96E-2
415 - UNDEFINED	416 - 0.15E-1	417 - 0.10E-1	418 - 0.11E-1	419 - 0.73E-2	420 - 0.15E-1
421 - 0.56E-2	501 - 0.16E-1	502 - 0.47E-1	503 - 0.71E-2	504 - 0.16E-1	505 - 0.33E-1
506 - 0.52E-2	507 - 0.35E-2	508 - 0.14E-1	601 - 0.31E-1	602 - 0.62E-2	603 - UNDEFINED
604 - 0.23E+0	605 - 0.18E-1	606 - 0.19E-1	607 - 0.62E-2	608 - 0.25E-1	609 - 0.89E-2
611 - 0.23E-1	701 - 0.18E-2	702 - 0.27E-2	703 - 0.65E-2	704 - 0.11E-1	705 - 0.71E-1
801 - 0.43E-2	802 - 0.17E-1	803 - 0.31E-1	804 - 0.51E-2	805 - 0.18E-1	806 - 0.81E-2
807 - 0.28E-1	808 - 0.54E-1	809 - 0.20E-1	810 - 0.20E+0	811 - 0.33E+0	812 - 0.49E-2
813 - 0.49E+0	814 - 0.22E-1	815 - 0.66E-1	816 - 0.17E-1	901 - 0.32E-2	902 - 0.39E-2
903 - 0.61E+1	904 - 0.47E+0	905 - 0.28E-1	1001 - 0.24E-2	1002 - 0.34E-2	1003 - 0.27E-1
1004 - 0.92E-2	1005 - 0.10E-1	1006 - 0.22E-1	1007 - 0.11E-1	1008 - 0.19E-1	1009 - 0.11E+0
1010 - 0.18E+1	1011 - 0.18E-1	1012 - 0.20E+0	1013 - 0.18E-1	1014 - 0.62E+1	1015 - 0.82E-2
1016 - 0.64E-2	1101 - 0.52E-1	1102 - 0.38E-2	1103 - 0.23E-2	1104 - 0.20E+1	1105 - 0.12E+0
1106 - 0.35E-2	1201 - 0.84E-2	1202 - 0.40E-2	1203 - 0.47E-2	1204 - 0.26E-2	1205 - 0.73E-2
1206 - 0.60E-2	1207 - 0.86E-2				

[Water Management Unit - Value]

Prepared by USEPA Wetlands Research Program, USEPA Environmental Research Lab, Corvallis, Oregon

WATER QUALITY SENSITIVITY (NON-NORMALIZED)

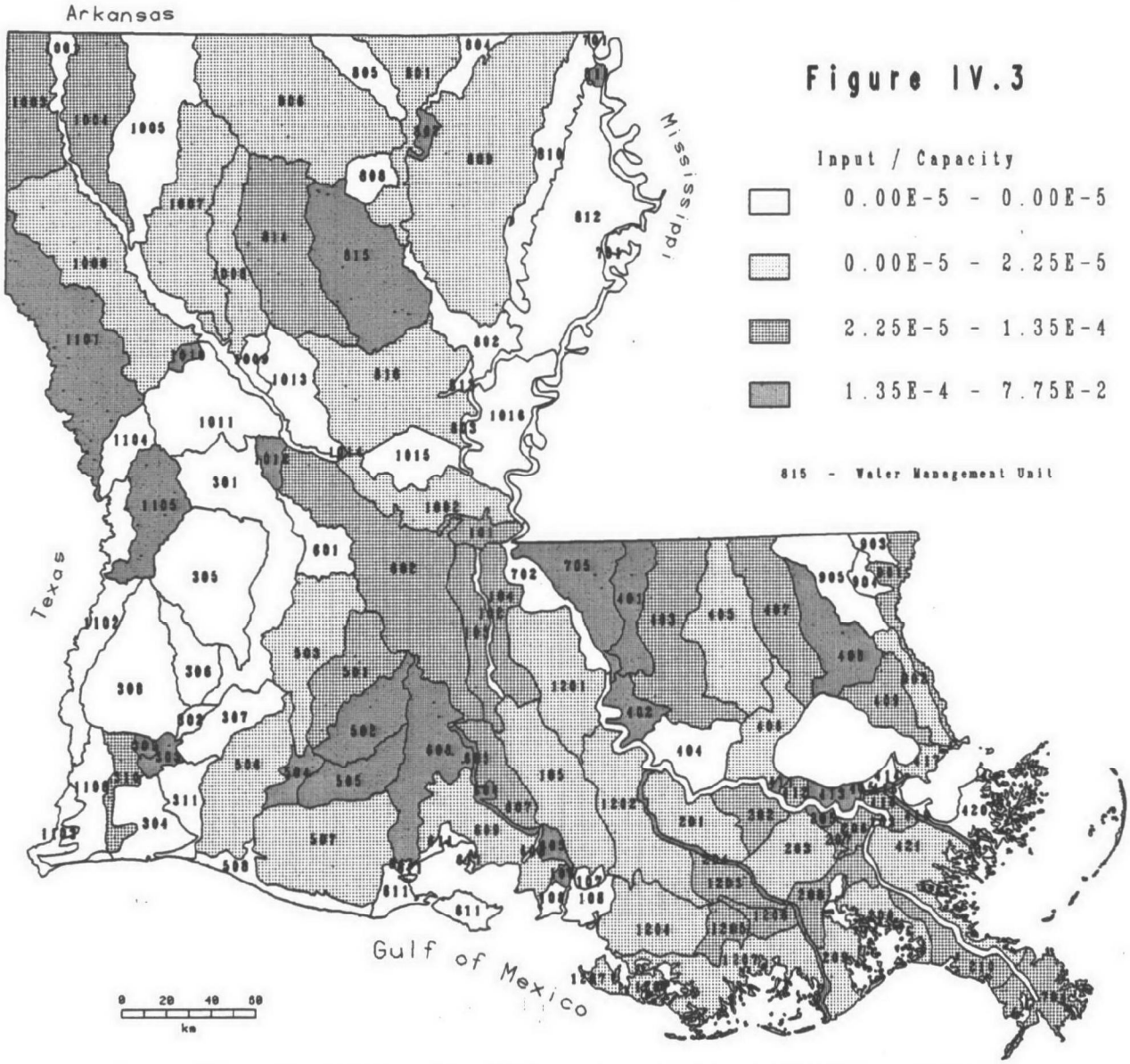


101 - 0.00E+0	102 - 0.00E+0	103 - 0.00E+0	104 - 0.00E+0	105 - 0.00E+0	106 - 0.72E-2
107 - 0.00E+0	108 - 0.00E+0	201 - 0.20E-2	202 - 0.32E-3	203 - 0.46E-3	204 - 0.66E-1
205 - 0.70E-2	206 - 0.27E-2	207 - 0.23E-2	208 - 0.16E-2	209 - 0.00E+0	210 - 0.00E+0
301 - 0.00E+0	302 - 0.00E+0	303 - 0.13E-1	304 - 0.00E+0	305 - 0.00E+0	306 - 0.00E+0
307 - 0.00E+0	308 - 0.00E+0	309 - 0.88E-1	310 - 0.20E-2	311 - 0.00E+0	401 - 0.57E-1
402 - 0.92E-2	403 - 0.11E-1	404 - 0.00E+0	405 - 0.15E-2	406 - 0.00E+0	407 - 0.94E-2
408 - 0.21E-1	409 - 0.93E-2	411 - 0.00E+0	412 - 0.15E-2	413 - 0.91E-1	414 - 0.00E+0
415 - UNDEFINED	416 - 0.34E-1	417 - 0.39E-3	418 - 0.12E-2	419 - 0.40E-1	420 - 0.00E+0
421 - 0.45E-3	501 - 0.90E-2	502 - 0.19E-1	503 - 0.24E-2	504 - 0.56E-2	505 - 0.23E-1
506 - 0.13E-2	507 - 0.55E-3	508 - 0.00E+0	601 - 0.00E+0	602 - 0.11E-1	603 - UNDEFINED
604 - 0.21E+1	605 - 0.46E-2	606 - 0.00E+0	607 - 0.16E-2	608 - 0.22E-1	609 - 0.40E-3
611 - 0.00E+0	701 - 0.00E+0	702 - 0.00E+0	703 - 0.00E+0	704 - 0.53E-2	705 - 0.16E-1
801 - 0.50E-3	802 - 0.00E+0	803 - 0.00E+0	804 - 0.00E+0	805 - 0.00E+0	806 - 0.96E-3
807 - 0.00E+0	808 - 0.00E+0	809 - 0.13E-1	810 - 0.00E+0	811 - 0.00E+0	812 - 0.00E+0
813 - 0.00E+0	814 - 0.14E-1	815 - 0.24E-1	816 - 0.48E-3	901 - 0.51E-2	902 - 0.19E-2
903 - 0.00E+0	904 - 0.00E+0	905 - 0.00E+0	1001 - 0.00E+0	1002 - 0.14E-2	1003 - 0.17E-1
1004 - 0.10E-1	1005 - 0.00E+0	1006 - 0.32E-2	1007 - 0.38E-2	1008 - 0.12E-2	1009 - 0.00E+0
1010 - 0.00E+0	1011 - 0.00E+0	1012 - 0.00E+0	1013 - 0.00E+0	1014 - 0.00E+0	1015 - 0.00E+0
1016 - 0.00E+0	1101 - 0.00E+0	1102 - 0.00E+0	1103 - 0.00E+0	1104 - 0.00E+0	1105 - 0.18E-1
1106 - 0.00E+0	1201 - 0.94E-3	1202 - 0.18E-2	1203 - 0.53E-2	1204 - 0.79E-3	1205 - 0.51E-2
1206 - 0.85E-3	1207 - 0.11E-2				

[Water Management Unit - Value]

Prepared by USEPA Wetlands Research Program, USEPA Environmental Research Lab, Corvallis, Oregon

WATER QUALITY SENSITIVITY (NORMALIZED)

