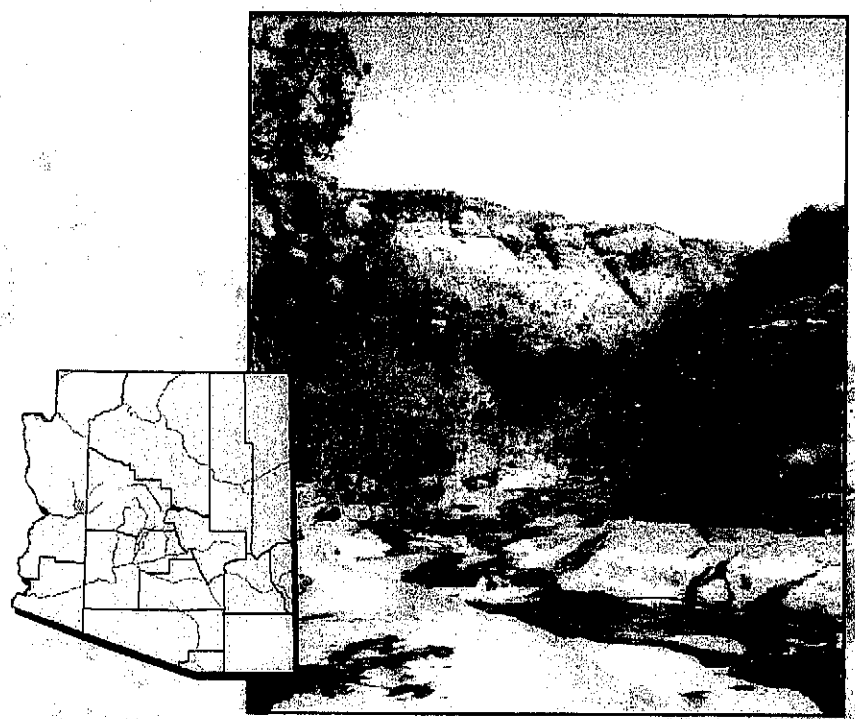
# Draft Final Report
# SMALL & MINOR WATERCOURSES ANALYSIS for Cochise County, Arizona

Contract No. AD 990205



## ARIZONA STATE LAND DEPARTMENT

June 9, 2000


Stantec Consulting Inc.
*In Association with*
JE Fuller/Hydrology & Geomorphology, Inc.

Stantec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DRAFT FINAL REPORT

# SMALL AND MINOR WATERCOURSES ANALYSIS

## for Cochise County, Arizona

Contract No. AD 990205

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June 9, 2000

SMALL AND MINOR WATERCOURSES ANALYSIS
FOR COCHISE COUNTY
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# Executive Summary

The small and minor watercourses in Cochise County were evaluated using the three-level evaluation process that was previously developed by the project team (Stantec, 1998 & 1999b). This evaluation process analyzes the watercourses at increasing levels of detail to assess susceptibility and evidence of stream navigability.

The results of the Level 1 analysis for the 1,739 watercourses in Cochise County indicated 1,698 watercourses (i.e., RL1 data set) fail every diagnostic attribute that was used in the screening process. These diagnostic attributes include *stream type, dam information, historical and modern boating accounts, the existence of fish,* and *any special watercourse status designation.* Forty one (41) watercourses passed the Level 1 analysis to proceed to Level 2 analysis. The Level 2 analysis employs a qualitative approach. All 41 watercourses failed the Level 2 analysis and were dropped from further study and investigation (i.e., RL2 data set). That is, no watercourse within Cochise County was further evaluated in Level 3 and Level 4 analyses.

A list of the rejected and not rejected watercourses at each level of the analysis is presented in the Appendix.

# 1.0 Introduction

## 1.1 STUDY BACKGROUND

The State of Arizona is currently adjudicating navigability with regard to ownership interest in streambeds throughout Arizona. Claims of streambed ownership depend on whether or not a given stream was navigable or susceptible to navigation at the time of statehood in 1912. The reader is referred to the Project Background section of the report titled, "*Criteria for Assessing Characteristics of Navigability for Small Watercourses in Arizona*" (Stantec, 1998) for a complete discussion of the history of the navigability issue in Arizona.

The Arizona Navigable Stream Adjudication Commission (ANSAC) is legislatively mandated to establish administrative procedures, hold public hearings, and make recommendations to the Arizona Legislature as to which watercourses were navigable or non-navigable at the time of statehood. To date there have been 14 major river systems that have been adjudicated by the State of Arizona.

ANSAC is required to complete their legislatively mandated tasks by July 1, 2002. There are over 39,039 documented watercourses in Arizona, the vast majority of which are minor or small watercourses. In consideration of these two factors, ANSAC determined that the small watercourses should be considered separately from the major rivers in order to expedite the evaluation process to meet the target date for completion in the year 2002. ANSAC contracted with Stantec in 1997 to: (1) establish minimum technical and historical criteria for small watercourses in accordance with the legislative definition of navigability; (2) develop an evaluation system to assess watercourses utilizing the criteria; and (3) catalog in a database all documented watercourses in the state. That work was completed in 1998 and the results are summarized in *Criteria for Assessing Characteristics of Navigability for Small Watercourses in Arizona* (Stantec, 1998).

In May 1999, ANSAC authorized the Stantec project team to proceed with a Pilot Study to further test the evaluation system and apply the small watercourse criteria to a limited sample of small watercourses in selected locations. The scope of work for the Pilot Study covered Level 1 analysis for the entire State of Arizona, Level 2 analysis for Mohave, La Paz, and Yuma counties, and Level 3 analysis for three watercourses identified to represent the diverse physiographic conditions in Arizona. The project team is currently under contract with the Arizona State Land Department (ASLD) to continue this work by applying the

evaluation system to all remaining small watercourses throughout the state that were not addressed in the Pilot Study. That work is scheduled for completion in June 2001.

The reporting of project results is categorized by county so that ANSAC can conduct hearings within each county for the purpose of determining stream navigability and settling streambed ownership. This report documents the navigability results for Cochise County.

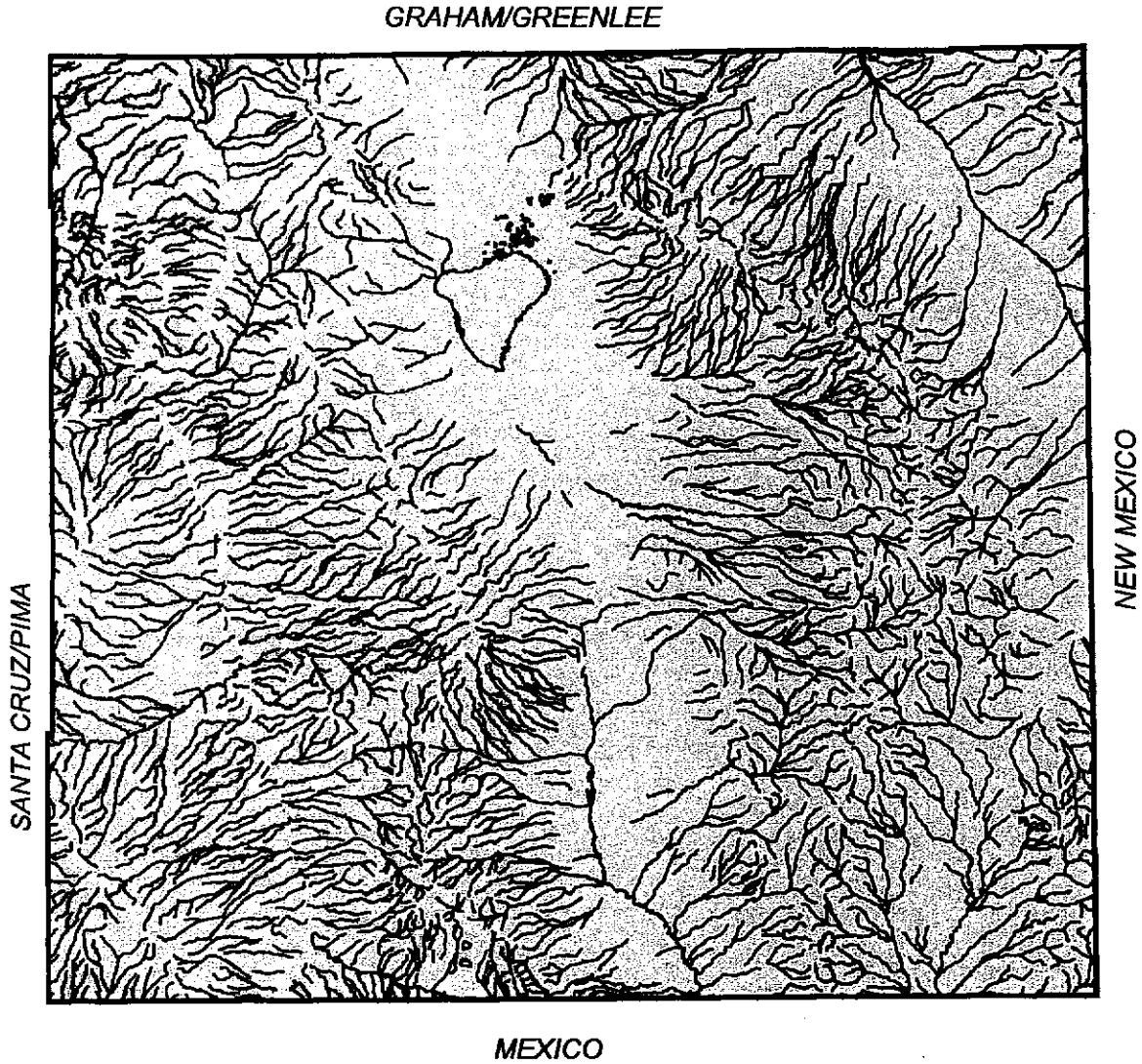
## 1.2 COUNTY DESCRIPTION

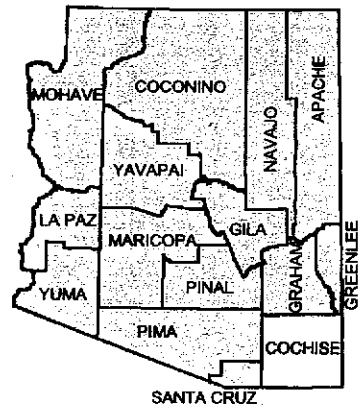
Cochise County is located in the southwest portion of the State and is comprised of about 6,215 $mi.^2$ land area. It borders the state of New Mexico to the east, Graham and Greenlee counties to the north and Pima and Santa Cruz counties to the west (see Figure 1). The county lies within the following Latitude and Longitude ranges: *31°20'00"N to 32°25'30"N and 109°03'00"W to 110°27'00"W.* There are 1739 documented small and minor watercourses in Cochise County of which 1618 are unnamed. These watercourses, both named and unnamed, were the subject of the evaluation process involving the three levels of analysis developed by the project team (and a detailed study if any watercourse(s) passed the Level 3 analysis).

## 1.3 REPORT OBJECTIVES

The work plan for the small and minor watercourses project was to analyze, summarize and present the results of the three-level classification analysis comprised of the following main work tasks and activities:

**FIGURE 1**
**Small and Minor Watercourses in Cochise County**




Arizona Map

***LEGEND:***

Cochise Watercourses

Cochise County

N
W E
S

10 0 10 20 30 Miles

**Task 1** – *Summarize and present the results of Level 1 Analysis*

This task identifies two data sets as the result of the Level 1 Analysis. They are:

(1) NRL1 data set – This data set comprises all watercourses that have at least one affirmative hit from six key stream attributes: *perennial classification, with fish, dam-impacted, with modern boating and historical boating records*, and *with special status*. This data set proceeds to the Level 2 analysis.

(2) RL1 data set – This data set comprises those watercourses that do not have any affirmative hit from the six key stream attributes. This data set is dropped from further analysis and investigation.

**Task 2** – *Summarize and present results from Level 2 analysis.*

Similar to Level 1 analysis, this task identifies two data sets as the result of the Level 2 analysis. They are:

(1) NRL2 data set – This data set is comprised of the watercourses that have potential susceptibility to navigation according to the qualitative evaluation procedure used in Level 2. This data set proceeds to Level 3 analysis.

(2) RL2 data set – This data set is comprised of those watercourses that have no evidence of susceptibility to navigation based on the qualitative investigation performed in Level 2. This data set is dropped from further analysis and investigation.

**Task 3** – *Summarize and present results from Level 3 analysis.*

Similar to Level 1 and Level 2 analyses, this task identifies two data sets as the result of the Level 3 analysis. They are:

(1) NRL3 data set – This data set is comprised of the watercourses that have characteristics of susceptibility to navigation upon evaluation of the geomorphologic, hydrologic, and hydraulic conditions of the watercourses and validation of these conditions with established boating criteria. This data set is recommended for a detailed study (Level 4 analysis).

(2) RL3 data set – This data set is comprised of those watercourses that fail to meet the criteria for susceptibility to navigation.