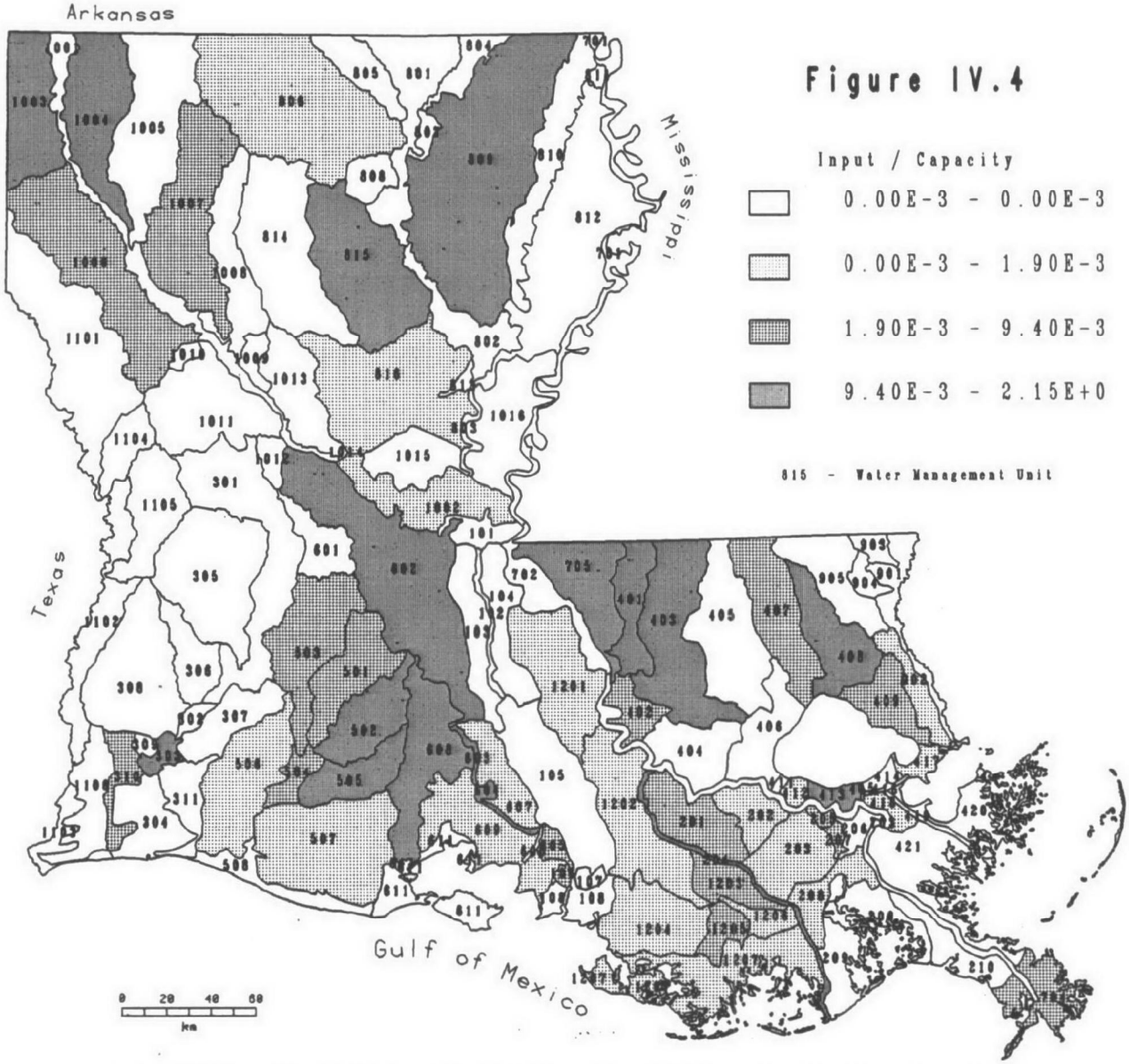


101 - 0.10E-3	102 - 0.00E+0	103 - 0.31E-4	104 - 0.40E-4	105 - 0.69E-5	106 - 0.25E-3
107 - 0.00E+0	108 - 0.00E+0	201 - 0.17E-4	202 - 0.28E-4	203 - 0.16E-4	204 - 0.41E-3
205 - 0.17E-3	206 - 0.11E-3	207 - 0.12E-3	208 - 0.24E-4	209 - 0.10E-4	210 - 0.29E-4
301 - 0.00E+0	302 - 0.00E+0	303 - 0.29E-3	304 - 0.00E+0	305 - 0.00E+0	306 - 0.00E+0
307 - 0.00E+0	308 - 0.00E+0	309 - 0.46E-2	310 - 0.34E-4	311 - 0.00E+0	401 - 0.55E-3
402 - 0.32E-3	403 - 0.31E-4	404 - 0.00E+0	405 - 0.59E-5	406 - 0.21E-4	407 - 0.53E-4
408 - 0.14E-3	409 - 0.89E-4	411 - 0.42E-3	412 - 0.12E-3	413 - 0.17E-2	414 - 0.00E+0
415 - UNDEFINED	416 - 0.14E-2	417 - 0.17E-4	418 - 0.32E-4	419 - 0.69E-3	420 - 0.00E+0
421 - 0.57E-5	501 - 0.65E-4	502 - 0.24E-3	503 - 0.22E-4	504 - 0.20E-3	505 - 0.24E-3
506 - 0.19E-4	507 - 0.86E-5	508 - 0.00E+0	601 - 0.00E+0	602 - 0.34E-4	603 - UNDEFINED
604 - 0.33E-1	605 - 0.28E-3	606 - 0.00E+0	607 - 0.11E-3	608 - 0.14E-3	609 - 0.37E-5
611 - 0.00E+0	701 - 0.00E+0	702 - 0.00E+0	703 - 0.00E+0	704 - 0.25E-4	705 - 0.14E-3
801 - 0.29E-5	802 - 0.00E+0	803 - 0.00E+0	804 - 0.00E+0	805 - 0.00E+0	806 - 0.30E-5
807 - 0.11E-2	808 - 0.00E+0	809 - 0.18E-4	810 - 0.00E+0	811 - 0.26E-1	812 - 0.00E+0
813 - 0.00E+0	814 - 0.11E-3	815 - 0.14E-3	816 - 0.21E-5	901 - 0.26E-4	902 - 0.13E-4
903 - 0.00E+0	904 - 0.00E+0	905 - 0.00E+0	1001 - 0.00E+0	1002 - 0.67E-5	1003 - 0.89E-4
1004 - 0.30E-4	1005 - 0.00E+0	1006 - 0.18E-4	1007 - 0.18E-4	1008 - 0.11E-4	1009 - 0.00E+0
1010 - 0.30E-1	1011 - 0.00E+0	1012 - 0.19E-2	1013 - 0.00E+0	1014 - 0.77E-1	1015 - 0.00E+0
1016 - 0.00E+0	1101 - 0.19E-3	1102 - 0.00E+0	1103 - 0.00E+0	1104 - 0.00E+0	1105 - 0.14E-3
1106 - 0.00E+0	1201 - 0.41E-5	1202 - 0.99E-5	1203 - 0.40E-4	1204 - 0.74E-5	1205 - 0.42E-4
1206 - 0.44E-4	1207 - 0.66E-5				

[Water Management Unit - Value]

Prepared by USEPA Wetlands Research Program, USEPA Environmental Research Lab, Corvallis, Oregon

NON-POINT WATER QUALITY SENSITIVITY (NON-NORMALIZED)

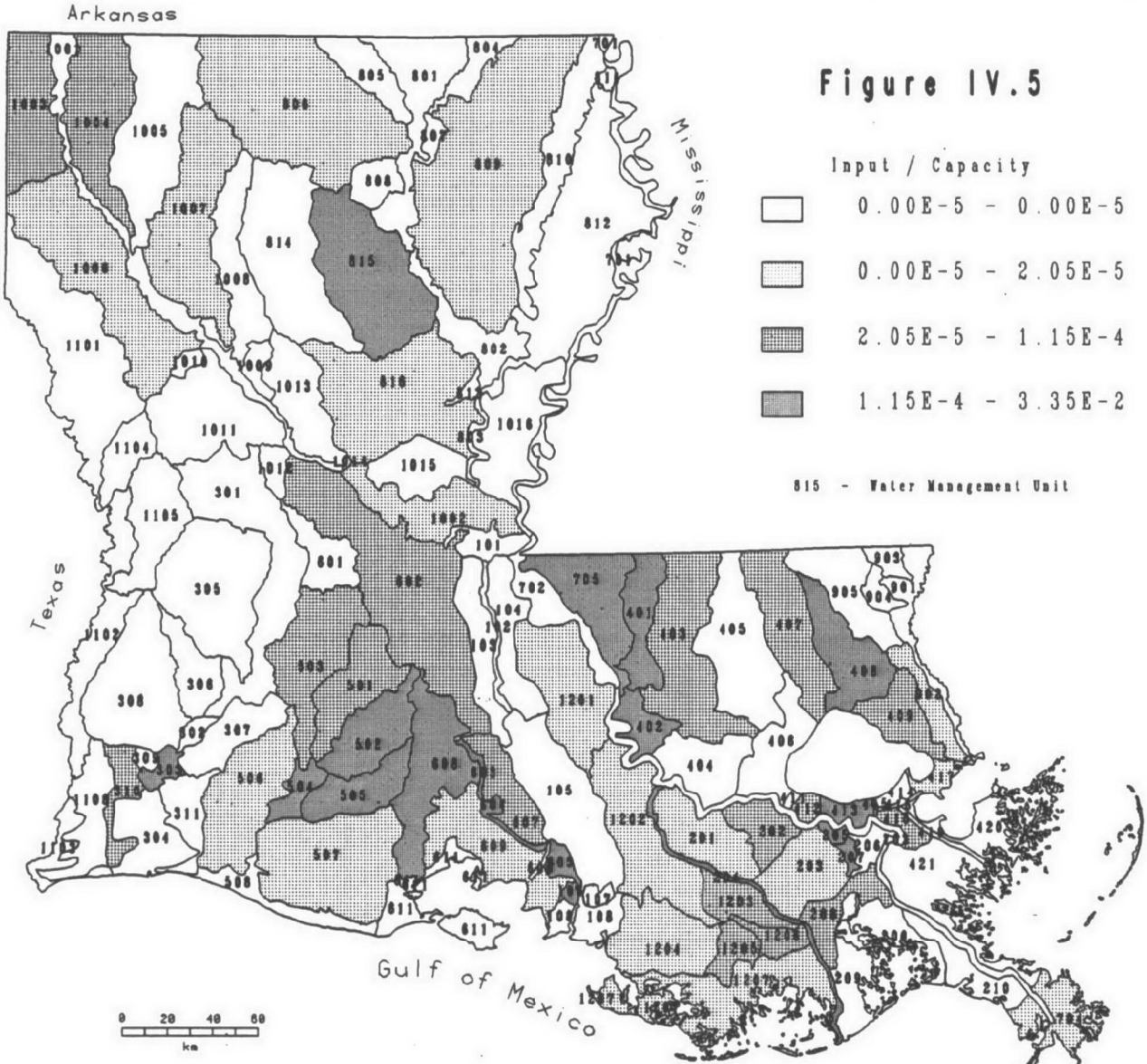


101 - 0.00E+0	102 - 0.00E+0	103 - 0.00E+0	104 - 0.00E+0	105 - 0.00E+0	106 - 0.72E-2
107 - 0.00E+0	108 - 0.00E+0	201 - 0.20E-2	202 - 0.32E-3	203 - 0.46E-3	204 - 0.66E-1
205 - 0.70E-2	206 - 0.00E+0	207 - 0.23E-2	208 - 0.16E-2	209 - 0.00E+0	210 - 0.00E+0
301 - 0.00E+0	302 - 0.00E+0	303 - 0.13E-1	304 - 0.00E+0	305 - 0.00E+0	306 - 0.00E+0
307 - 0.00E+0	308 - 0.00E+0	309 - 0.00E+0	310 - 0.20E-2	311 - 0.00E+0	401 - 0.57E-1
402 - 0.92E-2	403 - 0.11E-1	404 - 0.00E+0	405 - 0.00E+0	406 - 0.00E+0	407 - 0.94E-2
408 - 0.21E-1	409 - 0.93E-2	411 - 0.00E+0	412 - 0.77E-3	413 - 0.91E-1	414 - 0.00E+0
416 - UNDEFINED	418 - 0.00E+0	417 - 0.39E-3	418 - 0.12E-2	419 - 0.00E+0	420 - 0.00E+0
421 - 0.00E+0	501 - 0.90E-2	502 - 0.19E-1	503 - 0.24E-2	504 - 0.56E-2	505 - 0.23E-1
506 - 0.13E-2	507 - 0.55E-3	508 - 0.00E+0	601 - 0.00E+0	602 - 0.11E-1	603 - UNDEFINED
604 - 0.21E+1	605 - 0.46E-2	606 - 0.00E+0	607 - 0.16E-2	608 - 0.22E-1	609 - 0.17E-3
611 - 0.00E+0	701 - 0.00E+0	702 - 0.00E+0	703 - 0.00E+0	704 - 0.33E-2	705 - 0.16E-1
801 - 0.00E+0	802 - 0.00E+0	803 - 0.00E+0	804 - 0.00E+0	805 - 0.00E+0	806 - 0.96E-3
807 - 0.00E+0	808 - 0.00E+0	809 - 0.13E-1	810 - 0.00E+0	811 - 0.00E+0	812 - 0.00E+0
813 - 0.00E+0	814 - 0.00E+0	815 - 0.24E-1	816 - 0.48E-3	901 - 0.00E+0	902 - 0.19E-2
903 - 0.00E+0	904 - 0.00E+0	905 - 0.00E+0	1001 - 0.00E+0	1002 - 0.14E-2	1003 - 0.17E-1
1004 - 0.10E-1	1005 - 0.00E+0	1006 - 0.32E-2	1007 - 0.38E-2	1008 - 0.00E+0	1009 - 0.00E+0
1010 - 0.00E+0	1011 - 0.00E+0	1012 - 0.00E+0	1013 - 0.00E+0	1014 - 0.00E+0	1015 - 0.00E+0
1016 - 0.00E+0	1101 - 0.00E+0	1102 - 0.00E+0	1103 - 0.00E+0	1104 - 0.00E+0	1105 - 0.00E+0
1106 - 0.00E+0	1201 - 0.94E-3	1202 - 0.18E-2	1203 - 0.53E-2	1204 - 0.79E-3	1205 - 0.51E-2
1206 - 0.85E-3	1207 - 0.11E-2				

[Water Management Unit - Value]

Prepared by USEPA Wetlands Research Program, USEPA Environmental Research Lab, Corvallis, Oregon

NON-POINT WATER QUALITY SENSITIVITY (NORMALIZED)