**Task 4 –** *Detailed Studies (Level 4 Analysis)*

Detailed study for Level 3 survivors (NRL3 watercourses) is beyond the scope of the current project. NRL3 watercourses would be investigated in a separate contract with Arizona State Land Department. Though they are not part of the existing project contract, a section is allocated in this report for their integration as their study documentation becomes available.

# 2.0 Data Requirements

## 2.1 BASELINE DATA

The watercourse database operates in a Geographic Information System (GIS) environment. This allows the user to analyze the spatial characteristics of the studied watercourses in a graphical or tabular format. The project team selected ArcView GIS, a GIS analysis and thematic map software, for its ease of use and its operational capabilities. In addition, ArcView GIS supports many of the hydrologic assessment activities that have been conducted by state, federal and local agencies. The viability of this data must meet the following criteria to be considered applicable to this project:

- Data are already in or can be readily converted to a GIS format
- Data are readily accessible, technically sound and historically accurate
- Data can be easily sorted by category or criteria.

The primary data source in the development of the master database was obtained from the Arizona Land Resource Information System (ALRIS). The surface water data sets were originally derived from baseline Digital Line Graph (DLG) maps compiled by the US Geological Survey (USGS), which were further enhanced by the US Environmental Protection Agency (EPA) in several versions called the River Reach Files. The latest version, commonly called RF3, is a federal standard for identifying and cataloging water bodies. The RF3 file was converted to a GIS ARC format by ALRIS and has been distributed and used by various public and private agencies working on water management issues.

The base GIS layer used in the master watercourse database is an ALRIS-converted RF3 data set called STREAMS. It is a line coverage of hydrography (streams) within Arizona and contains 87,735 separate watercourse segments. The STREAMS file includes several fields that were relevant in the development of the master watercourse database. They include the Hydrologic Unit Code (HUC), segment number, mileage, watercourse type, and watercourse name. A binary (yes/no) field for each criterion and a county field were added to aid in the Level 1 sorting process. All manmade water features (canals, aqueducts, flumes, etc.) were removed from the master watercourse database. The major rivers previously assessed by the ASLD for characteristics of navigability or susceptibility to navigation and subsequently adjudicated by the ANSAC were also removed. The resulting master watercourse database contains 76,166 records or stream segments (typically many stream segments comprise one watercourse).

Additional ALRIS Data Sets were used in conjunction with the STREAMS layer to allow for detailed resolution of the physical location of each watercourse. These data sets are listed in Table 1.

TABLE 1
ALRIS Data Sets

| Name of Data Set | Data Type / Format | Description |
|---|---|---|
| AZSPRINGS | Vector: Point<br>Format: ArcInfo | This coverage consists of spring locations in Arizona. Incorporates information extracted from both the USGS Geonames database and the USGS Digital Line Graphs (DLG). |
| AZTRS | Vector: Polygon<br>Format: ArcInfo | This statewide coverage consists of the Township, Range and Section grid lines. |
| County | Vector: Polygon<br>Format: ArcInfo | This polygonal Data Set consists of individual county and an appended statewide coverage. |
| Lakes | Vector: Polygon<br>Format: ArcInfo | This polygon cover consists of all the lakes in Arizona. |
| HUCS | Vector: Polygon<br>Format: ArcInfo | This data set consists of Hydrologic Unit Code areas (drainage basins) in Arizona. |
| DAMS | Vector: Point<br>Format: ArcInfo | This data set consists of jurisdictional dams maintained by ADWR. |
| GAGES | Vector: Point<br>Format: ArcInfo | This data set consists of streamflow gaging stations maintained and operated by USGS. |

## 2.2 DATA CONVERSIONS

The processing of data during query and search operations was slow due to the large file sizes of the data sets being used. To allow for ease of data storage and manipulation, a method of reducing the file size was undertaken which would not impact the outcome of the investigation and analysis.

The largest challenge was identifying a method to combine multiple stream segments into a single watercourse. Approximately 73% (55,387 segments) of the records in the original STREAMS Data Set are without names. In addition, there are a large number of separate watercourses with the same names; (e.g., Sycamore Wash). To resolve this, the project team assigned a unique nomenclature to all unnamed and same-named watercourses. For unnamed watercourses, nomenclature was assigned by combining the HUC ID with the Segment number (e.g. H34-2300). Same-named watercourses were assigned new nomenclature by combining the name with the county within which the

majority of the watercourse was located. If there were more than one same-named watercourse within the same county, an additional numerical ID was added to the name (e.g., Sycamore Creek, Yavapai 1). This naming convention enabled reliable query and display and reduced the watercourse records to 39,039.

The project team assigned township, range, and section (TRS) location attributes to the mouth of each watercourse. The project team was not successful in linking the watercourse database to latitude/longitude GIS coverages, but this was not essential as the database is linked to the TRS system for location referencing.

## 2.3 DEVELOPMENT OF SATELLITE DATABASES

Six satellite databases were developed for each of the criterion comprising the Level 1 evaluation screening process. These satellite databases were populated with both diagnostic data fields used for the binary queries in the ANSAC master watercourse database, and also informational fields to provide additional information relative to the Level 1 criteria where readily available. The watercourses that tested affirmatively were converted to new satellite databases (themes) based on the criterion queried and were linked to the master database by a unique watercourse name or assigned watercourse ID. Each satellite database can be layered graphically in any selected combination to facilitate watercourse evaluation and to create meaningful reports. Listed below are the six satellite databases (with thematic displays) that were created along with the source documentation associated with each database.

**Perennial** - Only watercourses that have been classified by both the Arizona State Parks (1995) and ALRIS (1988) as perennial are so identified in the database. The approach used in identifying these watercourses in case of classification conflict was presented and described in detail in an earlier ANSAC report by Stantec (1998). Since the original stream database (comprised of 76,166 stream segments) was recently converted into a watercourse database (comprised of 39,039 records), assignment of perennial stream type to watercourses was made for those washes and streams with at least one perennial segment.

Conflicts in the classification of watercourses beyond the two sources named above are addressed in the Level 2 analysis, which employs a qualitative approach in the evaluation procedure. The project team acquired a GIS coverage developed by the Arizona Game and Fish Department entitled Perennial Waters of Arizona (AG&F, 1995,1997). The perennial streams, originally compiled and mapped by Brown et al (1977, 1978, and 1981), are the foundation of the GIS coverage of perennial streams developed by Arizona Game and Fish Department (1995, 1997). These data are used extensively by both federal and state agencies and were used by the project team to

supplement the original perennial streams classified by Arizona State Parks (1995) and ALRIS (1988). Brown's perennial streams data were not integrated into the Level 1 analysis, but were used for the qualitative assessment in Level 2 for NRL1 watercourses located in Cochise County.

**Dams** - The Arizona Department of Water Resources (ADWR) developed the GIS coverage in point features indicating the location of all the jurisdictional dams in Arizona. The coverage contains data fields describing essential attributes of those dams important to the agency in matters of dam safety, management and ownership. However, essential data important to the pilot study are not completely populated such as township, range, and section, county, date constructed, dam types, wash location, purpose, and other important physical attributes. The missing information plus the resolution of the dam coverage made the task of identifying dam-impacted streams very difficult. The resolution problem associated with the dam GIS coverage was largely due to inconsistent development standards of different state agencies. Most of the GIS coverages used in the project were developed by ALRIS, while the dam coverage was developed by ADWR.

There are other sources of data for dam structures built in the state of Arizona besides that provided by ADWR. The US Geological Survey (USGS) and the Federal Emergency Management Agency (FEMA) maintain a listing of dams for the entire United States. Inconsistency in the use of names for the dams and data attributes between these various sources resulted in the sole utilization of the ADWR dam database for the study. Originally, the dam coverage from ADWR was comprised of 397 records. After the deletion of dams that are used for mining tailings and those that are located off-stream (a total of 26 records), the final record count was reduced to 371 dams.

**Fish** - A report published by the USDA Forest Service titled *Run Wild* (Silvey et al, 1984) was used to identify the occurrence of fish species and their habitats in Arizona. Several sources validate the findings listed in the *Run Wild* document. A total of 292 watercourses were identified as having one or more species of fish. Efforts to acquire existing fish GIS database information from Arizona State University (ASU) was not successful. Instead, information gathered from a number of reliable federal and state agency sources was used. These sources are listed in the references.

**Historical and Modern Boating** – Published accounts of modern boating were obtained from the Greenlee County Historical Society, Coconino Historical Society, Mormon Archives, Apache County Historical Society, Arizona State Parks, Central Arizona Paddlers Club, Arizona Game and Fish Department and professional river rafting companies. One watercourse has a documented account of historical boating while 10 others have modern boating accounts.

**Special Status** – The Special Status category includes water-related characteristics that make a watercourse of particular interest or concern to

various organizations and/or governmental agencies. Watercourses identified as having the following designations were included in the Special Status database: In-stream Flow Application and/or Permit, Unique Waters, Wild and Scenic, Riparian, and Preserve area. Agencies issuing the Special Status designation were contacted to identify watercourses meeting the criterion.

# 3.0 Analytical Procedure

A three-level evaluation system shown in Figure 2 was developed by the project team under the previous phase of this project (Stantec, 1998) and adopted for use in the follow-up Pilot Study (Stantec, 1999). The approach involves a multi-level screening process of increasing refinement designed to identify watercourses least likely to meet the statutory and legal definitions of navigability. The evaluation process consists of three levels as follows:

## 3.1 LEVEL 1 ANALYSIS

The goal of Level 1 of the watercourse evaluation procedure is to perform an initial screening of the entire catalog of small and minor watercourses. The purpose is to eliminate the watercourses most likely to be non-susceptible to navigation and which exhibit no evidence of actual navigation in fact.

The Level 1 analysis is a binary, quantitative sorting process utilizing the data queries programmed into the database catalog. Those queries are the digital expression of the technical and historical criteria considered diagnostic for evaluating watercourses for susceptibility to navigation and for navigation in fact, respectively. The minimum criteria include *stream type, dam information, historical and modern boating accounts, the existence of fish,* and *any special watercourse status designation (see* Figure 3).

The Level 1 screening process is applied to all small watercourses in the database catalog using available information from existing databases compiled by various agencies. Only those watercourses that test negatively to all six criteria are rejected at Level 1 as most likely to be non-susceptible to navigation. All watercourses, which test affirmatively to one or more of the criteria comprising the data queries, require further evaluation at Level 2.