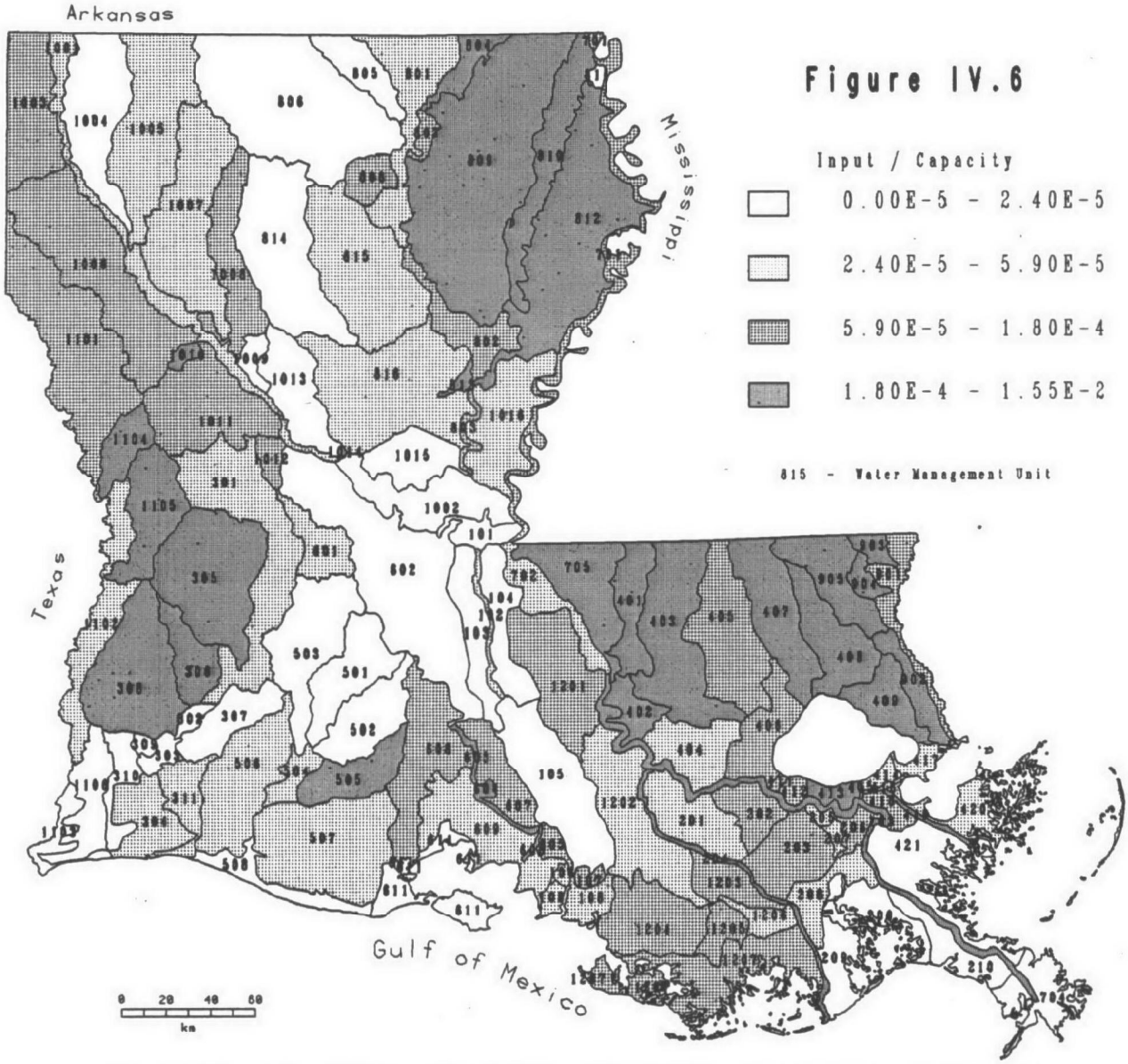


101 - 0.00E+0	102 - 0.00E+0	103 - 0.00E+0	104 - 0.00E+0	105 - 0.00E+0	106 - 0.25E-3
107 - 0.00E+0	108 - 0.00E+0	201 - 0.17E-4	202 - 0.28E-4	203 - 0.16E-4	204 - 0.41E-3
205 - 0.17E-3	206 - 0.00E+0	207 - 0.12E-3	208 - 0.24E-4	209 - 0.00E+0	210 - 0.00E+0
301 - 0.00E+0	302 - 0.00E+0	303 - 0.29E-3	304 - 0.00E+0	305 - 0.00E+0	306 - 0.00E+0
307 - 0.00E+0	308 - 0.00E+0	309 - 0.00E+0	310 - 0.34E-4	311 - 0.00E+0	401 - 0.55E-3
402 - 0.32E-3	403 - 0.31E-4	404 - 0.00E+0	405 - 0.00E+0	406 - 0.00E+0	407 - 0.53E-4
408 - 0.14E-3	409 - 0.89E-4	411 - 0.00E+0	412 - 0.60E-4	413 - 0.17E-2	414 - 0.00E+0
415 - UNDEFINED	416 - 0.00E+0	417 - 0.17E-4	418 - 0.32E-4	419 - 0.00E+0	420 - 0.00E+0
421 - 0.00E+0	501 - 0.85E-4	502 - 0.24E-3	503 - 0.22E-4	504 - 0.20E-3	505 - 0.24E-3
506 - 0.19E-4	507 - 0.86E-5	508 - 0.00E+0	601 - 0.00E+0	602 - 0.34E-4	603 - UNDEFINED
604 - 0.33E-1	605 - 0.28E-3	606 - 0.00E+0	607 - 0.11E-3	608 - 0.14E-3	609 - 0.16E-5
611 - 0.00E+0	701 - 0.00E+0	702 - 0.00E+0	703 - 0.00E+0	704 - 0.15E-4	705 - 0.14E-3
801 - 0.00E+0	802 - 0.00E+0	803 - 0.00E+0	804 - 0.00E+0	805 - 0.00E+0	806 - 0.30E-5
807 - 0.00E+0	808 - 0.00E+0	809 - 0.18E-4	810 - 0.00E+0	811 - 0.00E+0	812 - 0.00E+0
813 - 0.00E+0	814 - 0.00E+0	815 - 0.14E-3	816 - 0.21E-5	901 - 0.00E+0	902 - 0.13E-4
903 - 0.00E+0	904 - 0.00E+0	905 - 0.00E+0	1001 - 0.00E+0	1002 - 0.67E-5	1003 - 0.89E-4
1004 - 0.30E-4	1005 - 0.00E+0	1006 - 0.18E-4	1007 - 0.18E-4	1008 - 0.00E+0	1009 - 0.00E+0
1010 - 0.00E+0	1011 - 0.00E+0	1012 - 0.00E+0	1013 - 0.00E+0	1014 - 0.00E+0	1015 - 0.00E+0
1016 - 0.00E+0	1101 - 0.00E+0	1102 - 0.00E+0	1103 - 0.00E+0	1104 - 0.00E+0	1105 - 0.00E+0
1106 - 0.00E+0	1201 - 0.41E-5	1202 - 0.99E-5	1203 - 0.40E-4	1204 - 0.74E-5	1205 - 0.42E-4
1206 - 0.44E-4	1207 - 0.68E-5				

[Water Management Unit - Value]

Prepared by USEPA Wetlands Research Program, USEPA Environmental Research Lab, Corvallis, Oregon

LIFE SUPPORT SENSITIVITY

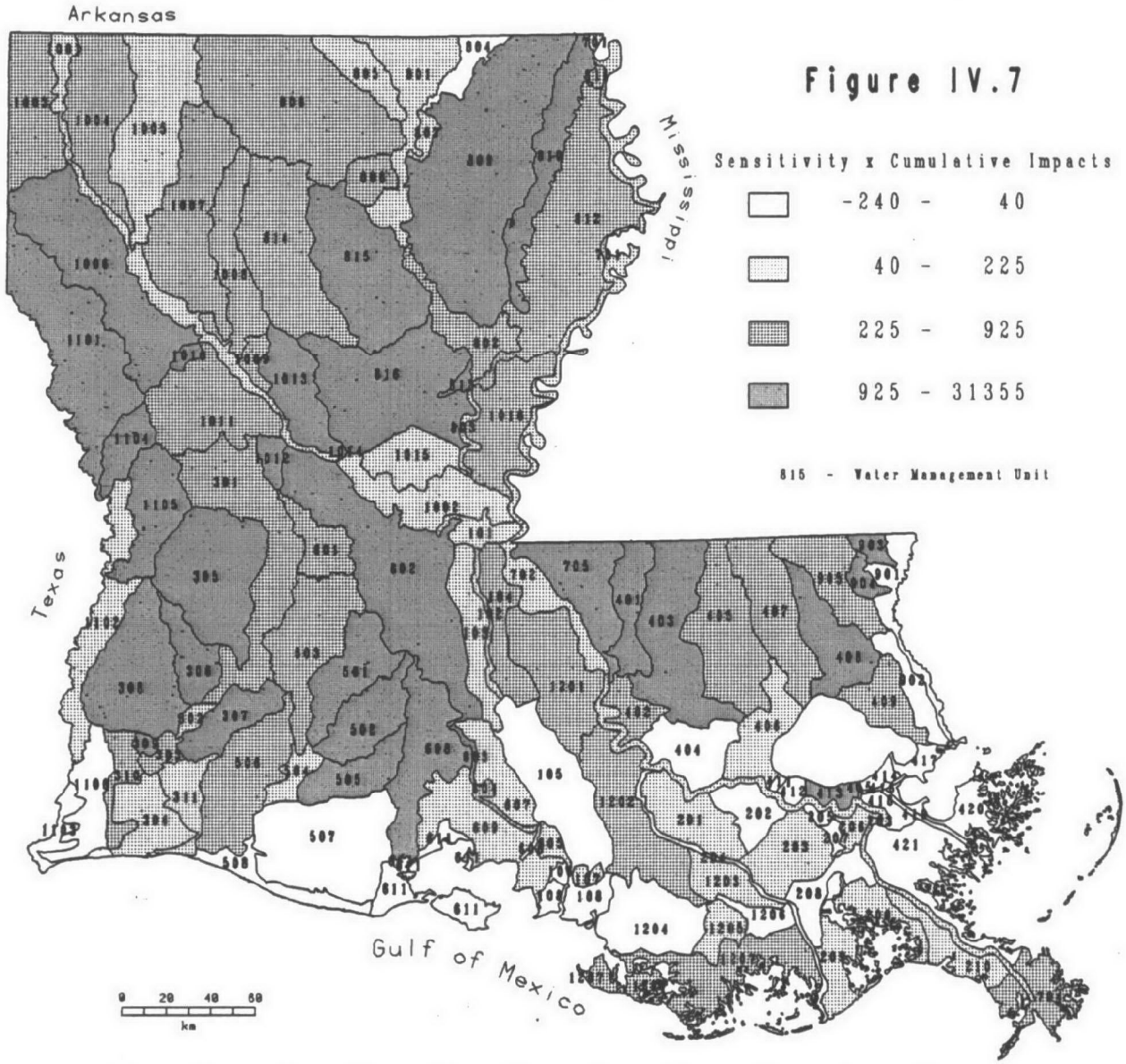


101 - 0.80E-5	102 - 0.30E-4	103 - 0.14E-5	104 - 0.16E-4	105 - 0.94E-5	106 - 0.51E-4
107 - 0.76E-4	108 - 0.39E-4	201 - 0.35E-4	202 - 0.76E-4	203 - 0.74E-4	204 - 0.27E-3
205 - 0.49E-4	206 - 0.65E-4	207 - 0.42E-4	208 - 0.91E-4	209 - 0.23E-4	210 - 0.17E-4
301 - 0.30E-4	302 - 0.00E+0	303 - 0.00E+0	304 - 0.38E-4	305 - 0.18E-3	306 - 0.97E-3
307 - 0.15E-5	308 - 0.46E-3	309 - 0.00E+0	310 - 0.19E-4	311 - 0.37E-4	401 - 0.69E-2
402 - 0.21E-3	403 - 0.27E-3	404 - 0.40E-4	405 - 0.13E-3	406 - 0.67E-4	407 - 0.25E-3
408 - 0.21E-2	409 - 0.80E-3	411 - 0.11E-3	412 - 0.10E-3	413 - 0.93E-3	414 - 0.29E-4
415 - UNDEFINED	416 - 0.10E-3	417 - 0.37E-4	418 - 0.69E-4	419 - 0.23E-3	420 - 0.43E-4
421 - 0.24E-4	501 - 0.00E+0	502 - 0.00E+0	503 - 0.68E-5	504 - 0.44E-4	505 - 0.19E-3
506 - 0.26E-4	507 - 0.38E-4	508 - 0.20E-4	601 - 0.37E-4	602 - 0.13E-4	603 - UNDEFINED
604 - 0.50E-2	605 - 0.16E-3	606 - 0.19E-3	607 - 0.64E-4	608 - 0.17E-3	609 - 0.45E-4
611 - 0.13E-4	701 - 0.60E-4	702 - 0.30E-4	703 - 0.87E-3	704 - 0.19E-4	705 - 0.54E-3
801 - 0.35E-4	802 - 0.74E-4	803 - 0.15E-3	804 - 0.16E-2	805 - 0.48E-7	806 - 0.24E-4
807 - 0.10E-3	808 - 0.12E-3	809 - 0.35E-3	810 - 0.34E-2	811 - 0.00E+0	812 - 0.28E-3
813 - 0.48E-3	814 - 0.93E-8	815 - 0.52E-4	816 - 0.41E-4	901 - 0.12E-3	902 - 0.23E-3
903 - 0.15E-1	904 - 0.17E-2	905 - 0.38E-3	1001 - 0.32E-4	1002 - 0.52E-5	1003 - 0.12E-3
1004 - 0.36E-5	1005 - 0.57E-4	1008 - 0.13E-3	1007 - 0.39E-4	1008 - 0.68E-4	1009 - 0.00E+0
1010 - 0.29E-2	1011 - 0.13E-3	1012 - 0.12E-3	1013 - 0.29E-5	1014 - 0.27E-3	1015 - 0.11E-4
1016 - 0.25E-4	1101 - 0.94E-4	1102 - 0.31E-4	1103 - 0.17E-4	1104 - 0.19E-3	1105 - 0.27E-3
1106 - 0.15E-4	1201 - 0.60E-4	1202 - 0.47E-4	1203 - 0.85E-4	1204 - 0.84E-4	1205 - 0.13E-3
1206 - 0.56E-4	1207 - 0.79E-4				

[Water Management Unit - Value]

Prepared by USEPA Wetlands Research Program, USEPA Environmental Research Lab, Corvallis, Oregon

HYDROLOGIC EFFECTS (NON-NORMALIZED)