Figure 2
THREE-LEVEL WATERCOURSE
EVALUATION PROCEDURE

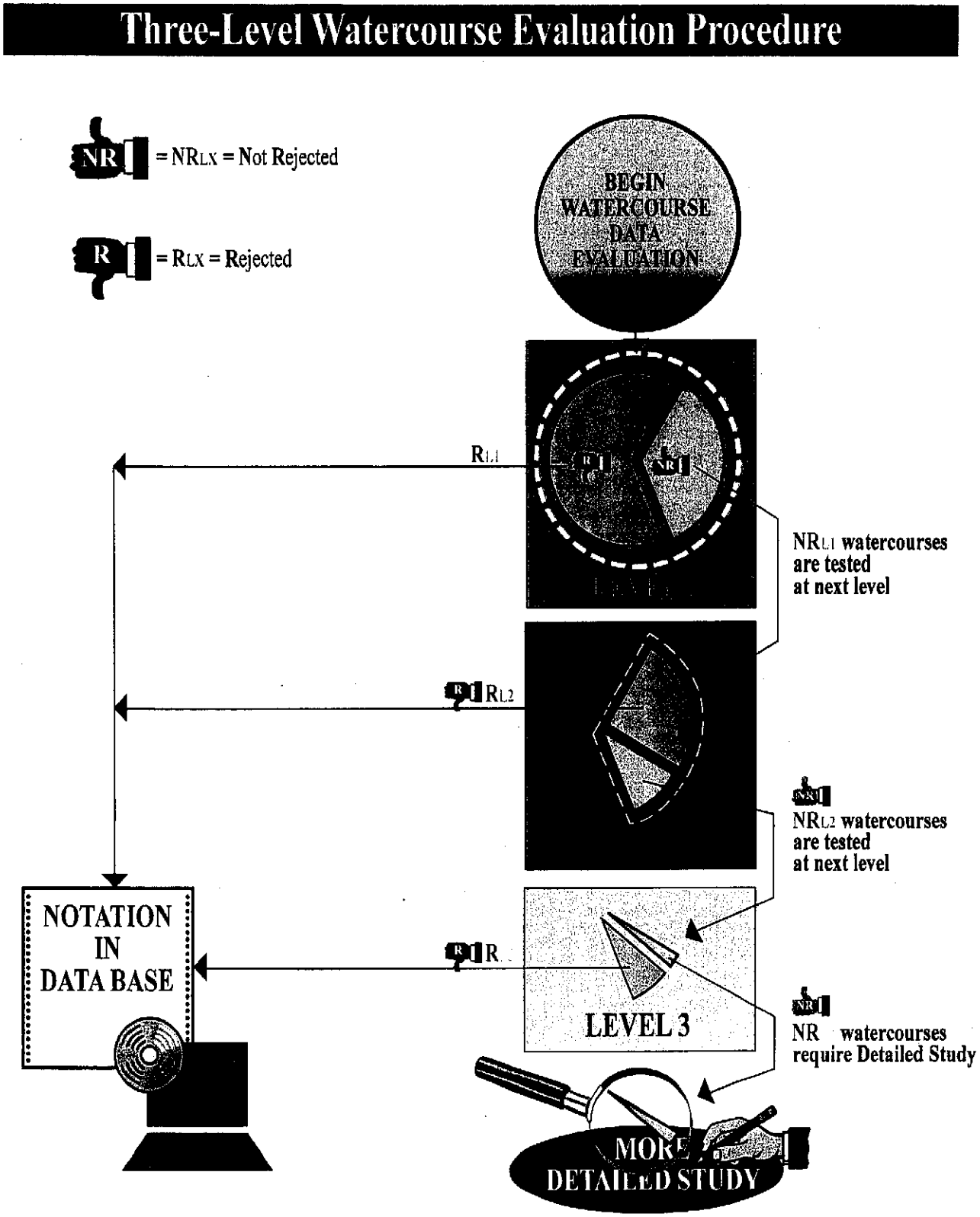
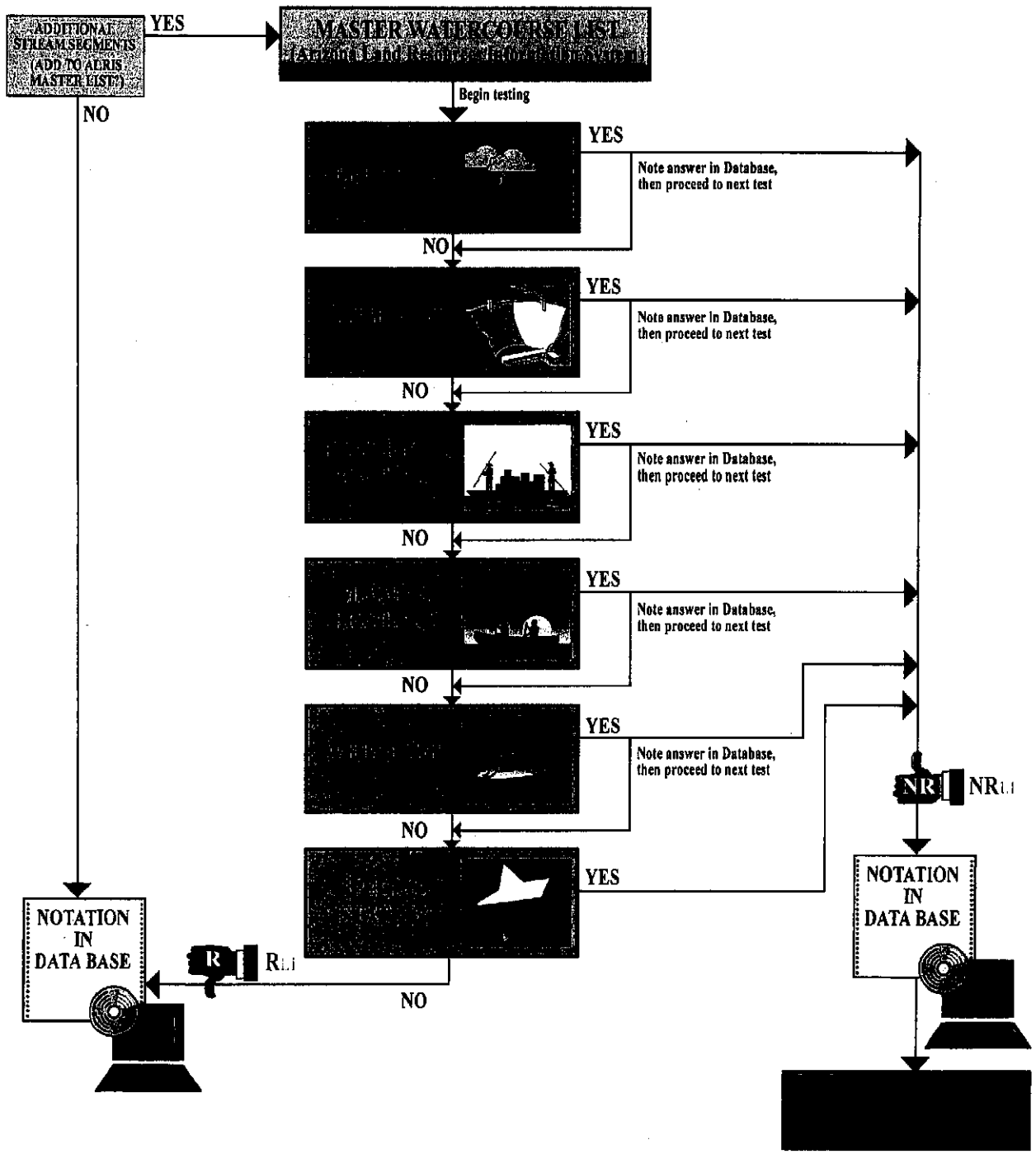


Figure 3
LEVEL 1 SCREENING PROCEDURE

# Level 1 Screening Procedure



## 3.2 LEVEL 2 ANALYSIS

The goal of the Level 2 watercourse evaluation procedure is to perform a refined screening to eliminate the watercourses unlikely to be susceptible to navigation. Contiguous watercourse segments were combined to form study reaches to be evaluated in Level 2.

The Level 2 method of approach is more qualitative than the binary data queries employed at Level 1. Level 2 assessment involves the qualitative review of watercourse location, typical watershed characteristics, and typical watercourse characteristics, among other features, for verification and interpretation of the reason(s), which caused them to advance from Level 1. The recommended Level 2 methodology involves the further assessment of those watercourse characteristics that tested positively at Level 1 in two parts as shown in Figure 4 and described below:

1. The first-cut filter individually analyzes each criterion that caused a particular watercourse to advance to Level 2 – referred to herein as "affirmative responses" – for information salient to the navigability question as shown in Figure 5. Those watercourses are categorized into three groups as follows:

   *Category A* – Potentially Susceptible to Navigation

   *Category B* – Not Likely Susceptible to Navigation

   *Category C* – Not Susceptible to Navigation

   All watercourses with documented boating accounts - historical and/or modern - will automatically advance to *Category A* comprised of watercourses potentially susceptible to navigation. These watercourses are forwarded for Level 3 analysis.

   The streams classified as *Category C*, which comprised of watercourses not susceptible to navigation, are rejected at Level 2 and will not be investigated further.

2. The second cut filter analyzes *Category B* watercourses with multiple affirmative hits on multiple segments for diagnostic hit combinations that are evidence of navigation in fact or are indicative of susceptibility to navigation as shown in Figure 6. In addition, a rating system is applied to rank the Level 2 watercourses and identify those watercourses that merit further evaluation at Level 3. The application of the rating system is based on the premise that the six criteria used in the classification analysis of the small and minor watercourses do not carry equal weights as far as establishing potential susceptibility of any given watercourse to navigation.

**Figure 4**
**Level 2 Screening Concept**

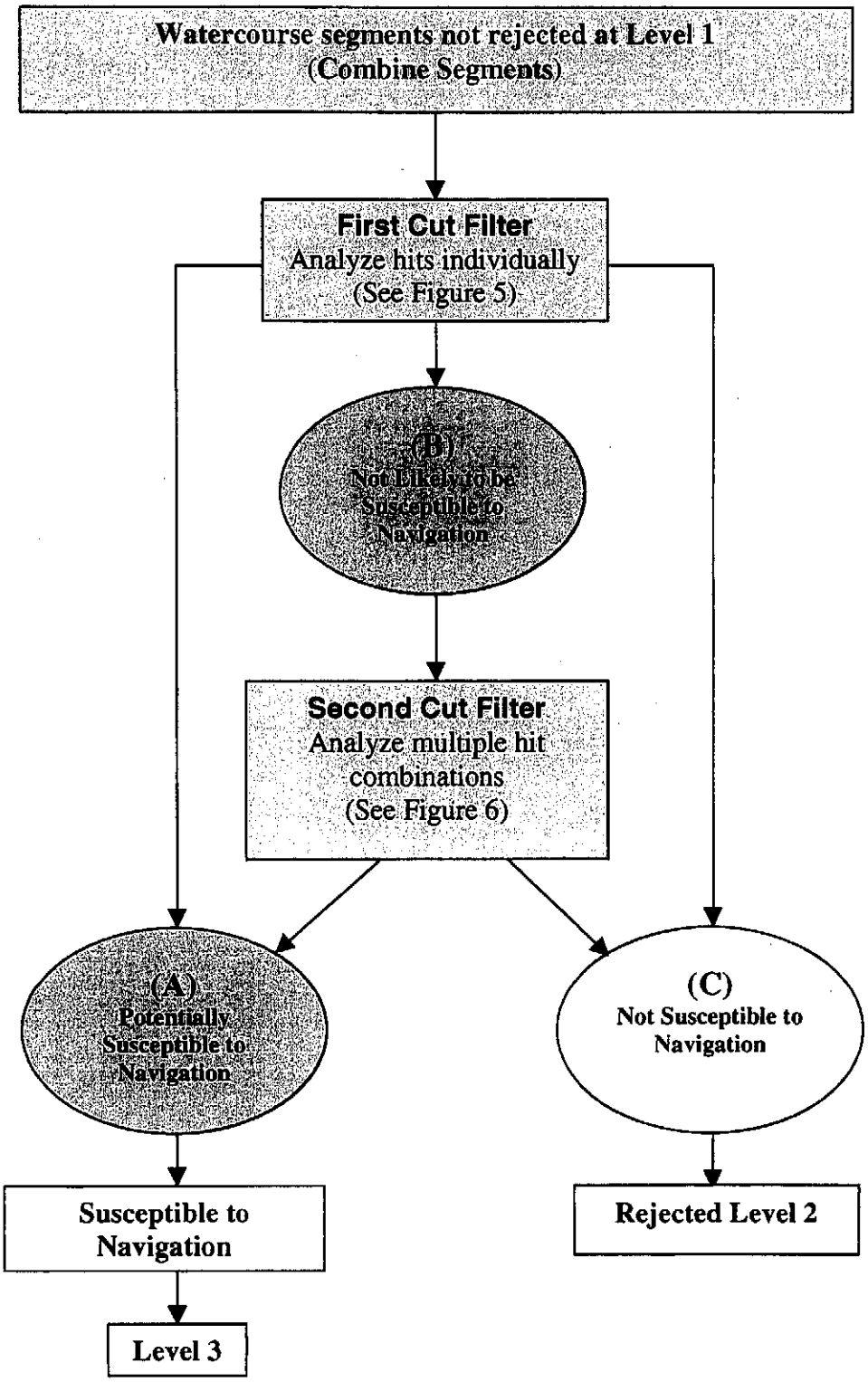


**Figure 5**
**Level 2 Watercourse Screening**
**First Cut Filter**

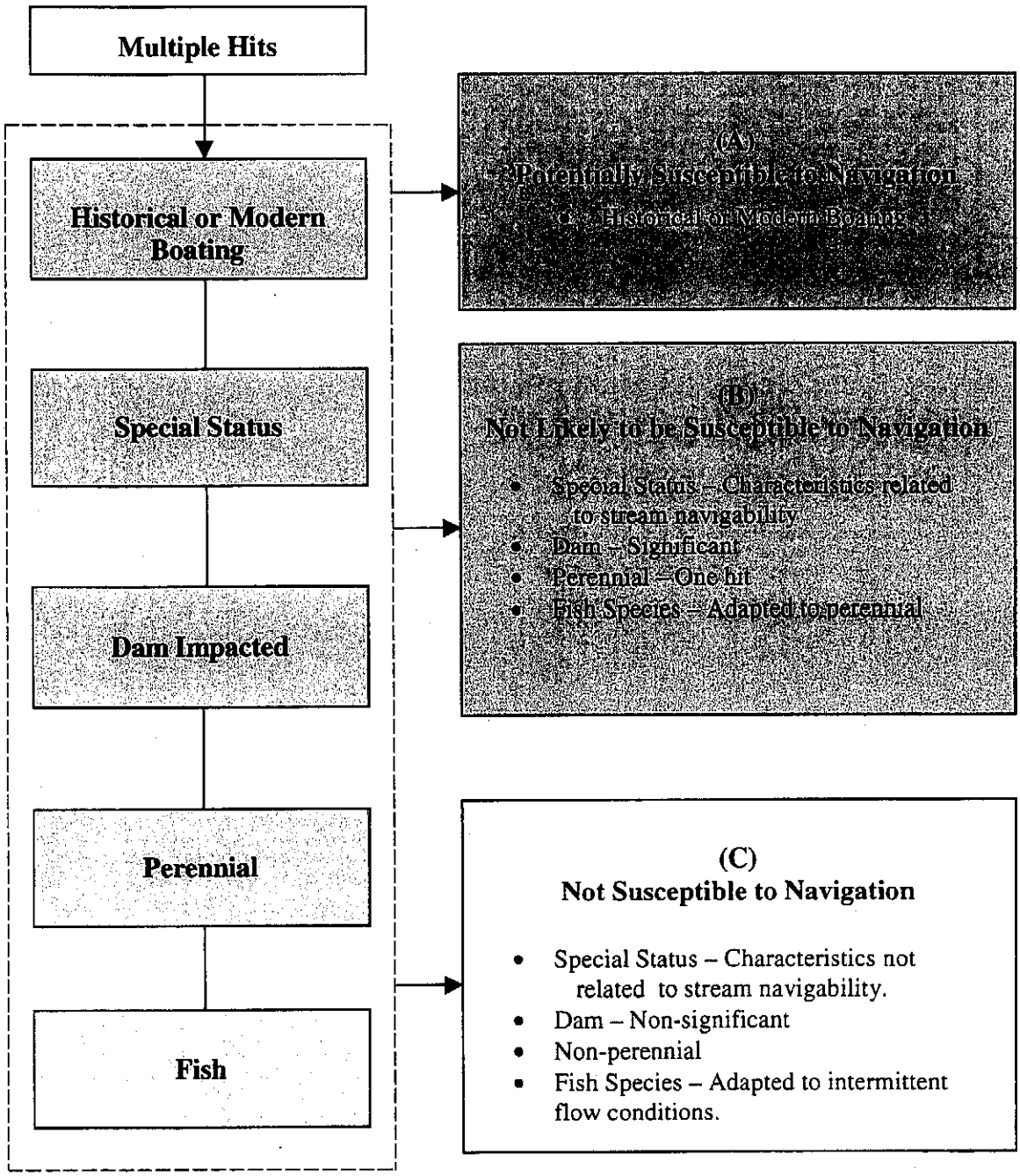
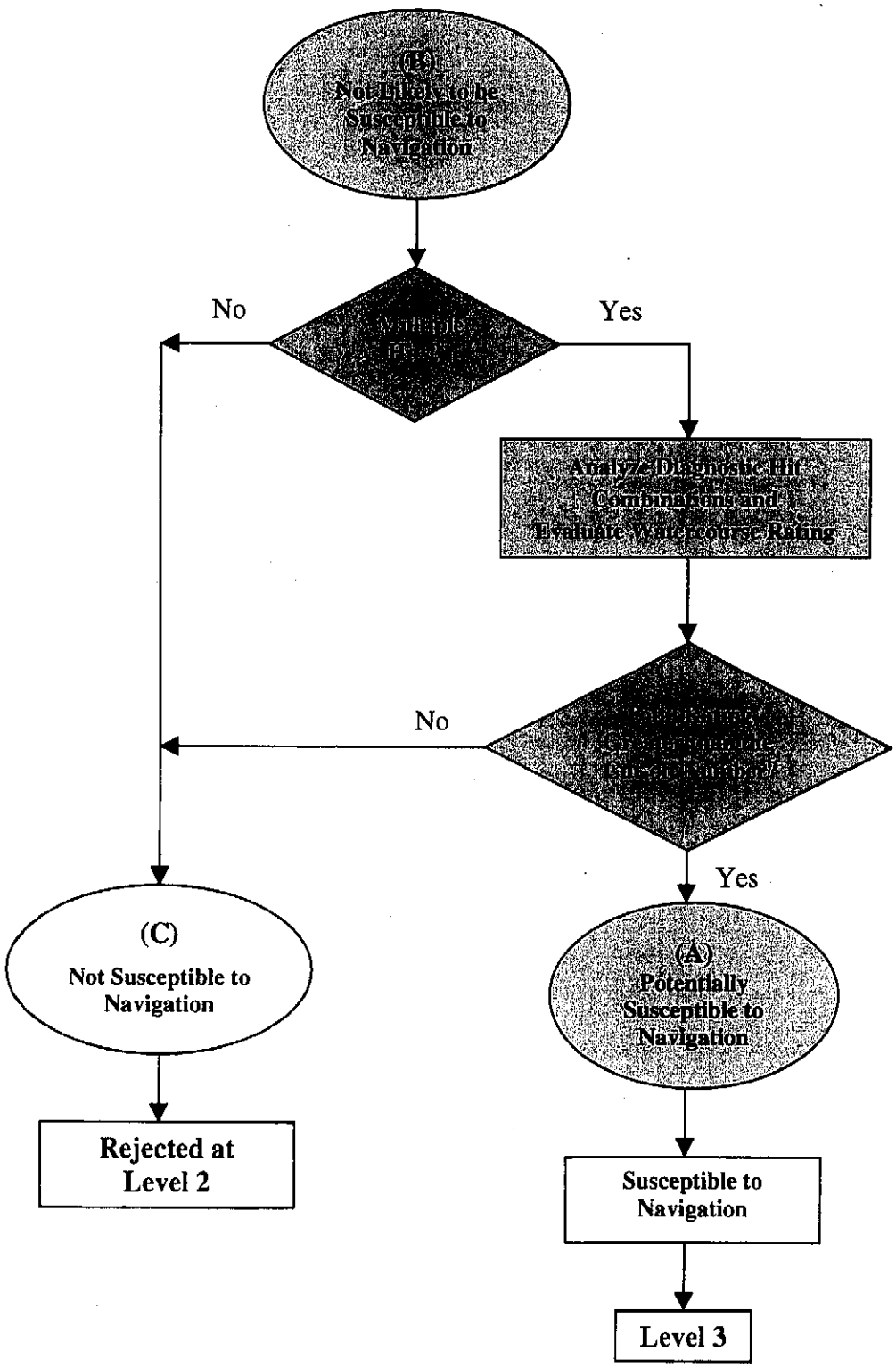


**Figure 6**
**Level 2 Watercourse Screening**
**Second Cut Filter**



Ultimately, the second cut filter classifies the watercourses into two categories (i.e., *Category A* and *Category C*) based on their likelihood of being susceptible to navigation. Watercourses with multiple hits indicative of susceptibility on contiguous segments and with evaluated total ratings of more than 11.0 are classified under *Category A*. *Category A* watercourses, which merit quantitative engineering analysis, are potentially susceptible to navigation and thus, forwarded for Level 3 analysis.

Watercourses, which are determined upon visual and/or manual inspection to exhibit physical characteristics incompatible with successful navigation (such as high elevations or steep slopes), and which received total ratings of 11.0 and below, are classified under *Category C*. *Category C* watercourses are rejected at Level 2 and are eliminated from further consideration in the study.

In the establishment of the rating system for the watercourses in Level 2, a cut-off number could be determined that helps separate the watercourses that are rejected at Level 2 and those that are forwarded for Level 3 analysis. The problem of not using a rating system for the watercourses is the assumption that the six criteria for the classification analysis carry the same weight as far as assessing their role to the stream navigability question. For example, historical boating, which is perceived to have the greatest bearing to stream navigability from among the six criteria, should carry the greatest weight possible.

Assigning associated weights to each of the six criteria based on their relevance to stream navigability aids in establishing a ranking system for the watercourses. The ranking system for the watercourses prioritizes the streams as follows: (1) those watercourses that show evidence of potential susceptibility to navigation which are forwarded to Level 3; and (2) those watercourses that show limited or weak susceptibility to navigation which are rejected at Level 2.

In order to assign numerical weights to the six criteria, a rating system was adopted with the goal of ranking the 1025 watercourses statewide to be evaluated in Level 2. The rating system was created by applying the criteria scoring matrix used for value engineering evaluation as shown in Figure B-1 (see Appendix B).

The procedure involves the identification of all the criteria to be used in the analysis. For the current study, the criteria are: *(a) historical boating, (b) modern boating, (c) perennial, (d) dam-impacted, (e) special status,* and *(f) fish.* Each criterion is compared with the rest of the criteria by assigning relative numerical values based on the preference scale provided below.

| Value | Degree of Preference |
|---|---|
| *4* | *Major Preference* |
| *3* | *Medium Preference* |
| *2* | *Minor Preference* |
| *1* | *No Preference* |
| | *(Each criterion scores one point).* |

For example, if three criteria (say *X, Y,* and *Z*) are being compared for the purpose of assigning numerical weights to them, each criterion must be individually compared to each of the other criteria (say *X vs. Y, X vs. Z, and Y vs. Z*). In each comparison there are only two possible choices, i.e., either one criterion is superior or preferred over the other criterion, or both criteria are on par - that is, no criterion is superior or preferred. For the first choice (where one criterion is superior or preferred), alphanumeric ratings similar to the examples below could be used:

*X4* - indicates that criterion *X* is a *major preference* over criterion *Y* or criterion *Z*, whichever criterion *X* is being compared against.

*Z3* - indicates that criterion *Z* is a *medium preference* over criterion *X* or criterion *Y*, whichever criterion *Z* is being compared against.

*Y2* - indicates that criterion *Y* is a *minor preference* over criterion *X* or criterion *Z*, whichever criterion *Y* is being compared against.

For the second choice (where no criterion is superior or preferred), alphanumeric ratings similar to the examples below could be used:

*X,Y1* - indicates that criterion *X* and criterion *Y* are on par (no preference) assigning one point for each criterion.

*Y,Z1* - indicates that criterion *Y* and criterion *Z* are on par (no preference) assigning one point for each crietrion.

When all possible comparison scenarios are exhausted, the assigned numerical values are summed up for each criterion. The criterion that receives the highest total raw score should carry the highest numerical weight. Ranking all the criteria based on the raw scores evaluated, numerical weights from 0 to 10 are assigned accordingly. A numerical weight of 10 should be assigned to the criterion with the largest raw score, 9 or a lower rating to the second largest raw score, and so on.

## 3.3 LEVEL 3 ANALYSIS

The goal of the Level 3 sorting process is to eliminate watercourses that are non-susceptible to navigation utilizing quantitative engineering methodologies. The primary objective of the Level 3 engineering methodologies is to provide

technically sound data from which typical channel characteristics and flow rates for each watercourse can be estimated and used to determine susceptibility to navigation. Additionally, any physical obstacles to successful navigation along a watercourse will be identified and assessed at Level 3.

The recommended methodologies for the Level 3 screening process involve application of quantitative hydrologic and hydraulic analyses that require a significant level of effort to meet the requirements of the adjudication process. The availability of streamgage data significantly impacts the level of effort required to quantify discharge rate and hydraulic geometry for evaluation of watercourse susceptibility to navigation. The recommended methodologies include:

1. Quantitative analysis of US Geological Survey (USGS) streamflow records or USGS regression-type methodologies based on streamflow records or extrapolation of gage data to adjacent watersheds to estimate discharge in the subject watercourse; and

2. Use of USGS rating curves or Manning's ratings to estimate flow characteristics such as depth, width and velocity in the subject watercourse.

The Level 3 screening process is applied only to those watercourses not rejected at Level 2 (NRL2 data set). The watercourses with no evidence of actual navigation in fact and determined to be not susceptible to navigation are rejected at Level 3. All remaining watercourses merit Detailed Study (Level 4) comparable to that performed for the major river studies and advance to the final level of the watercourse evaluation system.