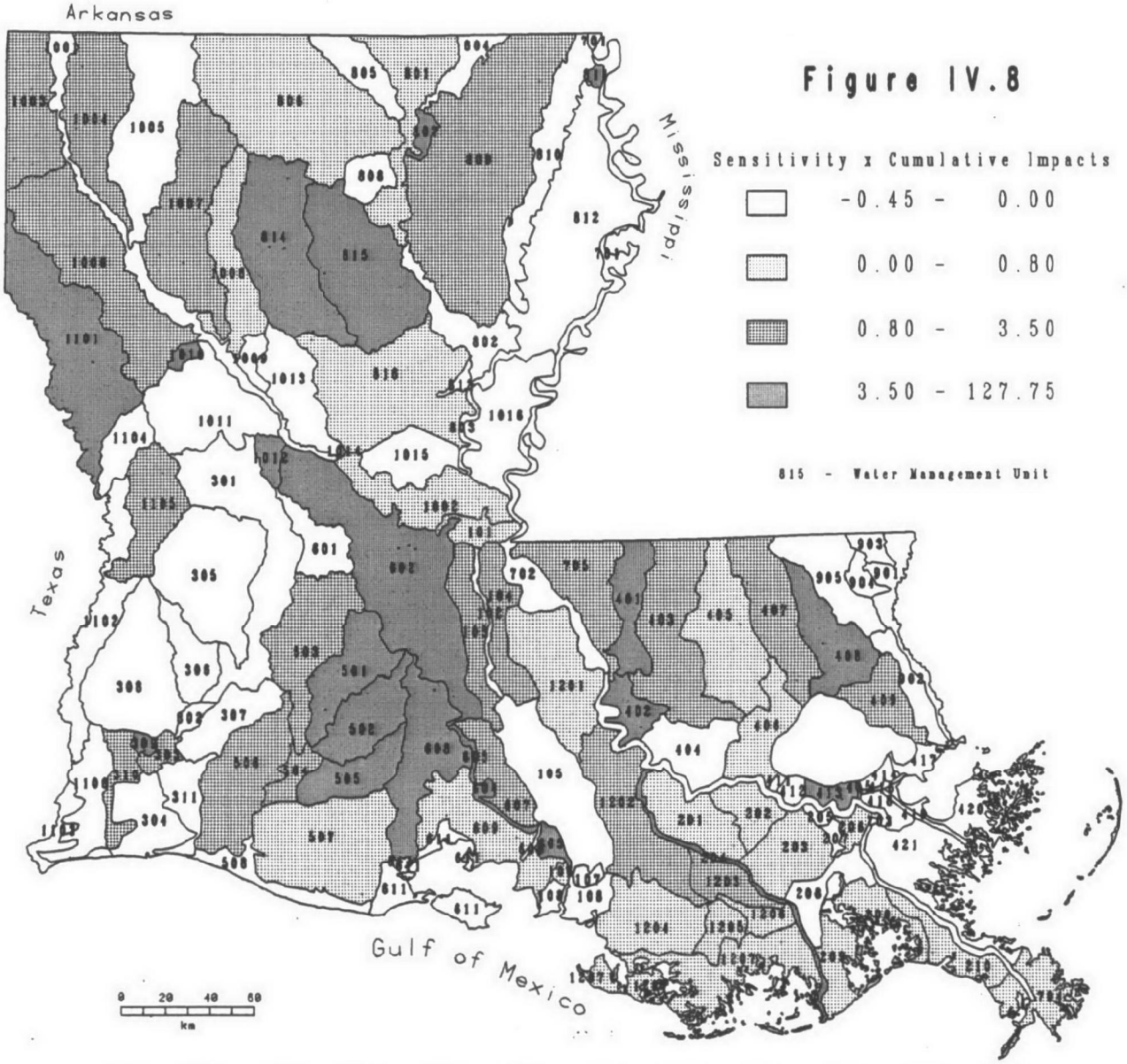


101 - 52	102 - 149	103 - 178	104 - 510	105 - -6	106 - 13
107 - 95	108 - 27	201 - 59	202 - 24	203 - 129	204 - 33
205 - -32	206 - 41	207 - -55	208 - -31	209 - 44	210 - 47
301 - 345	302 - 66	303 - 259	304 - 173	305 - 2381	306 - 6278
307 - 1485	308 - 7814	309 - 2167	310 - 557	311 - 84	401 - 4762
402 - 585	403 - 1177	404 - 2	405 - 825	406 - 56	407 - 562
408 - 1313	409 - 366	411 - -2	412 - -2	413 - 5712	414 - -8
415 - UNDEFINED	416 - -1	417 - -28	418 - -57	419 - -4	420 - -127
421 - -181	501 - 1453	502 - 2880	503 - 531	504 - 142	505 - 939
506 - 314	507 - 30	508 - -240	601 - 740	602 - 1874	603 - UNDEFINED
604 - 389	605 - 218	606 - 15	607 - 72	608 - 2112	609 - 189
611 - -12	701 - 96	702 - 53	703 - 128	704 - 239	705 - 1783
801 - 77	802 - 531	803 - 134	804 - 1	805 - 128	806 - 283
807 - 88	808 - 659	809 - 2393	810 - 7491	811 - 234	812 - 668
813 - 2144	814 - 755	815 - 3730	816 - 1513	901 - -8	902 - -19
903 - 31352	904 - 2550	905 - 846	1001 - 54	1002 - 161	1003 - 765
1004 - 328	1005 - 219	1006 - 1490	1007 - 517	1008 - 563	1009 - 551
1010 - 7650	1011 - 667	1012 - 1361	1013 - 1547	1014 - 2434	1015 - 86
1016 - 623	1101 - 2474	1102 - 154	1103 - -7	1104 - 14720	1105 - 2146
1106 - 10	1201 - 876	1202 - 522	1203 - 119	1204 - 24	1205 - 85
1206 - 35	1207 - 666				

[Water Management Unit - Value]

Prepared by USEPA Wetlands Research Program, USEPA Environmental Research Lab, Corvallis, Oregon

WATER QUALITY EFFECTS (NON-NORMALIZED)

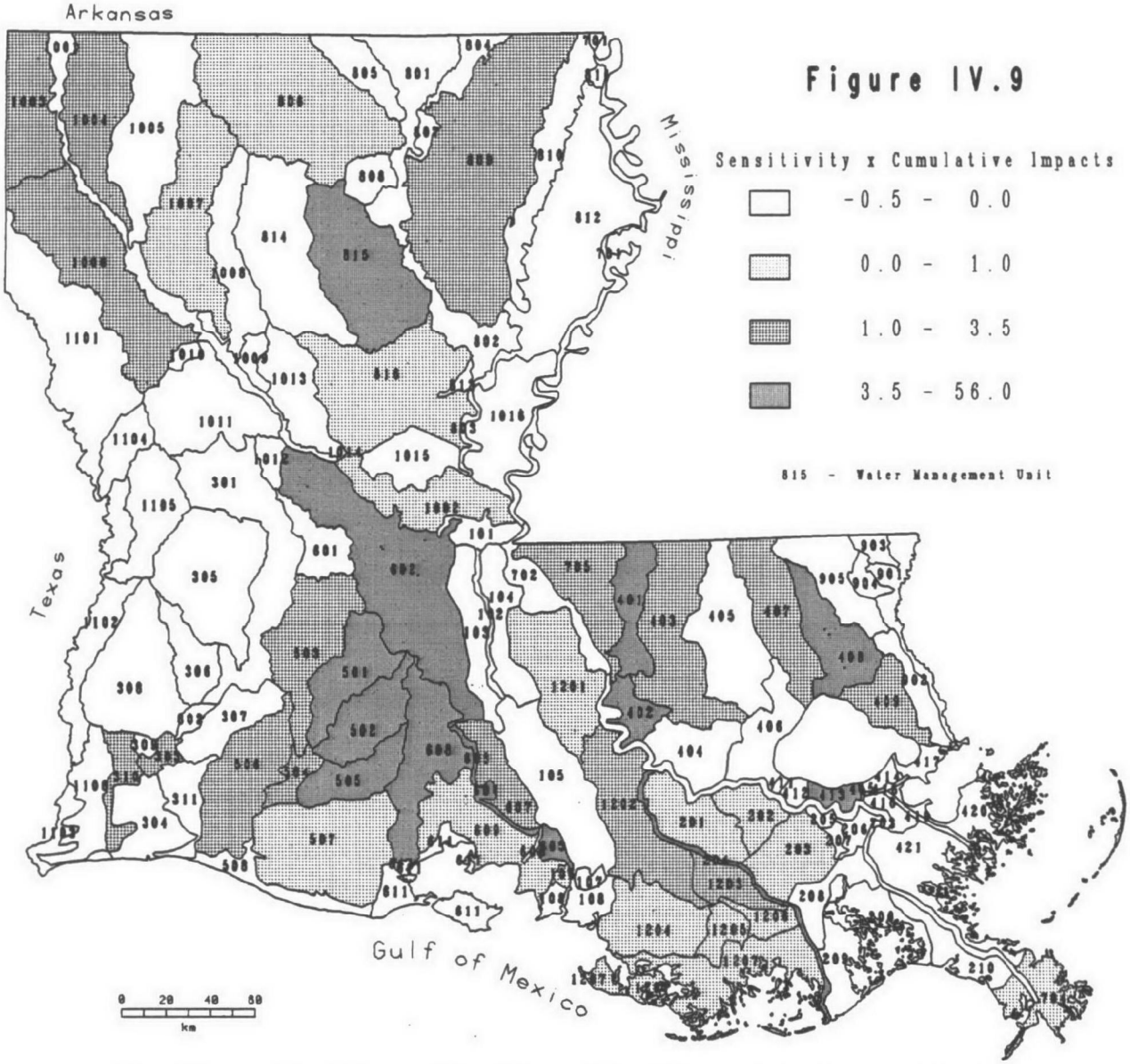


101 -	0.78	102 -	0.00	103 -	1.41	104 -	3.37	105 -	-0.03	106 -	0.27
107 -	0.00	108 -	0.00	201 -	0.39	202 -	0.11	203 -	0.34	204 -	3.69
205 -	-0.21	206 -	0.49	207 -	-0.41	208 -	-0.14	209 -	0.09	210 -	0.23
301 -	0.00	302 -	0.00	303 -	3.35	304 -	0.00	305 -	0.00	306 -	0.00
307 -	0.00	308 -	0.00	309 -	30.05	310 -	1.17	311 -	0.00	401 -	7.94
402 -	5.48	403 -	2.47	404 -	0.00	405 -	0.28	406 -	0.10	407 -	1.69
408 -	5.17	409 -	1.52	411 -	-0.03	412 -	-0.02	413 -	18.28	414 -	0.00
415 -	UNDEFINED	416 -	-0.09	417 -	-0.05	418 -	-0.16	419 -	-0.42	420 -	0.00
421 -	-0.18	501 -	5.29	502 -	14.64	503 -	1.63	504 -	1.78	505 -	6.67
506 -	1.17	507 -	0.07	508 -	0.00	601 -	0.00	602 -	7.75	603 -	UNDEFINED
604 -	55.66	605 -	3.52	606 -	0.00	607 -	1.33	608 -	12.03	609 -	0.08
611 -	0.00	701 -	0.00	702 -	0.00	703 -	0.00	704 -	0.57	705 -	3.49
801 -	0.05	802 -	0.00	803 -	0.00	804 -	0.00	805 -	0.00	806 -	0.11
807 -	3.54	808 -	0.00	809 -	2.25	810 -	0.00	811 -	18.41	812 -	0.00
813 -	0.00	814 -	3.76	815 -	7.78	816 -	0.18	901 -	-0.07	902 -	-0.06
903 -	0.00	904 -	0.00	905 -	0.00	1001 -	0.00	1002 -	0.32	1003 -	2.48
1004 -	1.05	1005 -	0.00	1006 -	1.19	1007 -	0.82	1008 -	0.32	1009 -	0.00
1010 -	127.73	1011 -	0.00	1012 -	12.59	1013 -	0.00	1014 -	30.28	1015 -	0.00
1016 -	0.00	1101 -	8.84	1102 -	0.00	1103 -	0.00	1104 -	0.00	1105 -	2.56
1106 -	0.00	1201 -	0.43	1202 -	1.30	1203 -	1.03	1204 -	0.07	1205 -	0.48
1206 -	0.28	1207 -	0.51								

[Water Management Unit - Value]

Prepared by USEPA Wetlands Research Program, USEPA Environmental Research Lab, Corvallis, Oregon

NON-POINT WATER QUALITY EFFECTS (NON-NORMALIZED)

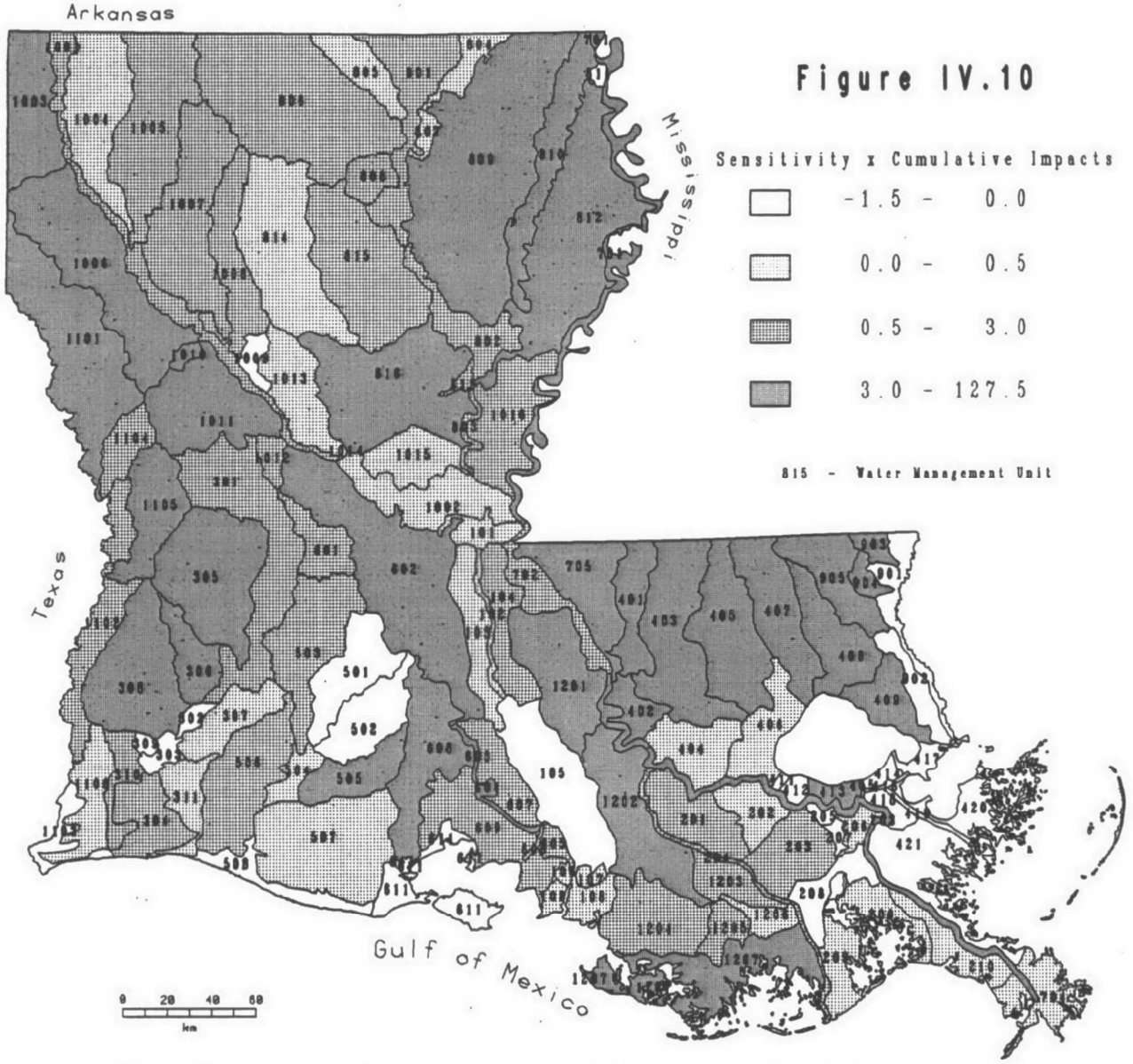


101 - 0.0	102 - 0.0	103 - 0.0	104 - 0.0	105 - 0.0	106 - 0.3
107 - 0.0	108 - 0.0	201 - 0.4	202 - 0.1	203 - 0.3	204 - 3.7
205 - -0.2	206 - 0.0	207 - -0.4	208 - -0.1	209 - 0.0	210 - 0.0
301 - 0.0	302 - 0.0	303 - 3.4	304 - 0.0	305 - 0.0	306 - 0.0
307 - 0.0	308 - 0.0	309 - 0.0	310 - 1.2	311 - 0.0	401 - 7.9
402 - 5.5	403 - 2.5	404 - 0.0	405 - 0.0	406 - 0.0	407 - 1.7
408 - 5.2	409 - 1.5	411 - 0.0	412 - 0.0	413 - 18.3	414 - 0.0
415 - UNDEFINED	416 - 0.0	417 - 0.0	418 - -0.2	419 - 0.0	420 - 0.0
421 - 0.0	501 - 5.3	502 - 14.6	503 - 1.6	504 - 1.8	505 - 6.7
506 - 1.2	507 - 0.1	508 - 0.0	601 - 0.0	602 - 7.8	603 - UNDEFINED
604 - 55.7	605 - 3.5	606 - 0.0	607 - 1.3	608 - 12.0	609 - 0.0
611 - 0.0	701 - 0.0	702 - 0.0	703 - 0.0	704 - 0.3	705 - 3.5
801 - 0.0	802 - 0.0	803 - 0.0	804 - 0.0	805 - 0.0	806 - 0.1
807 - 0.0	808 - 0.0	809 - 2.2	810 - 0.0	811 - 0.0	812 - 0.0
813 - 0.0	814 - 0.0	815 - 7.8	816 - 0.2	901 - 0.0	902 - -0.1
903 - 0.0	904 - 0.0	905 - 0.0	1001 - 0.0	1002 - 0.3	1003 - 2.5
1004 - 1.1	1005 - 0.0	1006 - 1.2	1007 - 0.8	1008 - 0.0	1009 - 0.0
1010 - 0.0	1011 - 0.0	1012 - 0.0	1013 - 0.0	1014 - 0.0	1015 - 0.0
1016 - 0.0	1101 - 0.0	1102 - 0.0	1103 - 0.0	1104 - 0.0	1105 - 0.0
1106 - 0.0	1201 - 0.4	1202 - 1.3	1203 - 1.0	1204 - 0.1	1205 - 0.5
1206 - 0.3	1207 - 0.5				

[Water Management Unit - Value]

Prepared by USEPA Wetlands Research Program, USEPA Environmental Research Lab, Corvallis, Oregon

LIFE SUPPORT EFFECTS (NON-NORMALIZED)

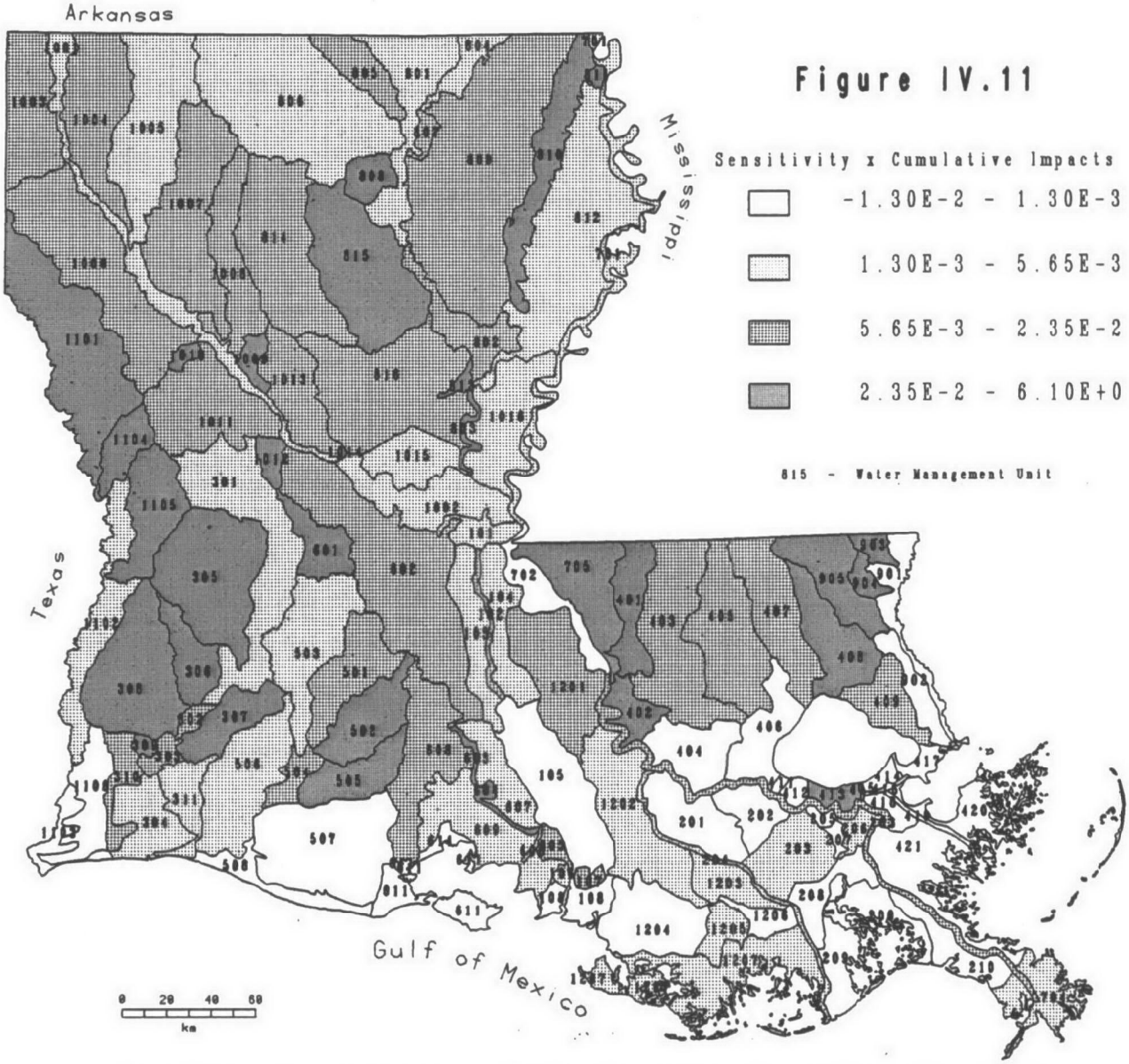


101 - 0.1	102 - 0.3	103 - 0.1	104 - 1.4	105 - 0.0	106 - 0.1
107 - 0.5	108 - 0.2	201 - 0.8	202 - 0.3	203 - 1.6	204 - 2.4
205 - -0.1	206 - 0.3	207 - -0.1	208 - -0.2	209 - 0.2	210 - 0.1
301 - 2.0	302 - 0.0	303 - 0.0	304 - 0.9	305 - 12.7	306 - 31.5
307 - 0.1	308 - 47.0	309 - 0.0	310 - 0.7	311 - 0.5	401 - 98.2
402 - 3.6	403 - 21.5	404 - 0.0	405 - 6.5	406 - 0.3	407 - 8.1
408 - 76.9	409 - 13.6	411 - 0.0	412 - 0.0	413 - 10.2	414 - 0.0
415 - UNDEFINED	416 - 0.0	417 - -0.1	418 - -0.4	419 - -0.1	420 - -0.4
421 - -0.8	501 - 0.0	502 - 0.0	503 - 0.5	504 - 0.4	505 - 5.5
506 - 1.6	507 - 0.3	508 - -0.3	601 - 0.9	602 - 3.1	603 - UNDEFINED
604 - 8.4	605 - 2.0	606 - 0.2	607 - 0.7	608 - 14.9	609 - 1.0
611 - 0.0	701 - 3.2	702 - 0.6	703 - 17.2	704 - 0.4	705 - 13.7
801 - 0.6	802 - 2.4	803 - 0.7	804 - 0.4	805 - 0.0	806 - 0.8
807 - 0.3	808 - 1.4	809 - 42.3	810 - 127.5	811 - 0.0	812 - 38.5
813 - 2.1	814 - 0.0	815 - 2.9	816 - 3.6	901 - -0.3	902 - -1.1
903 - 77.9	904 - 9.3	905 - 11.7	1001 - 0.7	1002 - 0.2	1003 - 3.4
1004 - 0.1	1005 - 1.2	1006 - 8.8	1007 - 1.8	1008 - 2.0	1009 - 0.0
1010 - 12.3	1011 - 4.6	1012 - 0.8	1013 - 0.2	1014 - 0.1	1015 - 0.1
1016 - 2.4	1101 - 4.5	1102 - 1.3	1103 - -0.1	1104 - 1.4	1105 - 5.0
1106 - 0.0	1201 - 6.3	1202 - 6.2	1203 - 2.2	1204 - 0.8	1205 - 1.5
1206 - 0.3	1207 - 6.1				

[Water Management Unit - Value]

Prepared by USEPA Wetlands Research Program, USEPA Environmental Research Lab, Corvallis, Oregon

HYDROLOGIC EFFECTS (NORMALIZED)

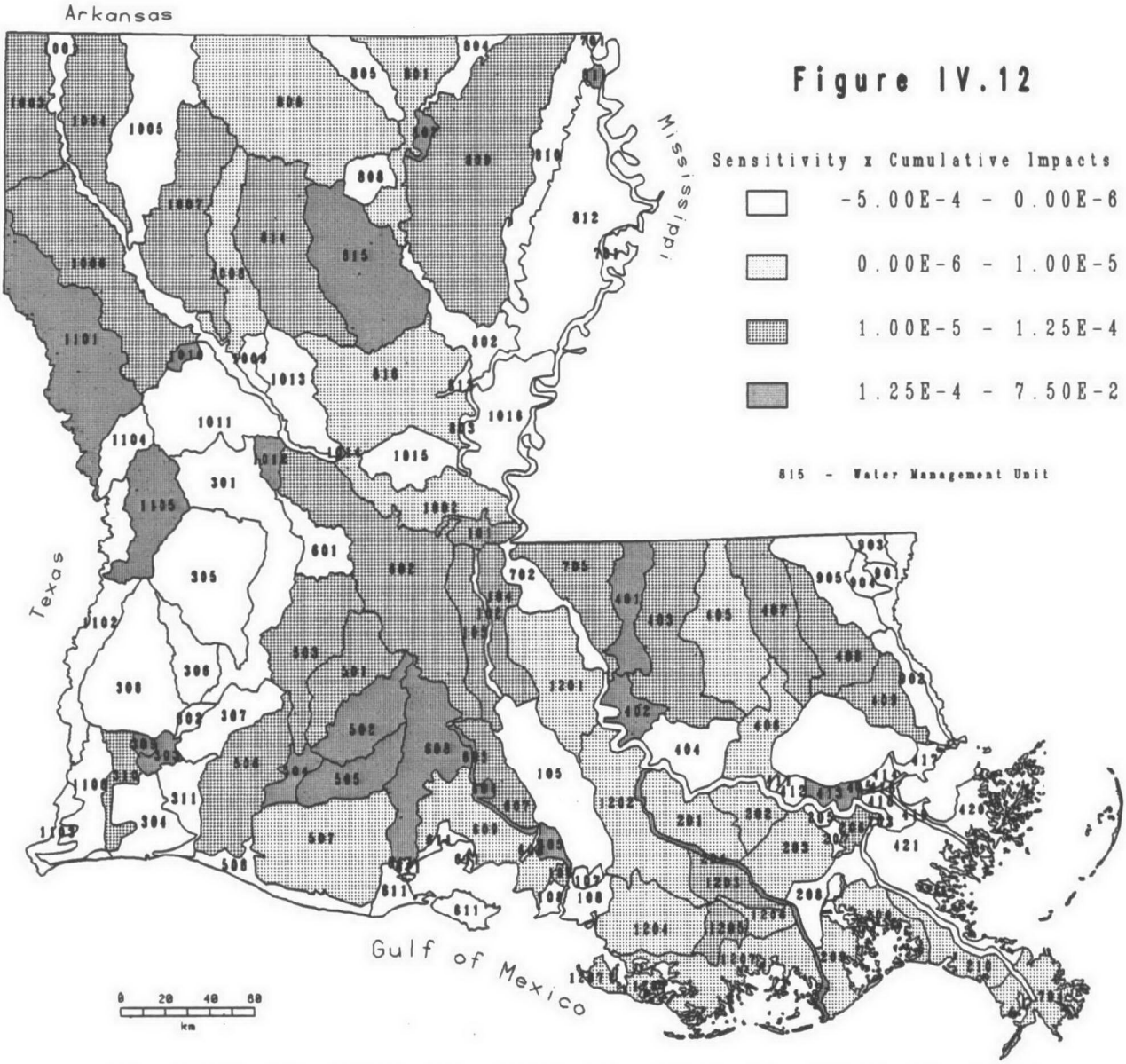


101	-	0.30E-2	102	-	0.13E-1	103	-	0.23E-2	104	-	0.47E-2	105	-	-0.45E-4	106	-	0.26E-2
107	-	0.87E-2	108	-	0.57E-3	201	-	0.71E-3	202	-	0.61E-3	203	-	0.15E-2	204	-	0.29E-2
205	-	-0.68E-2	206	-	0.31E-2	207	-	-0.11E-1	208	-	-0.88E-3	209	-	0.42E-3	210	-	0.11E-2
301	-	0.35E-2	302	-	0.83E-2	303	-	0.17E-1	304	-	0.27E-2	305	-	0.31E-1	306	-	0.19E+0
307	-	0.29E-1	308	-	0.73E-1	309	-	0.32E+0	310	-	0.11E-1	311	-	0.28E-2	401	-	0.32E+0
402	-	0.29E-1	403	-	0.12E-1	404	-	0.52E-4	405	-	0.13E-1	406	-	0.11E-2	407	-	0.14E-1
408	-	0.32E-1	409	-	0.13E-1	411	-	-0.65E-3	412	-	-0.28E-3	413	-	0.49E+0	414	-	-0.11E-2
415	-	UNDEFINED	416	-	-0.14E-2	417	-	-0.30E-2	418	-	-0.13E-1	419	-	-0.53E-2	420	-	-0.37E-2
421	-	-0.32E-2	501	-	0.15E-1	502	-	0.44E-1	503	-	0.45E-2	504	-	0.11E-1	505	-	0.29E-1
506	-	0.28E-2	507	-	0.24E-3	508	-	-0.71E-2	601	-	0.27E-1	602	-	0.72E-2	603	-	UNDEFINED
604	-	0.23E+0	605	-	0.14E-1	606	-	0.12E-1	607	-	0.35E-2	608	-	0.23E-1	609	-	0.24E-2
611	-	-0.17E-3	701	-	0.14E-2	702	-	0.12E-2	703	-	0.58E-2	704	-	0.39E-2	705	-	0.81E-1
801	-	0.21E-2	802	-	0.15E-1	803	-	0.28E-1	804	-	0.25E-2	805	-	0.11E-1	806	-	0.41E-2
807	-	0.22E-1	808	-	0.46E-1	809	-	0.18E-1	810	-	0.20E+0	811	-	0.31E+0	812	-	0.44E-2
813	-	0.48E+0	814	-	0.17E-1	815	-	0.61E-1	816	-	0.13E-1	901	-	-0.44E-3	902	-	-0.98E-3
903	-	0.61E+1	904	-	0.45E+0	905	-	0.24E-1	1001	-	0.16E-2	1002	-	0.22E-2	1003	-	0.23E-1
1004	-	0.69E-2	1005	-	0.55E-2	1006	-	0.19E-1	1007	-	0.83E-2	1008	-	0.16E-1	1009	-	0.98E-1
1010	-	0.18E+1	1011	-	0.14E-1	1012	-	0.19E+0	1013	-	0.17E-1	1014	-	0.60E+1	1015	-	0.26E-2
1016	-	0.49E-2	1101	-	0.47E-1	1102	-	0.22E-2	1103	-	-0.19E-3	1104	-	0.20E+1	1105	-	0.11E+0
1106	-	0.15E-3	1201	-	0.70E-2	1202	-	0.22E-2	1203	-	0.24E-2	1204	-	0.19E-3	1205	-	0.24E-2
1206	-	0.12E-2	1207	-	0.29E-2												