# 4.0 Results

## 4.1 LEVEL 1 ANALYSIS

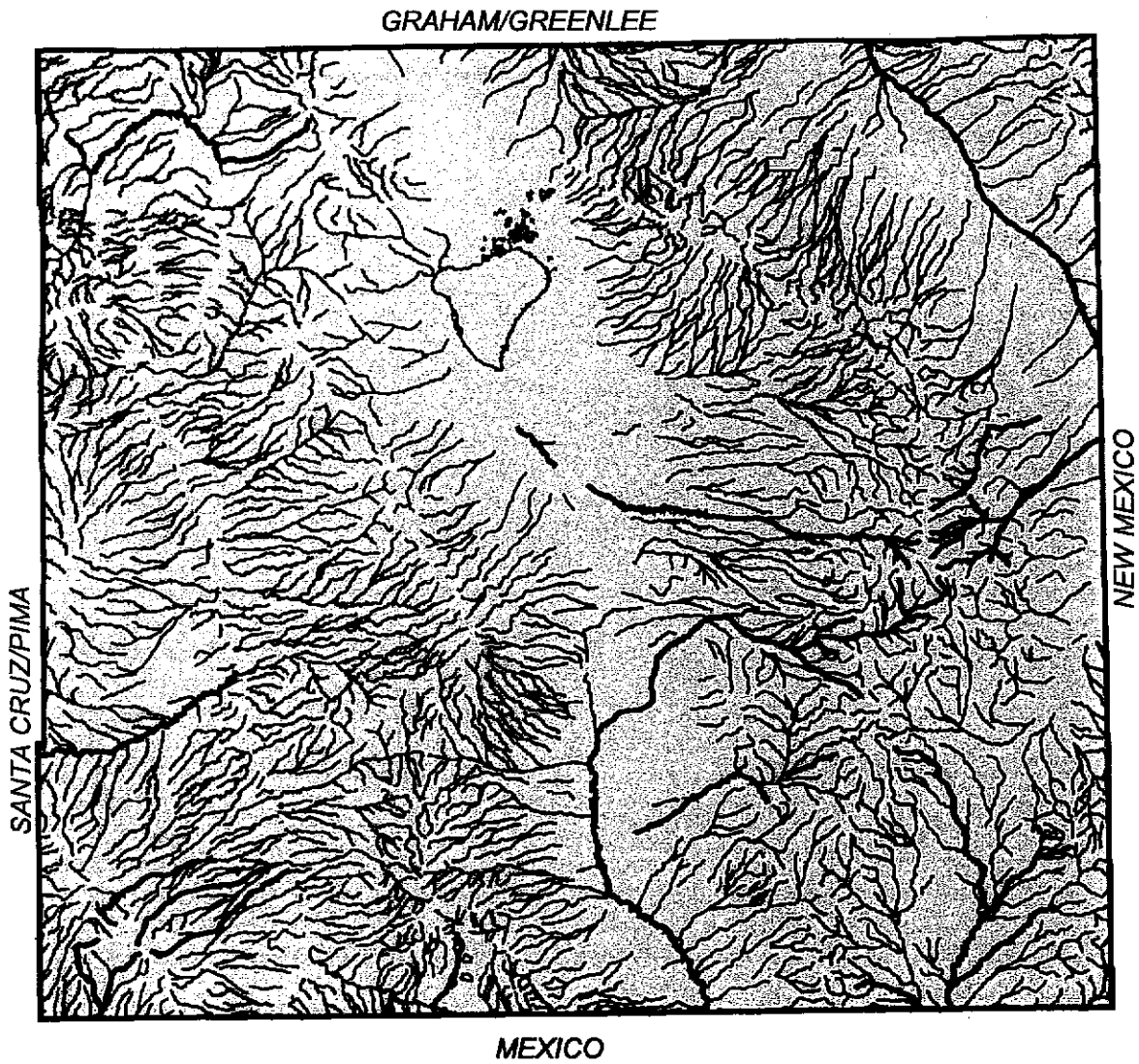
The application of the Level 1 sorting procedure to all small and minor watercourses in Cochise County resulted into two data sets. The RL1 data set is comprised of all watercourses that test negatively for each criterion used in the Level 1 database query. This indicates that no characteristics of stream susceptibility to navigation are exhibited based upon known records and information. Level 1 analysis results indicate a significant percentage of the watercourses (97.6% or 1,698 records out of 1,739 total) test negatively to all Level 1 criteria and, therefore, do not justify further evaluation at Level 2.

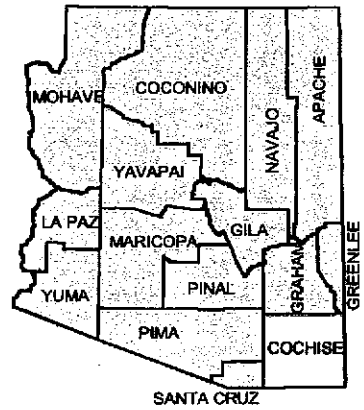
The NLR1 data set is comprised of those watercourses that exhibit some characteristics of susceptibility to navigation based upon at least one affirmative response (hit) to the six criteria used in the Level 1 evaluation. Results of the analysis indicate that there are 41 watercourses (approximately 2.4%) in Cochise County, which justify analysis at Level 2.

The summary listings for RL1 and NRL1 data sets are presented in Tables A-1A and A-1B in Appendix A. Twenty six (26) of the NRL1 watercourses are one-hitters and 15 watercourses tested affirmatively to more than one of the Level 1 criteria used in the database query.

The maps of RL1 and NRL1 data sets determined from the Level 1 sort are shown in Figure 7.

**FIGURE 7**
**NRL1 and RL1 Data Sets from Level 1 Analysis for Cochise County**




Arizona Map

***LEGEND:***

NRL1 Data Set

RL1 Data Set

Cochise County

N
W E
S

10 0 10 20 30 Miles

## 4.2 LEVEL 2 ANALYSIS

The NRL1 data set resulting from Level 1 analysis contains 41 watercourses. Results from the application of the Level 2 approach to the 41 watercourses are presented and discussed in the sections that follow. Employing the first-cut screening process shown in Figure 5 for the NRL1 data set leads to the classification of the watercourses as follows:

1. Stream *Category B* – navigation possible, not likely.

    a. Babocomari River – Cochise
    b. Bass Canyon
    c. Cave Creek – Cochise
    d. Hot Springs Canyon
    e. Leslie Creek
    f. Morse Canyon
    g. Parker Canyon
    h. Ramsey Canyon
    i. Redfield Canyon
    j. Rucker canyon
    k. South Fork Cave Creek
    l. Swamp Springs Canyon
    m. Turkey Creek – Cochise
    n. Turkey Creek – Cochise/Santa Cruz
    o. Whitewater Draw

2. Stream Category C – navigation unlikely.

    a. Bear Creek - Cochise
    b. Black Draw
    c. Cottonwood Draw
    d. East Turkey Creek
    e. Garden Canyon
    f. Joaquin Creek
    g. Miller Canyon
    h. Mulberry Draw
    i. San Simon River
    j. 17 unnamed washes

Employing the second-cut filter screening process shown in Figure 6 and the criteria scoring matrix presented in Figure B-1 (see Appendix B) to establish a ranking system for the watercourses leads to the identification of a cut-off number that separates those watercourses rejected at Level 2 and those that are forwarded for Level 3 analysis. All watercourses with total ratings equal to or lesser than the cut-off number of 11.0 are classified under *Category C.* These watercourses comprise the RL2 data

set, which are not forwarded for Level 3 analysis. On the other hand, the watercourses with total ratings more than the cut-off number of 11.0 are classified under *Category A*. These watercourses comprise those that are potentially susceptible to navigation and hence, are forwarded for Level 3 analysis.

The listing of watercourses classified under stream *Category A* and *Category C* for the second cut filter screening process are provided as follows:

3. Stream *Category A* – potentially susceptible to navigation.

   *[No Category B watercourse qualifies to be classified under Category A as the maximum total rating evaluated for the watercourses is 11.0].*

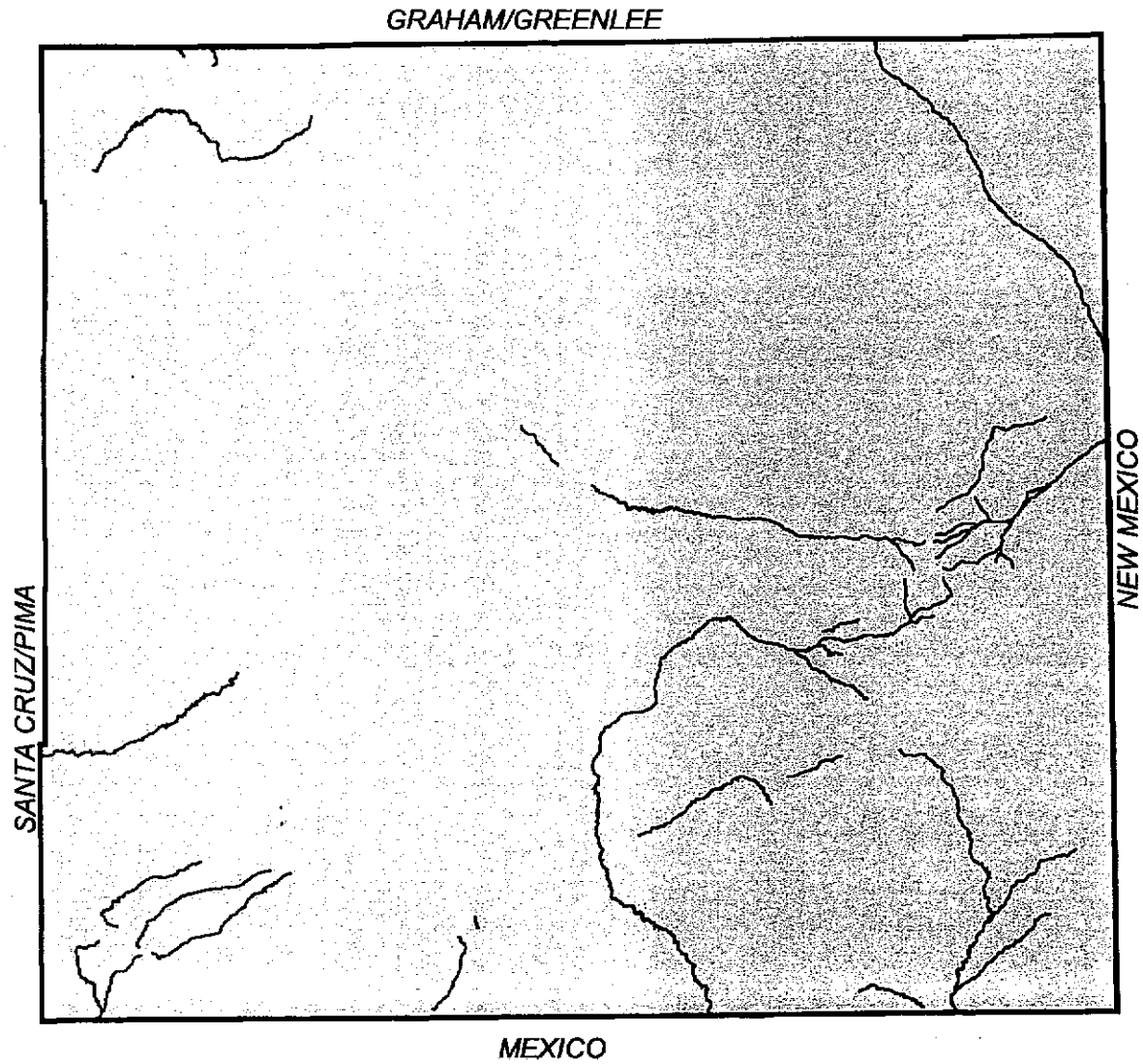
4. Stream Category C – navigation unlikely.

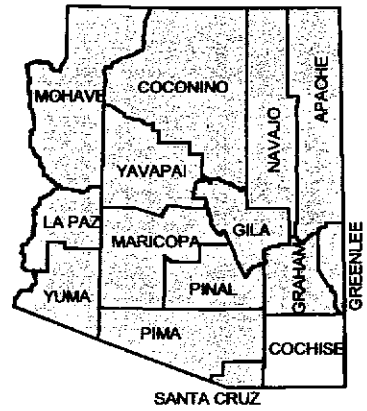
   a. Babocomari River – Cochise
   b. Bass Canyon
   c. Cave Creek – Cochise
   d. Hot Springs Canyon
   e. Leslie Creek
   f. Morse Canyon
   g. Parker Canyon
   h. Ramsey Canyon
   i. Redfield Canyon
   j. Rucker canyon
   k. South Fork Cave Creek
   l. Swamp Springs Canyon
   m. Turkey Creek – Cochise
   n. Turkey Creek – Cochise/Santa Cruz
   o. Whitewater Draw

A summary listing of the RL2 data set is presented in Tables A-2A (see Appendix A). The map associated with the RL2 data set evaluated from Level 2 is shown in Figure 8.

The numerical weights assigned to the six criteria were based on the average values evaluated from the use of the criteria scoring matrix. This numerical weights are used as multipliers for the six criteria in calculating the total rating associated with each watercourse. The summary table listing the numerical weights assigned to the six criteria from a pool of seven participants is shown in Table B-1 (see Appendix B - Criteria Weight Evaluation).

**FIGURE 8**
**NRL2 and RL2 Data Sets from Level 2 Analysis for Cochise County**




Arizona Map

***LEGEND:***

NRL2 Data Set

RL2 Data Set

Cochise County

N
W E
S

10 0 10 20 30 Miles

## 4.3 LEVEL 3 ANALYSIS

No watercourse in Cochise County passed the Level 2 analysis (i.e., NRL2 data set) therefore no Level 3 analysis was performed.

## 4.4 LEVEL 4 ANALYSIS (DETAILED STUDY)

There are no watercourses in Cochise County that merit a detailed study.

# 5.0 Conclusions and Recommendations

- The Level 1 analysis performed for the watercourses in Cochise County resulted in two data sets. Out of a total of 1,739 watercourses identified, there are 1698 that were classified under RL1 and 41 that were classified under NRL1. The lists of both data sets are provided in Appendix A.

- The qualitative approach employed in the Level 2 analysis for the NRL1 data set resulted in initially sorting watercourses into *Category B and Category C*. No watercourse qualified to be classified under *Category A*. The second-cut filter and the use of the criteria weights resulted in refining the screening of watercourses in *Category B*. Ultimately, Level 2 analysis results indicate that all the 41 watercourses merit no further evaluation and analysis in Level 3.

- No watercourse in Cochise County reached Level 3 analysis and none is recommended for Level 4 analysis or detailed study.