[Water Management Unit - Value]

Prepared by USEPA Wetlands Research Program, USEPA Environmental Research Lab, Corvallis, Oregon

WATER QUALITY EFFECTS (NORMALIZED)

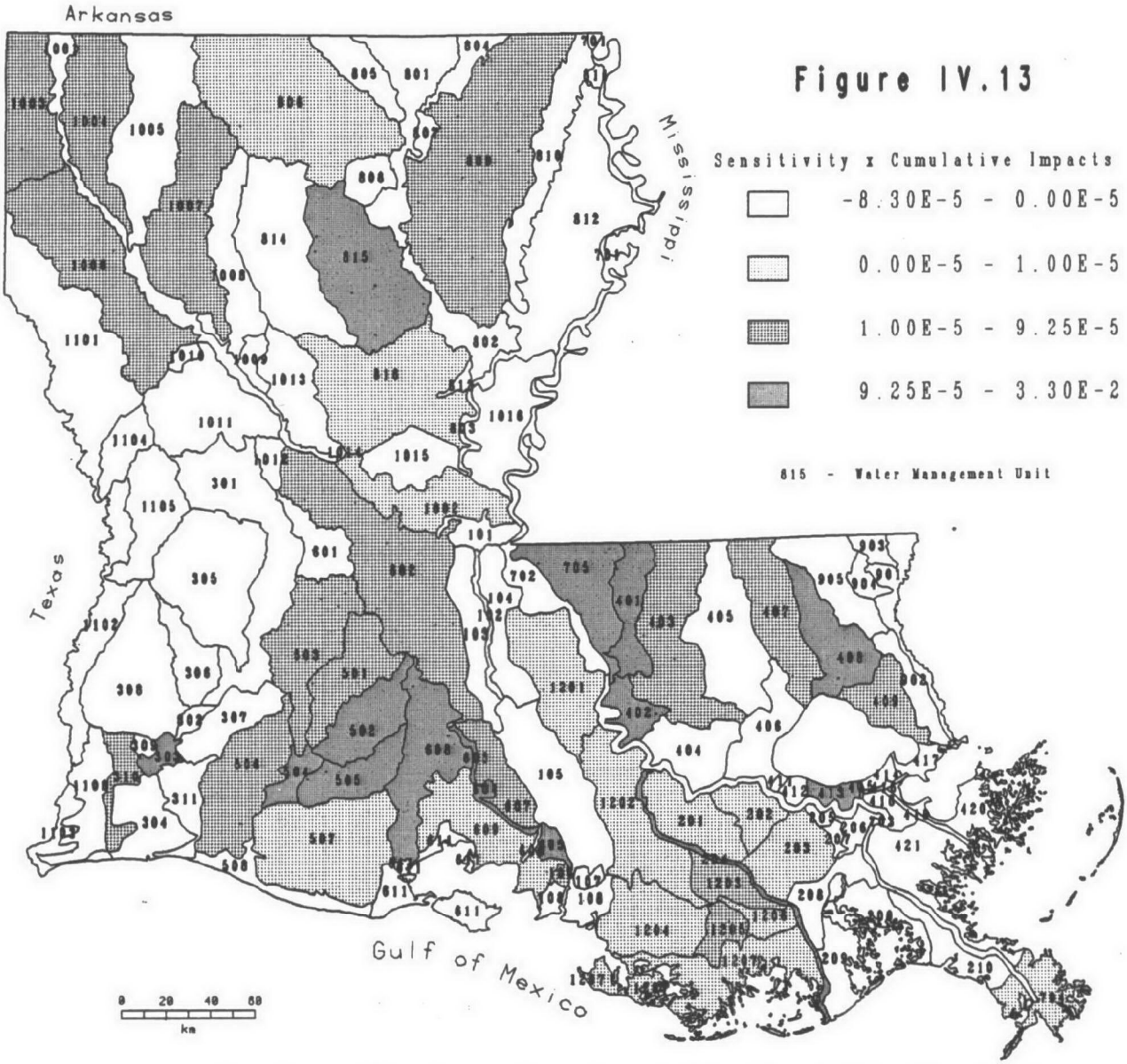


101	-	0.45E-4	102	-	0.00E+0	103	-	0.18E-4	104	-	0.31E-4	105	-	-0.20E-6	106	-	0.53E-4
107	-	0.00E+0	108	-	0.00E+0	201	-	0.47E-5	202	-	0.28E-5	203	-	0.40E-5	204	-	0.33E-3
205	-	-0.44E-4	206	-	0.37E-4	207	-	-0.83E-4	208	-	-0.39E-5	209	-	0.91E-6	210	-	0.53E-5
301	-	0.00E+0	302	-	0.00E+0	303	-	0.22E-3	304	-	0.00E+0	305	-	0.00E+0	306	-	0.00E+0
307	-	0.00E+0	308	-	0.00E+0	309	-	0.44E-2	310	-	0.23E-4	311	-	0.00E+0	401	-	0.54E-3
402	-	0.27E-3	403	-	0.26E-4	404	-	0.00E+0	405	-	0.46E-5	406	-	0.19E-5	407	-	0.41E-4
408	-	0.12E-3	409	-	0.55E-4	411	-	-0.12E-4	412	-	-0.22E-5	413	-	0.16E-2	414	-	0.00E+0
415	-	UNDEFINED	416	-	-0.14E-3	417	-	-0.50E-5	418	-	-0.36E-4	419	-	-0.50E-3	420	-	0.00E+0
421	-	-0.33E-5	501	-	0.55E-4	502	-	0.22E-3	503	-	0.14E-4	504	-	0.13E-3	505	-	0.21E-3
506	-	0.10E-4	507	-	0.59E-6	508	-	0.00E+0	601	-	0.00E+0	602	-	0.30E-4	603	-	UNDEFINED
604	-	0.33E-1	605	-	0.22E-3	606	-	0.00E+0	607	-	0.65E-4	608	-	0.13E-3	609	-	0.10E-5
611	-	0.00E+0	701	-	0.00E+0	702	-	0.00E+0	703	-	0.00E+0	704	-	0.92E-5	705	-	0.12E-3
801	-	0.14E-5	802	-	0.00E+0	803	-	0.00E+0	804	-	0.00E+0	805	-	0.00E+0	806	-	0.15E-5
807	-	0.87E-3	808	-	0.00E+0	809	-	0.17E-4	810	-	0.00E+0	811	-	0.24E-1	812	-	0.00E+0
813	-	0.00E+0	814	-	0.86E-4	815	-	0.13E-3	816	-	0.16E-5	901	-	-0.35E-5	902	-	-0.32E-5
903	-	0.00E+0	904	-	0.00E+0	905	-	0.00E+0	1001	-	0.00E+0	1002	-	0.43E-5	1003	-	0.76E-4
1004	-	0.22E-4	1005	-	0.00E+0	1006	-	0.15E-4	1007	-	0.13E-4	1008	-	0.91E-5	1009	-	0.00E+0
1010	-	0.30E-1	1011	-	0.00E+0	1012	-	0.18E-2	1013	-	0.00E+0	1014	-	0.75E-1	1015	-	0.00E+0
1016	-	0.00E+0	1101	-	0.17E-3	1102	-	0.00E+0	1103	-	0.00E+0	1104	-	0.00E+0	1105	-	0.13E-3
1106	-	0.00E+0	1201	-	0.34E-5	1202	-	0.56E-5	1203	-	0.20E-4	1204	-	0.54E-6	1205	-	0.14E-4
1206	-	0.91E-5	1207	-	0.22E-5												

[Water Management Unit - Value]

Prepared by USEPA Wetlands Research Program, USEPA Environmental Research Lab, Corvallis, Oregon

NON-POINT WATER QUALITY EFFECTS (NORMALIZED)

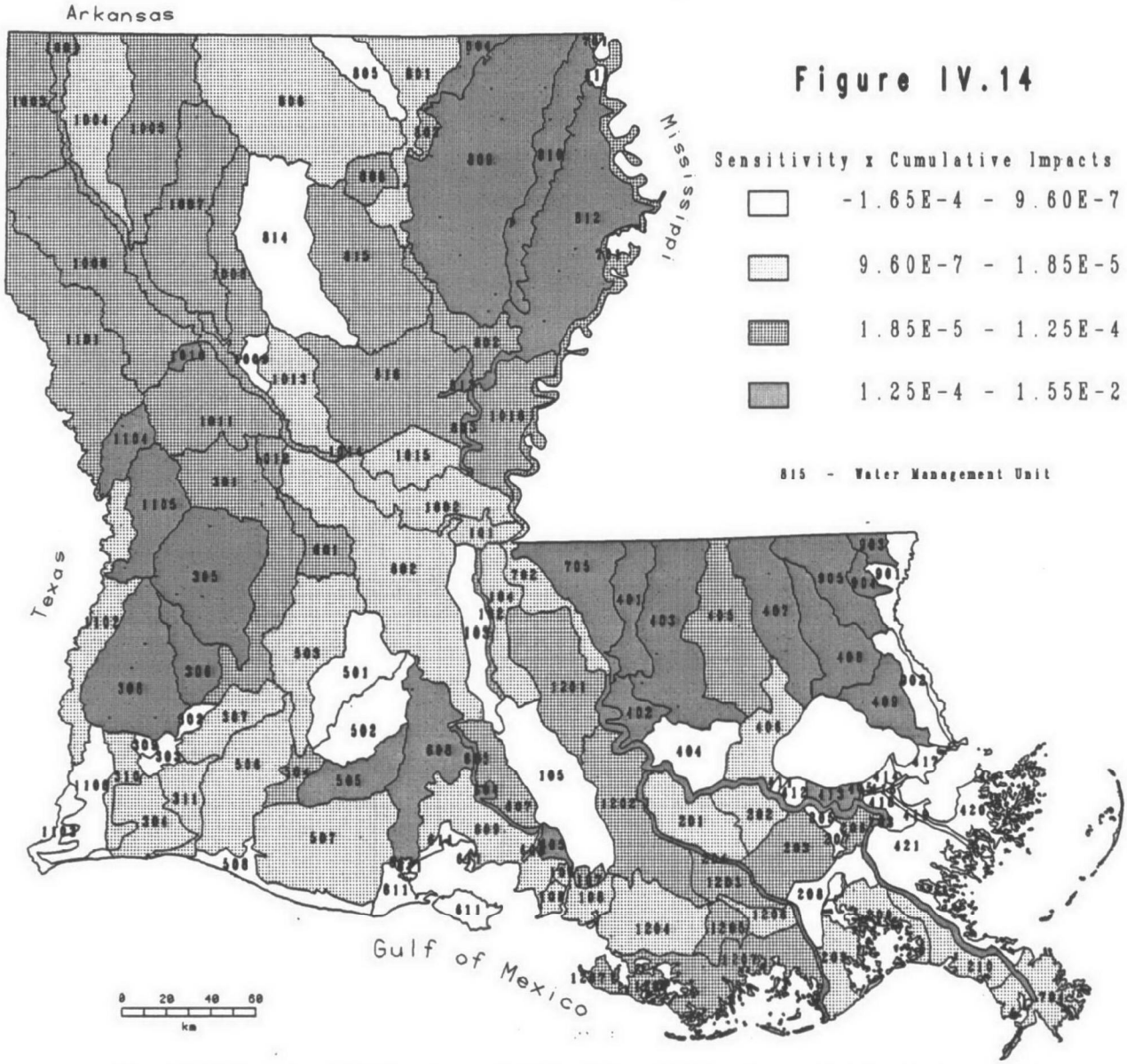


101 -	0.00E+0	102 -	0.00E+0	103 -	0.00E+0	104 -	0.00E+0	105 -	0.00E+0	106 -	0.53E-4
107 -	0.00E+0	108 -	0.00E+0	201 -	0.47E-5	202 -	0.28E-5	203 -	0.40E-5	204 -	0.33E-3
205 -	-0.44E-4	206 -	0.00E+0	207 -	-0.83E-4	208 -	-0.39E-5	209 -	0.00E+0	210 -	0.00E+0
301 -	0.00E+0	302 -	0.00E+0	303 -	0.22E-3	304 -	0.00E+0	305 -	0.00E+0	306 -	0.00E+0
307 -	0.00E+0	308 -	0.00E+0	309 -	0.00E+0	310 -	0.23E-4	311 -	0.00E+0	401 -	0.54E-3
402 -	0.27E-3	403 -	0.26E-4	404 -	0.00E+0	405 -	0.00E+0	406 -	0.00E+0	407 -	0.41E-4
408 -	0.12E-3	409 -	0.55E-4	411 -	0.00E+0	412 -	-0.11E-5	413 -	0.16E-2	414 -	0.00E+0
415 -	UNDEFINED	416 -	0.00E+0	417 -	-0.50E-5	418 -	-0.36E-4	419 -	0.00E+0	420 -	0.00E+0
421 -	0.00E+0	501 -	0.55E-4	502 -	0.22E-3	503 -	0.14E-4	504 -	0.13E-3	505 -	0.21E-3
506 -	0.10E-4	507 -	0.59E-6	508 -	0.00E+0	601 -	0.00E+0	602 -	0.30E-4	603 -	UNDEFINED
604 -	0.33E-1	605 -	0.22E-3	606 -	0.00E+0	607 -	0.65E-4	608 -	0.13E-3	609 -	0.43E-6
611 -	0.00E+0	701 -	0.00E+0	702 -	0.00E+0	703 -	0.00E+0	704 -	0.56E-5	705 -	0.12E-3
801 -	0.00E+0	802 -	0.00E+0	803 -	0.00E+0	804 -	0.00E+0	805 -	0.00E+0	806 -	0.15E-5
807 -	0.00E+0	808 -	0.00E+0	809 -	0.17E-4	810 -	0.00E+0	811 -	0.00E+0	812 -	0.00E+0
813 -	0.00E+0	814 -	0.00E+0	815 -	0.13E-3	816 -	0.18E-5	901 -	0.00E+0	902 -	-0.32E-5
903 -	0.00E+0	904 -	0.00E+0	905 -	0.00E+0	1001 -	0.00E+0	1002 -	0.43E-5	1003 -	0.76E-4
1004 -	0.22E-4	1005 -	0.00E+0	1006 -	0.15E-4	1007 -	0.13E-4	1008 -	0.00E+0	1009 -	0.00E+0
1010 -	0.00E+0	1011 -	0.00E+0	1012 -	0.00E+0	1013 -	0.00E+0	1014 -	0.00E+0	1015 -	0.00E+0
1016 -	0.00E+0	1101 -	0.00E+0	1102 -	0.00E+0	1103 -	0.00E+0	1104 -	0.00E+0	1105 -	0.00E+0
1106 -	0.00E+0	1201 -	0.34E-5	1202 -	0.56E-5	1203 -	0.20E-4	1204 -	0.54E-6	1205 -	0.14E-4
1206 -	0.91E-5	1207 -	0.22E-5								

[Water Management Unit - Value]

Prepared by USEPA Wetlands Research Program, USEPA Environmental Research Lab, Corvallis, Oregon

LIFE SUPPORT EFFECTS (NORMALIZED)



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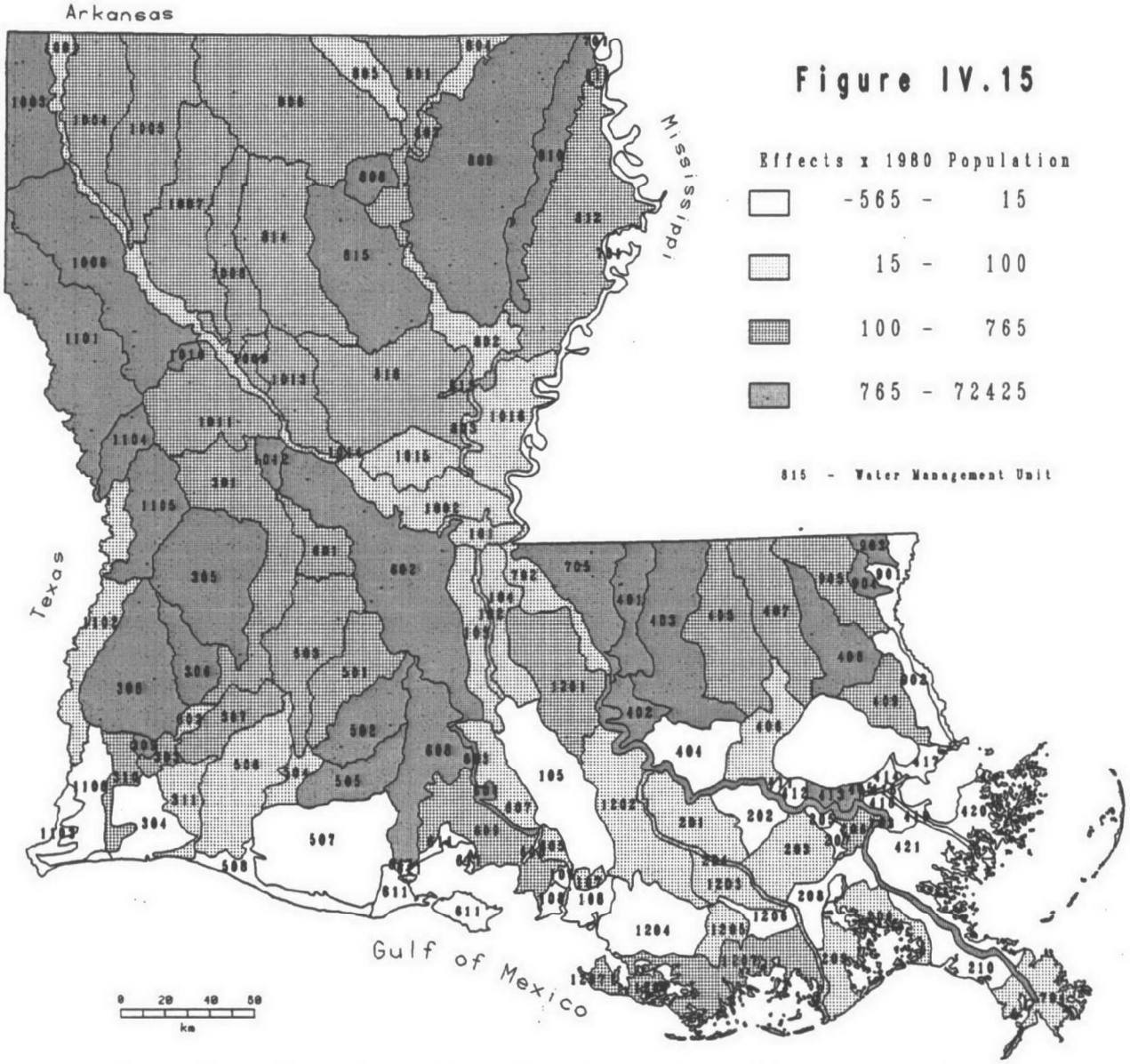
301	-	0.21E-4	302	-	0.00E+0	303	-	0.00E+0	304	-	0.14E-4	305	-	0.16E-3	306	-	0.95E-3
307	-	0.14E-5	308	-	0.44E-3	309	-	0.00E+0	310	-	0.13E-4	311	-	0.15E-4	401	-	0.67E-2
402	-	0.18E-3	403	-	0.23E-3	404	-	0.72E-6	405	-	0.11E-3	406	-	0.61E-5	407	-	0.20E-3
408	-	0.19E-2	409	-	0.49E-3	411	-	-0.29E-5	412	-	-0.19E-5	413	-	0.88E-3	414	-	-0.34E-5
415	-	UNDEFINED	416	-	-0.98E-5	417	-	-0.10E-4	418	-	-0.80E-4	419	-	-0.16E-3	420	-	-0.11E-4
421	-	-0.14E-4	501	-	0.00E+0	502	-	0.00E+0	503	-	0.43E-5	504	-	0.28E-4	505	-	0.17E-3
506	-	0.14E-4	507	-	0.26E-5	508	-	-0.10E-4	601	-	0.32E-4	602	-	0.12E-4	603	-	UNDEFINED
604	-	0.50E-2	605	-	0.13E-3	606	-	0.11E-3	607	-	0.36E-4	608	-	0.16E-3	609	-	0.12E-4
611	-	-0.94E-7	701	-	0.48E-4	702	-	0.14E-4	703	-	0.78E-3	704	-	0.71E-5	705	-	0.47E-3
801	-	0.17E-4	802	-	0.65E-4	803	-	0.14E-3	804	-	0.79E-3	805	-	0.29E-7	806	-	0.12E-4
807	-	0.79E-4	808	-	0.10E-3	809	-	0.33E-3	810	-	0.34E-2	811	-	0.00E+0	812	-	0.25E-3
813	-	0.47E-3	814	-	0.73E-8	815	-	0.48E-4	816	-	0.32E-4	901	-	-0.17E-4	902	-	-0.58E-4
903	-	0.15E-1	904	-	0.17E-2	905	-	0.33E-3	1001	-	0.22E-4	1002	-	0.33E-5	1003	-	0.11E-3
1004	-	0.27E-5	1005	-	0.31E-4	1006	-	0.11E-3	1007	-	0.29E-4	1008	-	0.57E-4	1009	-	0.00E+0
1010	-	0.29E-2	1011	-	0.99E-4	1012	-	0.11E-3	1013	-	0.27E-5	1014	-	0.26E-3	1015	-	0.34E-5
1016	-	0.19E-4	1101	-	0.84E-4	1102	-	0.18E-4	1103	-	-0.14E-5	1104	-	0.19E-3	1105	-	0.25E-3
1106	-	0.64E-6	1201	-	0.51E-4	1202	-	0.27E-4	1203	-	0.43E-4	1204	-	0.62E-5	1205	-	0.41E-4
1206	-	0.12E-4	1207	-	0.27E-4												

[Water Management Unit - Value]

Prepared by USEPA Wetlands Research Program, USEPA Environmental Research Lab, Corvallis, Oregon

HYDROLOGIC SIGNIFICANCE TO HUMANS



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301 -	170	302 -	48	303 -	208	304 -	13	305 -	924	306 -	1455
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408 -	1520	409 -	446	411 -	-1	412 -	-1	413 -	72425	414 -	-139
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506 -	79	507 -	6	508 -	-23	601 -	564	602 -	813	603 -	UNDEFINED
604 -	1023	605 -	85	606 -	13	607 -	72	608 -	3299	609 -	123
611 -	-3	701 -	15	702 -	38	703 -	770	704 -	28	705 -	5152
801 -	104	802 -	76	803 -	28	804 -	18	805 -	65	806 -	300
807 -	263	808 -	1499	809 -	2055	810 -	3305	811 -	186	812 -	124
813 -	248	814 -	439	815 -	1359	816 -	433	901 -	-8	902 -	-22
903 -	27838	904 -	2180	905 -	627	1001 -	67	1002 -	61	1003 -	3447
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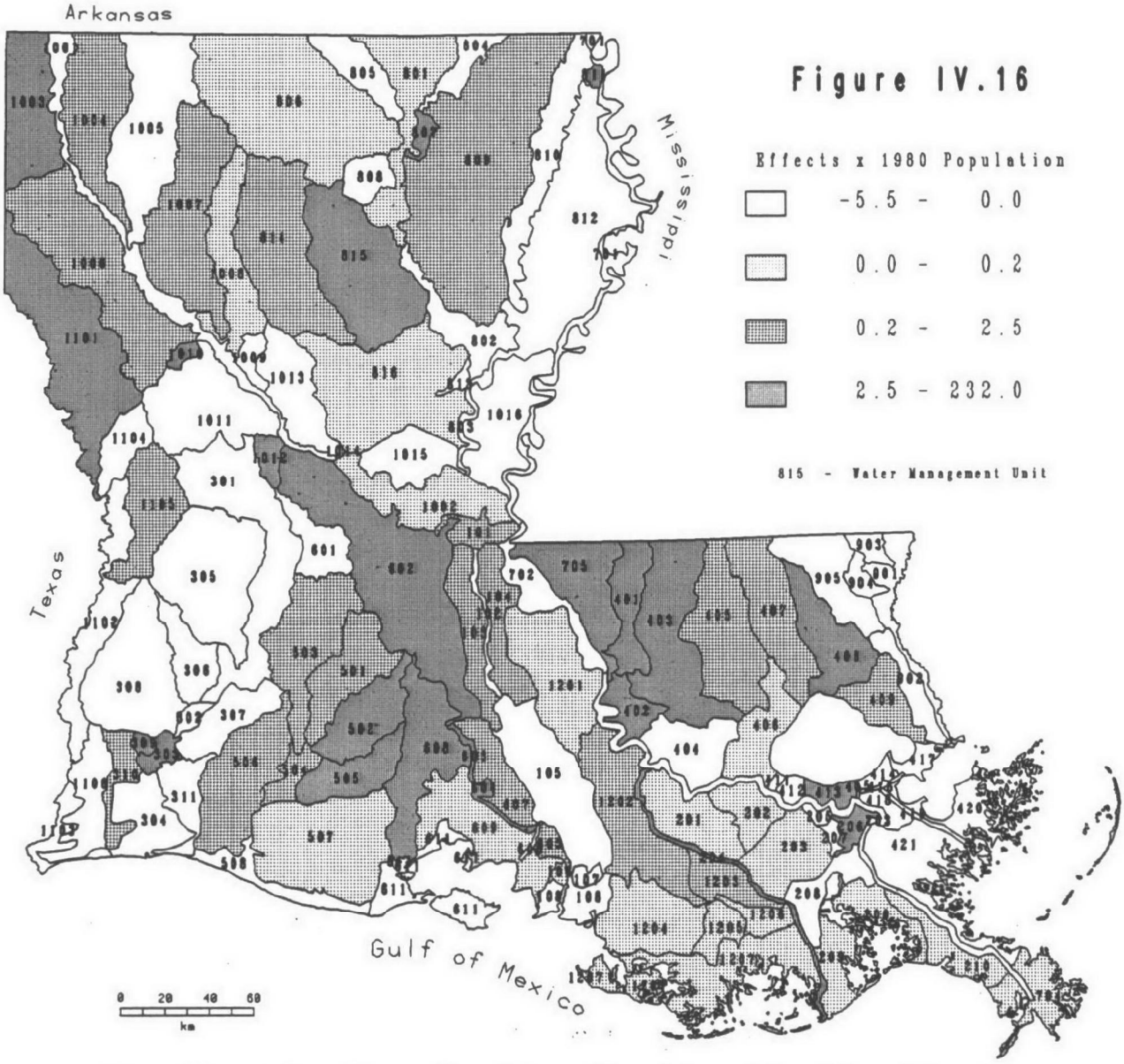
1106 -	3	1201 -	251	1202 -	96	1203 -	33	1204 -	7	1205 -	23
1206 -	10	1207 -	131								

[Water Management Unit - Value]

Prepared by USEPA Wetlands Research Program, USEPA Environmental Research Lab, Corvallis, Oregon