# 6.0 References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# Appendix A – List of Watercourses

## TABLE A-1A
## RL1 Watercourses for Cochise County

| No. (1) | W_ID (2) | W_NAME (3) | SEGCOUNT (4) | W_COUNTIES (5) | W_MILES (6) | W_ADDRESS (7) | W_PER (8) | W_MBOAT (9) | W_HBOAT (10) | W_FISH (11) | W_DIMP (12) | W_SSTATUS (13) | HITS (14) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 56 | Apache Canyon Stream | 2 | Cochise/Pima | 8.8835 | T18.0S,R18.0E,S07 | No | No | No | No | No | No | 0 |
| 2 | 76 | Ash Creek 1 - Cochise | 6 | Cochise | 16.6219 | T18.0S,R26.0E,S24 | No | No | No | No | No | No | 0 |
| 3 | 80 | Ash Creek 1 - Pima/Cochise | 5 | Pima/Cochise | 5.2923 | T16.0S,R19.0E,S06 | No | No | No | No | No | No | 0 |
| 4 | 82 | Ash Creek 2 - Cochise | 17 | Cochise | 9.2036 | T16.0S,R19.0E,S08 | No | No | No | No | No | No | 0 |
| 5 | 89 | Ash Creek 3 - Graham | 10 | Graham/Cochise | 25.3967 | T10.0S,R22.0E,S36 | No | No | No | No | No | No | 0 |
| 6 | 92 | Ash Creek Canyon | 3 | Cochise | 9.9756 | T13.0S,R22.0E,S26 | No | No | No | No | No | No | 0 |
| 7 | 120 | Banning Creek | 12 | Cochise | 14.1748 | T22.0S,R23.0E,S21 | No | No | No | No | No | No | 0 |
| 8 | 140 | Bear Creek 1 - Cochise | 2 | Pima/Cochise | 9.0827 | T14.0S,R19.0E,S29 | No | No | No | No | No | No | 0 |
| 9 | 158 | Bee Canyon Wash | 2 | Cochise | 5.9401 | T13.0S,R23.0E,S09 | No | No | No | No | No | No | 0 |
| 10 | 171 | Big Bend Creek | 8 | Cochise | 10.3035 | T21.0S,R28.0E,S22 | No | No | No | No | No | No | 0 |
| 11 | 186 | Big Sand Wash - Cochise | 2 | Cochise | 3.0331 | T16.0S,R28.0E,S01 | No | No | No | No | No | No | 0 |
| 12 | 206 | Bitter Creek - Cochise | 1 | Cochise | 1.0856 | T15.0S,R30.0E,S31 | No | No | No | No | No | No | 0 |
| 13 | 239 | Blacktail Wash | 3 | Cochise | 9.5572 | T21.0S,R19.0E,S01 | No | No | No | No | No | No | 0 |
| 14 | 286 | Box Spring Creek | 4 | Cochise/Graham | 13.7030 | T11.0S,R22.0E,S18 | No | No | No | No | No | No | 0 |
| 15 | 288 | Brad Creek | 1 | Cochise | 2.0607 | T15.0S,R30.0E,S20 | No | No | No | No | No | No | 0 |
| 16 | 304 | Brushy Creek - Cochise | 3 | Cochise | 6.2082 | T19.0S,R29.0E,S26 | No | No | No | No | No | No | 0 |
| 17 | 309 | Buck Creek | 2 | Cochise | 10.9847 | T22.0S,R30.0E,S17 | No | No | No | No | No | No | 0 |
| 18 | 354 | Cadillac Wash | 2 | Cochise | 9.3191 | T16.0S,R20.0E,S32 | No | No | No | No | No | No | 0 |
| 19 | 358 | California Wash | 1 | Cochise | 7.6152 | ,,SLG | No | No | No | No | No | No | 0 |
| 20 | 447 | Cherry Spring Canyon | 7 | Cochise | 9.6717 | T12.0S,R19.0E,S23 | No | No | No | No | No | No | 0 |
| 21 | 486 | Clifford Wash | 9 | Cochise | 18.5909 | ,,SLG | No | No | No | No | No | No | 0 |
| 22 | 503 | Collins Wash | 1 | Cochise | 2.1712 | T14.0S,R19.0E,S15 | No | No | No | No | No | No | 0 |
| 23 | 545 | Cottonwood Creek 1 - Cochise | 1 | Cochise | 2.1041 | T15.0S,R30.0E,S30 | No | No | No | No | No | No | 0 |
| 24 | 549 | Cottonwood Creek 2 - Cochise | 5 | Cochise | 7.4239 | T22.0S,R32.0E,S27 | No | No | No | No | No | No | 0 |
| 25 | 553 | Cottonwood Creek 3 - Cochise | 1 | Cochise | 5.6369 | T19.0S,R29.0E,S27 | No | No | No | No | No | No | 0 |
| 26 | 615 | Danger Wash | 2 | Cochise | 7.6561 | T22.0S,R30.0E,S19 | No | No | No | No | No | No | 0 |
| 27 | 639 | Deer Creek 1 - Cochise | 2 | Cochise | 2.5637 | T20.0S,R32.0E,S27 | No | No | No | No | No | No | 0 |
| 28 | 643 | Deer Creek 1 - Pima/Cochise | 5 | Pima/Cochise | 7.7186 | T14.0S,R19.0E,S20 | No | No | No | No | No | No | 0 |
| 29 | 658 | Dial Wash | 3 | Cochise/Graham | 16.3473 | T11.0S,R28.0E,S31 | No | No | No | No | No | No | 0 |
| 30 | 679 | Dragoon Wash | 16 | Cochise | 20.3956 | T17.0S,R21.0E,S31 | No | No | No | No | No | No | 0 |
| 31 | 733 | East Whitetail Creek | 17 | Cochise | 20.2668 | T16.0S,R30.0E,S25 | No | No | No | No | No | No | 0 |
| 32 | 748 | Escalante Wash | 2 | Cochise | 8.8439 | T18.0S,R21.0E,S16 | No | No | No | No | No | No | 0 |
| 33 | 770 | Fivemile Creek | 4 | Cochise | 16.9082 | T17.0S,R28.0E,S15 | No | No | No | No | No | No | 0 |
| 34 | 811 | Gadwell Canyon | 10 | Cochise | 19.5608 | T21.0S,R24.0E,S10 | No | No | No | No | No | No | 0 |
| 35 | 829 | Glance Creek | 9 | Cochise | 10.9687 | T24.0S,R25.0E,S04 | No | No | No | No | No | No | 0 |
| 36 | 831 | Gold Gulch | 25 | Cochise/Graham | 32.2825 | T10.0S,R28.0E,S33 | No | No | No | No | No | No | 0 |
| 37 | 881 | Guadalupe Canyon | 9 | Cochise | 7.8690 | T24.0S,R32.0E,S21 | No | No | No | No | No | No | 0 |
| 38 | 37602 | Haberstock Wash | 2 | Cochise | 6.9397 | T19.0S,R22.0E,S11 | No | No | No | No | No | No | 0 |
| 39 | 37608 | Hackberry Wash - Cochise | 3 | Cochise | 6.2530 | T22.0S,R29.0E,S35 | No | No | No | No | No | No | 0 |
| 40 | 37624 | Happy Camp Wash | 8 | Cochise | 16.8805 | T13.0S,R28.0E,S25 | No | No | No | No | No | No | 0 |
| 41 | 37641 | Hay Hollow Wash | 4 | Cochise | 12.9276 | T23.0S,R31.0E,S23 | No | No | No | No | No | No | 0 |
| 42 | 37648 | Henderson Wash | 2 | Cochise | 7.2643 | T19.0S,R22.0E,S24 | No | No | No | No | No | No | 0 |
| 43 | 37717 | Indian Creek 1 - Cochise | 8 | Cochise | 18.9735 | T23.0S,R30.0E,S18 | No | No | No | No | No | No | 0 |
| 44 | 37719 | Indian Creek 2 - Cochise | 2 | Cochise | 3.6409 | T16.0S,R30.0E,S20 | No | No | No | No | No | No | 0 |
| 45 | 37785 | Keating Creek | 4 | Cochise | 8.6647 | T16.0S,R30.0E,S12 | No | No | No | No | No | No | 0 |

## TABLE A-1A
## RL1 Watercourses for Cochise County

| No. (1) | W_ID (2) | W_NAME (3) | SEGCOUNT (4) | W_COUNTIES (5) | W_MILES (6) | W_ADDRESS (7) | W_PER (8) | W_MBOAT (9) | W_HBOAT (10) | W_FISH (11) | W_DIMP (12) | W_SSTATUS (13) | HITS (14) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 46 | 37955 | Mesa Draw | 7 | Cochise | 10.3054 | T21.0S,R28.0E,S22 | No | No | No | No | No | No | 0 |
| 47 | 37958 | Mescal Arroyo | 6 | Pima/Cochise | 9.2571 | T17.0S,R18.0E,S03 | No | No | No | No | No | No | 0 |
| 48 | 37959 | Mescal Creek - Cochise | 3 | Cochise | 5.3028 | T19.0S,R19.0E,S33 | No | No | No | No | No | No | 0 |
| 49 | 37967 | Middle Canyon Wash | 1 | Cochise | 5.0489 | T18.0S,R20.0E,S32 | No | No | No | No | No | No | 0 |
| 50 | 37974 | Middle Witch Creek | 1 | Cochise | 2.0537 | T17.0S,R29.0E,S19 | No | No | No | No | No | No | 0 |
| 51 | 38014 | Montosa Canyon | 2 | Pima/Cochise | 6.7310 | T18.0S,R18.0E,S21 | No | No | No | No | No | No | 0 |
| 52 | 38035 | Mud Spring Wash | 2 | Cochise/Graham | 8.0779 | T11.0S,R22.0E,S14 | No | No | No | No | No | No | 0 |
| 53 | 38100 | North Witch Creek | 2 | Cochise | 3.9859 | T17.0S,R29.0E,S19 | No | No | No | No | No | No | 0 |
| 54 | 38105 | O B Draw | 3 | Cochise | 7.9798 | T16.0S,R28.0E,S04 | No | No | No | No | No | No | 0 |
| 55 | 38109 | Oak Creek - Cochise | 2 | Cochise | 3.8614 | T16.0S,R30.0E,S23 | No | No | No | No | No | No | 0 |
| 56 | 38127 | Onion Creek | 2 | Cochise | 2.8245 | T17.0S,R30.0E,S25 | No | No | No | No | No | No | 0 |
| 57 | 38137 | Owl Creek | 2 | Cochise | 3.4577 | T20.0S,R32.0E,S20 | No | No | No | No | No | No | 0 |
| 58 | 38143 | Pacheco Wash | 2 | Cochise | 6.9414 | T16.0S,R20.0E,S06 | No | No | No | No | No | No | 0 |
| 59 | 38151 | Paige Creek | 27 | Pima/Cochise | 17.6841 | T13.0S,R19.0E,S23 | No | No | No | No | No | No | 0 |
| 60 | 38160 | Palomas Wash | 5 | Cochise | 7.7640 | T14.0S,R20.0E,S17 | No | No | No | No | No | No | 0 |
| 61 | 38216 | Pine Creek - Cochise | 5 | Cochise | 15.6040 | T17.0S,R30.0E,S32 | No | No | No | No | No | No | 0 |
| 62 | 38230 | Pinery Creek | 10 | Cochise | 22.5847 | T16.0S,R28.0E,S22 | No | No | No | No | No | No | 0 |
| 63 | 38259 | Pool Wash | 3 | Cochise | 5.6669 | T13.0S,R19.0E,S25 | No | No | No | No | No | No | 0 |
| 64 | 38273 | Pridham Creek | 4 | Cochise | 13.6684 | T18.0S,R27.0E,S25 | No | No | No | No | No | No | 0 |
| 65 | 38330 | Redrock Creek | 10 | Cochise | 9.8588 | T15.0S,R20.0E,S04 | No | No | No | No | No | No | 0 |
| 66 | 38331 | Reeves Creek | 3 | Cochise | 9.0578 | T20.0S,R23.0E,S05 | No | No | No | No | No | No | 0 |
| 67 | 38334 | Reiley Creek | 2 | Cochise | 7.7313 | T11.0S,R23.0E,S32 | No | No | No | No | No | No | 0 |
| 68 | 38339 | Ridge | 1 | Cochise | 10.4132 | T15.0S,R26.0E,S21 | No | No | No | No | No | No | 0 |
| 69 | 38356 | Rock Creek - Cochise | 3 | Cochise | 14.9889 | T18.0S,R28.0E,S09 | No | No | No | No | No | No | 0 |
| 70 | 38390 | Sacaton Wash | 2 | Cochise | 6.3199 | T12.0S,R25.0E,S09 | No | No | No | No | No | No | 0 |
| 71 | 38477 | Sheep Wash - Cochise | 13 | Cochise | 10.9688 | T16.0S,R22.0E,S18 | No | No | No | No | No | No | 0 |
| 72 | 38502 | Silver Creek 1 - Cochise | 14 | Cochise | 18.0801 | T24.0S,R30.0E,S17 | No | No | No | No | No | No | 0 |
| 73 | 38503 | Silver Creek 2 - Cochise | 3 | Cochise | 14.2734 | T16.0S,R32.0E,S26 | No | No | No | No | No | No | 0 |
| 74 | 38518 | Slaughterhouse Wash | 3 | Cochise | 8.0780 | T21.0S,R20.0E,S06 | No | No | No | No | No | No | 0 |
| 75 | 38519 | Slavin Wash | 8 | Cochise | 15.5599 | T18.0S,R21.0E,S17 | No | No | No | No | No | No | 0 |
| 76 | 38540 | Soldier Creek - Cochise | 4 | Cochise | 13.3633 | T22.0S,R20.0E,S04 | No | No | No | No | No | No | 0 |
| 77 | 38558 | South Fork Canyon | 1 | Cochise | 1.8877 | T13.0S,R22.0E,S26 | No | No | No | No | No | No | 0 |
| 78 | 38566 | South Fork Keating Creek | 1 | Cochise | 3.0214 | T16.0S,R30.0E,S14 | No | No | No | No | No | No | 0 |
| 79 | 38581 | South Witch Creek | 1 | Cochise | 4.0104 | T17.0S,R29.0E,S19 | No | No | No | No | No | No | 0 |
| 80 | 38583 | Soza Wash | 16 | Cochise | 10.8187 | T12.0S,R19.0E,S29 | No | No | No | No | No | No | 0 |
| 81 | 38590 | Spring Creek - Cochise | 4 | Cochise | 9.0321 | T23.0S,R22.0E,S15 | No | No | No | No | No | No | 0 |
| 82 | 38612 | Stanford Creek | 2 | Cochise | 13.2640 | T18.0S,R27.0E,S23 | No | No | No | No | No | No | 0 |
| 83 | 38648 | Sycamore Creek - Cochise | 3 | Cochise | 5.6937 | T23.0S,R32.0E,S10 | No | No | No | No | No | No | 0 |
| 84 | 38689 | Teran Wash | 10 | Cochise | 7.0686 | T13.0S,R20.0E,S31 | No | No | No | No | No | No | 0 |
| 85 | 38737 | Tres Alamos Wash | 29 | Cochise | 28.4659 | T16.0S,R20.0E,S05 | No | No | No | No | No | No | 0 |
| 86 | 38808 | Vanar Wash | 9 | Cochise | 10.5214 | T13.0S,R32.0E,S11 | No | No | No | No | No | No | 0 |
| 87 | 38832 | Walnut Gulch | 10 | Cochise | 12.1723 | .,SLG | No | No | No | No | No | No | 0 |
| 88 | 38833 | Walnut Wash | 6 | Cochise | 10.5341 | T15.0S,R24.0E,S19 | No | No | No | No | No | No | 0 |
| 89 | 38879 | West Whitetail Creek | 7 | Cochise | 8.7334 | T16.0S,R29.0E,S15 | No | No | No | No | No | No | 0 |
| 90 | 38912 | Wildcat Wash | 1 | Cochise | 6.5997 | T24.0S,R30.0E,S08 | No | No | No | No | No | No | 0 |

## TABLE A-1A
## RL1 Watercourses for Cochise County

| No. (1) | W_ID (2) | W_NAME (3) | SEGCOUNT (4) | W_COUNTIES (5) | W_MILES (6) | W_ADDRESS (7) | W_PER (8) | W_MBOAT (9) | W_HBOAT (10) | W_FISH (11) | W_DIMP (12) | W_SSTATUS (13) | HITS (14) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 91 | 38932 | Willow Wash - Cochise | 8 | Cochise | 19.2051 | ,,SLG | No | No | No | No | No | No | 0 |
| 92 | 38937 | Witch Creek | 1 | Cochise | 2.7809 | T17.0S,R28.0E,S15 | No | No | No | No | No | No | 0 |
| 93 | 38940 | Wood Canyon Stream | 8 | Cochise | 10.3409 | T15.0S,R30.0E,S30 | No | No | No | No | No | No | 0 |
| 94 | 38943 | Wood Canyon Wash | 3 | Cochise | 5.2289 | T12.0S,R23.0E,S26 | No | No | No | No | No | No | 0 |
| 95 | 38986 | a - Seg 3 Cochise | 5 | Cochise | 18.6128 | T23.0S,R27.0E,S28 | No | No | No | No | No | No | 0 |
| 96 | 38991 | a - Seg 7 Cochise | 7 | Cochise | 17.4819 | T21.0S,R21.0E,S11 | No | No | No | No | No | No | 0 |
| 97 | 39009 | b - Seg 8 Cochise | 5 | Cochise | 17.5033 | T20.0S,R26.0E,S32 | No | No | No | No | No | No | 0 |
| 98-1698 | --- | 1601 Unnamed watercourses | --- | Cochise | Varies | Varies | No | No | No | No | No | No | 0 |

**NOTES:** The column headings are identified as follows:

| | |
|---|---|
| **W_ID:** | Unique ID number given to the watercourse. |
| **W_NAME:** | Name of the watercourse. |
| **SEGCOUNT:** | Number of segments merged together to comprise the watercouse. |
| **W_COUNTIES:** | County(ies) where the watercourse is located. |
| **W_MILES:** | Length of the watercourse in miles. |
| **W_ADDRESS:** | Township, Range and Section of the mouth of the watercourse. |
| **W_PER:** | Stream classification- perennial or not. |
| **W_MBOAT:** | With modern boating or not. |
| **W_HBOAT:** | With historical boating or not. |
| **W_FISH:** | With fish or not. |
| **W_DIMP:** | Impacted by dam or not. |
| **W_SSTATUS:** | With special status designation or not. |
| **HITS:** | Number of affirmative hits based on the six attribute data. |

## TABLE A-1B
## NRL1 Watercourses for Cochise County

| No. (1) | W_ID (2) | W_NAME (3) | SEGCOUNT (4) | W_COUNTIES (5) | W_MILES (6) | W_ADDRESS (7) | W_PER (8) | W_MBOAT (9) | W_HBOAT (10) | W_FISH (11) | W_SSTATUS (12) | W_DIMP (13) | HITS (14) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 37832 | Leslie Creek | 4 | Cochise | 14.0590 | T22.0S,R26.0E,S11 | Yes | No | No | Yes | Yes | Yes | 4 |
| 2 | 38642 | Swamp Springs Canyon | 4 | Cochise/Graham | 5.6999 | T11.0S,R20.0E,S32 | Yes | No | No | Yes | Yes | No | 3 |
| 3 | 402 | Cave Creek - Cochise | 13 | Cochise | 17.5340 | T18.0S,R31.0E,S09 | Yes | No | No | Yes | Yes | No | 3 |
| 4 | 38378 | Rucker Canyon | 10 | Cochise | 10.4054 | T19.0S,R29.0E,S24 | No | No | No | Yes | Yes | Yes | 3 |
| 5 | 38559 | South Fork Cave Creek | 6 | Cochise | 8.0865 | T18.0S,R31.0E,S09 | Yes | No | No | Yes | Yes | No | 3 |
| 6 | 37692 | Hot Springs Canyon | 20 | Cochise | 25.9097 | T13.0S,R19.0E,S23 | Yes | No | No | Yes | Yes | No | 3 |
| 7 | 107 | Babocomari River - Cochise | 12 | Cochise | 20.0806 | ,,SLG | Yes | No | No | Yes | Yes | No | 3 |
| 8 | 132 | Bass Canyon | 1 | Cochise/Graham | 6.1781 | T12.0S,R21.0E,S08 | No | No | No | Yes | Yes | No | 3 |
| 9 | 38326 | Redfield Canyon | 22 | Graham/Cochise | 24.3009 | T12.0S,R18.0E,S02 | Yes | No | No | Yes | Yes | No | 3 |
| 10 | 38027 | Morse Canyon | 4 | Cochise | 2.9672 | T18.0S,R29.5E,S13 | Yes | No | No | Yes | No | No | 2 |
| 11 | 38771 | Turkey Creek - Cochise | 12 | Cochise | 35.6404 | T16.0S,R25.0E,S32 | Yes | No | No | Yes | No | No | 2 |
| 12 | 38900 | Whitewater Draw | 35 | Cochise | 57.9517 | T19.0S,R28.0E,S30 | Yes | No | No | Yes | No | No | 2 |
| 13 | 38774 | Turkey Creek - Cochise/Santa Cruz | 8 | Santa Cruz/Cochise | 17.2469 | ,,SLG | Yes | No | No | Yes | No | No | 2 |
| 14 | 37398 | Ramsey Canyon | 2 | Cochise | 13.2821 | T22.0S,R22.0E,S19 | Yes | No | No | No | Yes | No | 2 |
| 15 | 36134 | Parker Canyon | 1 | Santa Cruz/Cochise | 1.5568 | T23.0S,R18.0E,S24 | Yes | No | No | No | No | Yes | 2 |
| 16 | 729 | East Turkey Creek | 8 | Cochise | 13.5866 | T16.0S,R31.0E,S36 | Yes | No | No | No | No | No | 1 |
| 17 | 20378 | H46_0854 | 4 | Cochise | 2.4674 | T18.0S,R31.0E,S08 | Yes | No | No | No | No | No | 1 |
| 18 | 20384 | H46_0861 | 2 | Cochise | 3.6552 | T19.0S,R31.0E,S07 | Yes | No | No | No | No | No | 1 |
| 19 | 37461 | H84_0470 | 1 | Cochise | 0.1757 | ,,SLG | Yes | No | No | No | No | No | 1 |
| 20 | 37476 | H84_0485 | 2 | Cochise | 0.2080 | ,,SLG | Yes | No | No | No | No | No | 1 |
| 21 | 138 | Bear Creek - Cochise | 5 | Cochise | 7.0411 | ,,S90 | No | No | No | Yes | No | No | 1 |
| 22 | 557 | Cottonwood Draw | 1 | Cochise | 10.5432 | T24.0S,R30.0E,S11 | No | No | No | Yes | No | No | 1 |
| 23 | 22314 | H54_0055 | 1 | Cochise | 4.8634 | T21.0S,R28.0E,S15 | No | No | No | No | No | Yes | 1 |
| 24 | 22516 | H54_0277 | 3 | Cochise | 7.7073 | T19.0S,R28.0E,S34 | No | No | No | No | No | Yes | 1 |
| 25 | 22536 | H54_0301 | 1 | Cochise | 3.2658 | T19.0S,R29.0E,S19 | No | No | No | No | No | Yes | 1 |
| 26 | 37426 | H84_0433 | 4 | Cochise | 6.9469 | T24.0S,R24.0E,S18 | No | No | No | No | No | Yes | 1 |
| 27 | 38417 | San Simon River | 100 | Cochise/Graham | 78.2251 | T13.0S,R31.0E,S32 | No | No | No | No | No | Yes | 1 |
| 28 | 221 | Black Draw | 9 | Cochise | 19.5372 | T24.0S,R30.0E,S11 | Yes | No | No | No | No | No | 1 |
| 29 | 20375 | H46_0849 | 2 | Cochise | 3.1318 | T17.0S,R31.0E,S25 | Yes | No | No | No | No | No | 1 |
| 30 | 20385 | H46_0862 | 2 | Cochise | 3.1030 | T18.0S,R30.0E,S13 | Yes | No | No | No | No | No | 1 |
| 31 | 20390 | H46_0867 | 3 | Cochise | 2.1772 | T18.0S,R31.0E,S20 | Yes | No | No | No | No | No | 1 |
| 32 | 20391 | H46_0868 | 1 | Cochise | 0.9289 | T18.0S,R31.0E,S20 | Yes | No | No | No | No | No | 1 |
| 33 | 22525 | H54_0289 | 5 | Cochise | 5.8738 | T19.0S,R30.0E,S19 | No | No | No | No | No | Yes | 1 |
| 34 | 22529 | H54_0293 | 2 | Cochise | 3.2363 | T19.0S,R30.0E,S18 | Yes | No | No | No | No | No | 1 |
| 35 | 37092 | H84_0040 | 1 | Cochise | 0.0784 | T16.0S,R20.0E,S08 | Yes | No | No | No | No | No | 1 |
| 36 | 38040 | Mulberry Draw | 16 | Cochise | 19.9950 | T23.0S,R31.0E,S18 | Yes | No | No | No | No | No | 1 |
| 37 | 37758 | Joaquin Creek | 2 | Cochise | 8.1717 | T24.0S,R19.0E,S13 | No | No | No | Yes | No | No | 1 |
| 38 | 37988 | Miller Canyon | 2 | Cochise | 14.1268 | T13.0N,R10.0E,S01 | Yes | No | No | No | No | No | 1 |
| 39 | 37234 | Garden Canyon | 7 | Cochise | 12.0446 | T22.0S,R21.0E,S18 | Yes | No | No | No | No | No | 1 |
| 40 | 22339 | H54_0081 | 1 | Cochise | 1.1287 | T23.0S,R24.0E,S14 | No | No | No | No | No | Yes | 1 |
| 41 | 22637 | H55_0105 | 3 | Cochise | 6.1509 | T24.0S,R30.0E,S17 | No | No | No | No | No | Yes | 1 |

**NOTES:** The column headings are identified as follows:

**W_ID:** Unique ID number given to the watercourse.
**W_NAME:** Name of the watercourse.
**SEGCOUNT:** Number of segments merged together to comprise the watercouse.
**W_COUNTIES:** County(ies) where the watercourse is located.
**W_MILES:** Length of the watercourse in miles.
**W_ADDRESS:** Township, Range and Section of the mouth of the watercourse.
**W_PER:** Stream classification- perennial or not.
**W_MBOAT:** With modern boating or not.
**W_HBOAT:** With historical boating or not.
**W_FISH:** With fish or not.
**W_DIMP:** Impacted by dam or not.
**W_SSTATUS:** With special status designation or not.
**HITS:** Number of affirmative hits based on the six attribute data.