WATER QUALITY SIGNIFICANCE TO HUMANS



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402 - 20.3	403 - 3.8	404 - 0.0	405 - 0.2	406 - 0.1	407 - 2.1
408 - 6.0	409 - 1.9	411 - 0.0	412 - 0.0	413 - 231.8	414 - 0.0
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611 - 0.0	701 - 0.0	702 - 0.0	703 - 0.0	704 - 0.1	705 - 10.1
801 - 0.1	802 - 0.0	803 - 0.0	804 - 0.0	805 - 0.0	806 - 0.1
807 - 10.6	808 - 0.0	809 - 1.9	810 - 0.0	811 - 14.6	812 - 0.0
813 - 0.0	814 - 2.2	815 - 2.8	816 - 0.1	901 - -0.1	902 - -0.1
903 - 0.0	904 - 0.0	905 - 0.0	1001 - 0.0	1002 - 0.1	1003 - 11.1
1004 - 1.3	1005 - 0.0	1006 - 1.5	1007 - 0.3	1008 - 0.1	1009 - 0.0
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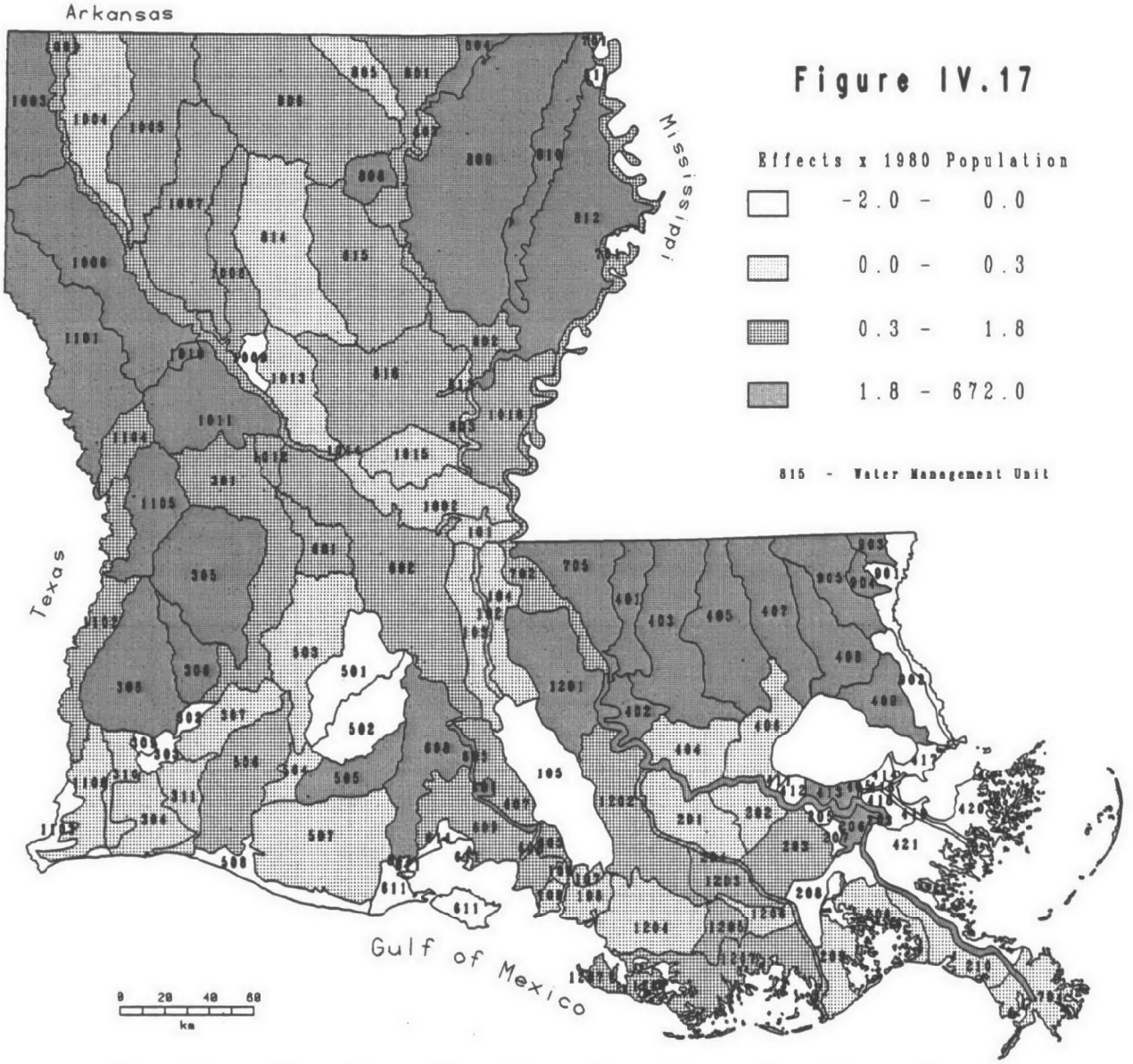
1016 - 0.0	1101 - 5.9	1102 - 0.0	1103 - 0.0	1104 - 0.0	1105 - 2.2
1106 - 0.0	1201 - 0.1	1202 - 0.2	1203 - 0.3	1204 - 0.0	1205 - 0.1
1206 - 0.1	1207 - 0.1				

[Water Management Unit - Value]

Prepared by USEPA Wetlands Research Program, USEPA Environmental Research Lab, Corvallis, Oregon

LIFE SUPPORT SIGNIFICANCE TO HUMANS



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402 - 13.4	403 - 33.1	404 - 0.0	405 - 4.6	406 - 0.2	407 - 10.1
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415 - UNDEFINED	416 - -0.4	417 - -2.0	418 - -1.1	419 - -1.0	420 - -0.5
421 - -0.4	501 - 0.0	502 - 0.0	503 - 0.1	504 - 0.1	505 - 6.2
506 - 0.4	507 - 0.1	508 - 0.0	601 - 0.7	602 - 1.3	603 - UNDEFINED
604 - 22.1	605 - 0.8	606 - 0.1	607 - 0.7	608 - 23.2	609 - 0.6
611 - 0.0	701 - 0.5	702 - 0.4	703 - 103.4	704 - 0.0	705 - 39.7
801 - 0.9	802 - 0.3	803 - 0.1	804 - 5.2	805 - 0.0	806 - 0.9
807 - 1.0	808 - 3.3	809 - 36.3	810 - 56.3	811 - 0.0	812 - 7.1
813 - 0.2	814 - 0.0	815 - 1.1	816 - 1.0	901 - -0.3	902 - -1.3
903 - 69.2	904 - 7.9	905 - 8.7	1001 - 0.9	1002 - 0.1	1003 - 15.5
1004 - 0.2	1005 - 1.7	1006 - 11.3	1007 - 0.7	1008 - 0.6	1009 - 0.0
1010 - 3.7	1011 - 2.2	1012 - 0.9	1013 - 0.0	1014 - 0.1	1015 - 0.1
1016 - 0.3	1101 - 5.0	1102 - 0.5	1103 - 0.0	1104 - 1.0	1105 - 4.4
1106 - 0.0	1201 - 1.8	1202 - 1.1	1203 - 0.6	1204 - 0.2	1205 - 0.4
1206 - 0.1	1207 - 1.2				

[Water Management Unit - Value]

Prepared by USEPA Wetlands Research Program, USEPA Environmental Research Lab, Corvallis, Oregon

APPENDIX V. Rankings of hydrologic units for hydrology, water quality, and life support cumulative effects.

Rank	Hydrology		Water Quality		Life Support	
	Unit	Value	Unit	Value	Unit	Value
1	508	-240.467	419	-0.421	902	-1.136
2	421	-180.604	207	-0.406	421	-0.765
3	420	-126.921	205	-0.209	420	-0.368
4	418	-56.735	421	-0.183	418	-0.356
5	207	-54.897	418	-0.163	508	-0.348
6	205	-32.305	208	-0.138	901	-0.315
7	208	-31.230	416	-0.089	208	-0.172
8	417	-28.289	901	-0.065	207	-0.142
9	902	-19.178	902	-0.063	419	-0.138
10	611	-11.541	417	-0.048	417	-0.100
11	901	-8.130	105	-0.028	205	-0.062
12	414	-7.738	411	-0.027	1103	-0.052
13	1103	-7.109	412	-0.018	105	-0.039
14	105	-6.356	102	0.000	414	-0.023
15	419	-4.449	107	0.000	412	-0.015
16	412	-2.251	108	0.000	411	-0.007
17	411	-1.519	301	0.000	611	-0.007
18	416	-0.915	302	0.000	416	-0.006
19	804	1.136	304	0.000	302	0.000
20	404	1.704	305	0.000	303	0.000
21	1106	10.158	306	0.000	309	0.000
22	106	13.225	307	0.000	501	0.000
23	606	15.395	308	0.000	502	0.000
24	202	23.593	311	0.000	811	0.000
25	1204	24.422	404	0.000	1009	0.000
26	108	27.056	414	0.000	814	0.000
27	507	30.065	420	0.000	805	0.000
28	204	32.505	508	0.000	404	0.024
29	1206	35.460	601	0.000	1106	0.044
30	206	41.172	606	0.000	106	0.056
31	209	43.793	611	0.000	101	0.060
32	210	47.395	701	0.000	103	0.064
33	101	51.533	702	0.000	307	0.071
34	702	53.057	703	0.000	1014	0.105
35	1001	54.314	802	0.000	1015	0.113
36	406	56.079	803	0.000	1004	0.129
37	201	58.689	804	0.000	210	0.136

APPENDIX V. Continued.

Rank	Hydrology		Water Quality		Life Support	
	Unit	Value	Unit	Value	Unit	Value
38	302	66.159	805	0.000	606	0.151
39	607	72.339	808	0.000	108	0.185
40	801	76.586	810	0.000	209	0.205
41	311	84.460	812	0.000	1002	0.246
42	1205	84.659	813	0.000	1013	0.248
43	1015	85.895	903	0.000	206	0.280
44	807	88.008	904	0.000	202	0.290
45	107	95.240	905	0.000	102	0.296
46	701	95.643	1001	0.000	406	0.315
47	1203	119.180	1005	0.000	807	0.321
48	805	127.668	1009	0.000	507	0.326
49	703	127.754	1011	0.000	1206	0.329
50	203	128.696	1013	0.000	804	0.359
51	803	133.769	1015	0.000	504	0.378
52	504	142.454	1016	0.000	704	0.437
53	102	149.050	1102	0.000	311	0.452
54	1102	154.297	1103	0.000	107	0.473
55	1002	160.846	1104	0.000	503	0.506
56	304	173.061	1106	0.000	702	0.593
57	103	178.396	801	0.051	801	0.635
58	609	189.274	1204	0.070	310	0.654
59	605	217.837	507	0.074	803	0.654
60	1005	218.541	609	0.079	1001	0.742
61	811	233.612	209	0.095	607	0.748
62	704	239.293	406	0.099	1012	0.795
63	303	259.117	806	0.106	1204	0.800
64	806	282.735	202	0.109	201	0.813
65	506	314.064	816	0.183	806	0.823
66	1004	328.281	210	0.226	601	0.874
67	301	344.771	1206	0.261	304	0.903
68	409	366.346	106	0.272	609	0.952
69	604	389.400	405	0.283	1005	1.219
70	104	509.511	1008	0.317	1102	1.262
71	1007	516.813	1002	0.318	1104	1.353
72	1202	522.037	203	0.336	104	1.382
73	503	531.012	201	0.389	808	1.450
74	802	531.053	1201	0.429	1205	1.463

APPENDIX V. Continued.

Rank	Hydrology		Water Quality		Life Support	
	Unit	Value	Unit	Value	Unit	Value
75	1009	551.340	1205	0.485	506	1.558
76	310	557.140	206	0.489	203	1.565
77	407	561.887	1207	0.508	1007	1.793
78	1008	563.094	704	0.568	1008	1.993
79	402	584.877	101	0.778	301	2.013
80	1016	623.238	1007	0.824	605	2.028
81	808	659.496	1203	1.026	813	2.105
82	1207	666.058	1004	1.051	1203	2.175
83	1011	667.106	506	1.170	802	2.376
84	812	668.121	310	1.173	204	2.403
85	601	740.486	1006	1.192	1016	2.407
86	814	754.841	1202	1.304	815	2.931
87	1003	765.464	607	1.326	602	3.083
88	405	825.474	103	1.414	701	3.206
89	905	846.195	409	1.524	1003	3.444
90	1201	876.197	503	1.633	816	3.591
91	505	938.620	407	1.690	402	3.630
92	403	1176.578	504	1.779	1101	4.467
93	408	1313.342	809	2.249	1011	4.619
94	1012	1360.994	403	2.469	1105	5.007
95	501	1453.033	1003	2.475	505	5.508
96	307	1484.728	1105	2.560	1207	6.130
97	1006	1489.570	303	3.352	1202	6.182
98	816	1512.565	104	3.367	1201	6.325
99	1013	1546.531	705	3.494	405	6.460
100	705	1782.650	605	3.519	407	8.116
101	602	1873.800	807	3.543	604	8.410
102	608	2111.788	204	3.687	1006	8.781
103	813	2143.520	814	3.762	904	9.255
104	1105	2146.070	408	5.166	413	10.243
105	309	2167.095	501	5.285	905	11.724
106	305	2381.461	402	5.481	1010	12.295
107	809	2393.229	505	6.670	305	12.747
108	1014	2434.454	602	7.754	409	13.615
109	1101	2473.665	815	7.780	705	13.738
110	904	2549.987	401	7.943	608	14.858
111	502	2880.099	1101	8.836	703	17.154

APPENDIX V. Continued.

Rank	Hydrology		Water Quality		Life Support	
	Unit	Value	Unit	Value	Unit	Value
112	815	3730.020	608	12.030	403	21.487
113	401	4762.078	1012	12.592	306	31.464
114	413	5711.713	502	14.641	812	38.464
115	306	6278.359	413	18.282	809	42.257
116	810	7490.685	811	18.406	308	46.966
117	1010	7650.105	309	30.054	408	76.897
118	308	7814.110	1014	30.281	903	77.925
119	1104	14720.110	604	55.662	401	98.221
120	903	31352.400	1010	127.732	810	127.521
121	415	UNDEFINED	415	UNDEFINED	415	UNDEFINED
122	603	UNDEFINED	603	UNDEFINED	603	UNDEFINED