## Table A-2A
## RL2 Watercourses for Cochise County

| NO (1) | W_ID (2) | W_NAME (3) | SEGCOUNT (4) | W_COUNTIES (5) | W_MILES (6) | W_ADDRESS (7) | L1_PER (8) | L2_PER (9) | L2_MBOAT (10) | L2_HBOAT (11) | L2_DIMP (12) | L2_FISH (13) | L2_SSTATUS (14) | NEW_RAT (15) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 38027 | Morse Canyon | 4 | Cochise | 2.9672 | T18.0S,R29.5E,S13 | Yes | Yes | No | No | No | Yes | No | 11.00 |
| 2 | 38326 | Redfield Canyon | 22 | Cochise/Graham | 24.3009 | T12.0S,R18.0E,S02 | Yes | Yes | No | No | No | Yes | Yes | 10.88 |
| 3 | 38642 | Swamp Springs Canyon | 4 | Cochise/Graham | 5.6999 | T11.0S,R20.0E,S32 | Yes | Yes | No | No | No | Yes | Yes | 10.88 |
| 4 | 402 | Cave Creek - Cochise | 13 | Cochise | 17.5340 | T18.0S,R31.0E,S09 | Yes | Yes | No | No | No | Yes | Yes | 10.26 |
| 5 | 38559 | South Fork Cave | 6 | Cochise | 8.0865 | T18.0S,R31.0E,S09 | Yes | Yes | No | No | No | Yes | Yes | 10.26 |
| 6 | 38771 | Turkey Creek - Cochise | 12 | Cochise | 35.6404 | T16.0S,R25.0E,S32 | Yes | Yes | No | No | No | Yes | No | 10.00 |
| 7 | 107 | Babocomari River - Cochise | 12 | Cochise | 20.0806 | ,,SLG | No | No/Yes | No | No | No | Yes | Yes | 8.38 |
| 8 | 37692 | Hot Springs Canyon | 20 | Cochise | 25.9097 | T13.0S,R19.0E,S23 | Yes | Yes/No | No | No | No | Yes | Yes | 8.26 |
| 9 | 36134 | Parker Canyon | 1 | Cochise/Santa Cruz | 1.5568 | T23.0S,R18.0E,S24 | No | No/Yes | No | No | Yes | No | No | 7.50 |
| 10 | 38900 | Whitewater Draw | 35 | Cochise | 57.9517 | T19.0S,R28.0E,S30 | Yes | Yes/No | No | No | No | Yes | No | 7.50 |
| 11 | 729 | East Turkey Creek | 8 | Cochise | 13.5866 | T16.0S,R31.0E,S36 | Yes | Yes | No | No | No | No | No | 7.00 |
| 12 | 20378 | H46_0854 | 4 | Cochise | 2.4674 | T18.0S,R31.0E,S08 | Yes | Yes | No | No | No | No | No | 7.00 |
| 13 | 20384 | H46_0861 | 2 | Cochise | 3.6552 | T18.0S,R31.0E,S07 | Yes | Yes | No | No | No | No | No | 7.00 |
| 14 | 37461 | H84_0470 | 1 | Cochise | 0.1757 | ,,SLG | Yes | Yes | No | No | No | No | No | 7.00 |
| 15 | 37476 | H84_0485 | 2 | Cochise | 0.2080 | ,,SLG | Yes | Yes | No | No | No | No | No | 7.00 |
| 16 | 37398 | Ramsey Canyon | 2 | Cochise | 13.2821 | T22.0S,R22.0E,S19 | No | No/Yes | No | No | No | No | Yes | 5.26 |
| 17 | 132 | Bass Canyon | 1 | Cochise/Graham | 6.1781 | T12.0S,R21.0E,S08 | No | No | No | No | No | Yes | Yes | 4.76 |
| 18 | 37832 | Leslie Creek | 4 | Cochise | 14.0590 | T22.0S,R26.0E,S11 | No | No | No | No | No | Yes | Yes | 4.76 |
| 19 | 38378 | Rucker Canyon | 10 | Cochise | 10.4054 | T19.0S,R29.0E,S24 | No | No | No | No | No | Yes | Yes | 4.26 |
| 20 | 138 | Bear Creek - Cochise | 5 | Cochise | 7.0411 | ,,S90 | No | No | No | No | No | Yes | No | 4.00 |
| 21 | 557 | Cottonwood Draw | 1 | Cochise | 10.5432 | T24.0S,R30.0E,S11 | No | No | No | No | No | Yes | No | 4.00 |
| 22 | 22314 | H54_0055 | 1 | Cochise | 4.8634 | T21.0S,R28.0E,S15 | No | No | No | No | Yes | No | No | 4.00 |
| 23 | 22516 | H54_0277 | 3 | Cochise | 7.7073 | T19.0S,R28.0E,S34 | No | No | No | No | Yes | No | No | 4.00 |
| 24 | 22536 | H54_0301 | 1 | Cochise | 3.2658 | T19.0S,R29.0E,S19 | No | No | No | No | Yes | No | No | 4.00 |
| 25 | 37426 | H84_0433 | 4 | Cochise | 6.9469 | T24.0S,R24.0E,S18 | No | No | No | No | Yes | No | No | 4.00 |
| 26 | 38417 | San Simon River | 100 | Cochise/Graham | 78.2251 | T13.0S,R31.0E,S32 | No | No | No | No | Yes | No | No | 4.00 |
| 27 | 37234 | Garden Canyon | 7 | Cochise | 12.0446 | ,,SLG | No | No/Yes | No | No | No | No | Yes | 3.88 |
| 28 | 221 | Black Draw | 9 | Cochise | 19.5372 | T24.0S,R30.0E,S11 | No | No/Yes | No | No | No | No | No | 3.50 |
| 29 | 20375 | H46_0849 | 2 | Cochise | 3.1318 | T17.0S,R31.0E,S25 | Yes | Yes/No | No | No | No | No | No | 3.50 |
| 30 | 20385 | H46_0862 | 2 | Cochise | 3.1030 | T18.0S,R30.0E,S13 | Yes | Yes/No | No | No | No | No | No | 3.50 |
| 31 | 20390 | H46_0867 | 3 | Cochise | 2.1772 | T18.0S,R31.0E,S20 | Yes | Yes/No | No | No | No | No | No | 3.50 |
| 32 | 20391 | H46_0868 | 1 | Cochise | 0.9289 | T18.0S,R31.0E,S20 | Yes | Yes/No | No | No | No | No | No | 3.50 |
| 33 | 22525 | H54_0289 | 5 | Cochise | 5.8738 | T19.0S,R30.0E,S19 | Yes | Yes/No | No | No | No | No | No | 3.50 |
| 34 | 22529 | H54_0293 | 2 | Cochise | 3.2363 | T19.0S,R30.0E,S18 | Yes | Yes/No | No | No | No | No | No | 3.50 |
| 35 | 37092 | H84_0040 | 1 | Cochise | 0.0784 | T16.0S,R20.0E,S08 | Yes | Yes/No | No | No | No | No | No | 3.50 |
| 36 | 38040 | Mulberry Draw | 16 | Cochise | 19.9950 | T23.0S,R31.0E,S18 | Yes | Yes/No | No | No | No | No | No | 3.50 |
| 37 | 37758 | Joaquin Creek | 2 | Cochise | 8.1717 | T24.0S,R19.0E,S13 | No | No | No | No | No | No | No | 3.50 |
| 38 | 38774 | Turkey Creek - Cochise/Sta. Cruz | 8 | Cochise/Santa Cruz | 17.2469 | ,,SLG | No | No | No | No | No | Yes | No | 3.00 |
| 39 | 37988 | Miller Canyon | 2 | Cochise | 14.1268 | ,,SLG | No | No | No | No | No | Yes | No | 3.00 |
| 40 | 22339 | H54_0081 | 1 | Cochise | 1.1287 | T23.0S,R24.0E,S14 | No | No | No | No | No | No | Yes | 0.88 |
| 41 | 22637 | H55_0105 | 3 | Cochise | 6.1509 | T24.0S,R30.0E,S17 | No | No | No | No | No | No | No | 0.00 |

**NOTES:** The column headings are identified as follows:

**W_ID:** Unique ID number given to the watercourse.
**W_NAME:** Name of the watercourse.
**SEGCOUNT:** Number of segments merged together to comprise the watercouse.
**W_COUNTIES:** County(ies) where the watercourse is located.
**W_MILES:** Length of the watercourse in miles.
**W_ADDRESS:** Township, Range and Section of the mouth of the watercourse.
**L1_PER:** Level 1 stream classification - perennial or not.

**L2_PER:** Level 2 stream classification which includes Brown's perennial stream data.
**L2_MBOAT:** With or without modern boating account.
**L2_HBOAT:** With or without historical boating account.
**L2_DIMP:** Dam-impacted or not.
**L2_FISH:** With fish or not.
**L2_SSTATUS:** With special status designationo or not.
**NEW_RAT** Computed total rating of the watercourse based on the evaluated weights.

**Table A-3**
**List of Small and Minor Watercourses for Cochise County**

Apache Canyon Stream
Ash Creek 1 - Cochise
Ash Creek 1 - Pima/Cochise
Ash Creek 2 - Cochise
Ash Creek 3 - Graham
Ash Creek Canyon
Babocomari River - Cochise
Banning Creek
Bass Canyon
Bear Creek - Cochise
Bear Creek 1 - Cochise
Bee Canyon Wash
Big Bend Creek
Big Sand Wash - Cochise
Bitter Creek - Cochise
Black Draw
Blacktail Wash
Box Spring Creek
Brad Creek
Brushy Creek - Cochise
Buck Creek
Cadillac Wash
California Wash
Cave Creek - Cochise
Cherry Spring Canyon
Clifford Wash
Collins Wash
Cottonwood Creek 1 - Cochise
Cottonwood Creek 2 - Cochise
Cottonwood Creek 3 - Cochise
Cottonwood Draw
Danger Wash
Deer Creek 1 - Cochise
Deer Creek 1 - Pima/Cochise
Dial Wash
Dragoon Wash
East Turkey Creek
East Whitetail Creek
Escalante Wash
Fivemile Creek
Gadwell Canyon
Garden Canyon
Glance Creek
Gold Gulch
Guadalupe Canyon
Haberstock Wash
Hackberry Wash - Cochise
Happy Camp Wash
Hay Hollow Wash
Henderson Wash
Hot Springs Canyon
Indian Creek 1 - Cochise
Indian Creek 2 - Cochise
Joaquin Creek
Keating Creek
Leslie Creek
Mesa Draw
Mescal Arroyo
Mescal Creek - Cochise
Middle Canyon Wash
Middle Witch Creek
Miller Canyon
Montosa Canyon
Morse Canyon
Mud Spring Wash
Mulberry Draw
North Witch Creek
O B Draw
Oak Creek - Cochise
Onion Creek
Owl Creek
Pacheco Wash
Paige Creek
Palomas Wash
Parker Canyon
Pine Creek - Cochise
Pinery Creek
Pool Wash
Pridham Creek
Ramsey Canyon
Redfield Canyon
Redrock Creek
Reeves Creek
Reiley Creek
Ridge
Rock Creek - Cochise
Rucker Canyon
Sacaton Wash
San Simon River
Sheep Wash - Cochise
Silver Creek 1 - Cochise
Silver Creek 2 - Cochise
Slaughterhouse Wash
Slavin Wash
Soldier Creek - Cochise
South Fork Canyon
South Fork Cave Creek
South Fork Keating Creek
South Witch Creek
Soza Wash
Spring Creek - Cochise
Stanford Creek

**Table A-3**
**List of Small and Minor Watercourses for Cochise County**

Swamp Springs Canyon
Sycamore Creek - Cochise
Teran Wash
Tres Alamos Wash
Turkey Creek - Cochise
Turkey Creek - Santa Cruz
Vanar Wash
Walnut Gulch
Walnut Wash
West Whitetail Creek
Whitewater Draw
Wildcat Wash
Willow Wash - Cochise
Witch Creek
Wood Canyon Stream
Wood Canyon Wash
a - Seg 3 Cochise
a - Seg 7 Cochise
b - Seg 8 Cochise
1618 Unnamed watercourses

# Appendix B - Criteria Weight Evaluation

**Figure B-1**
**Criteria Scoring Matrix**

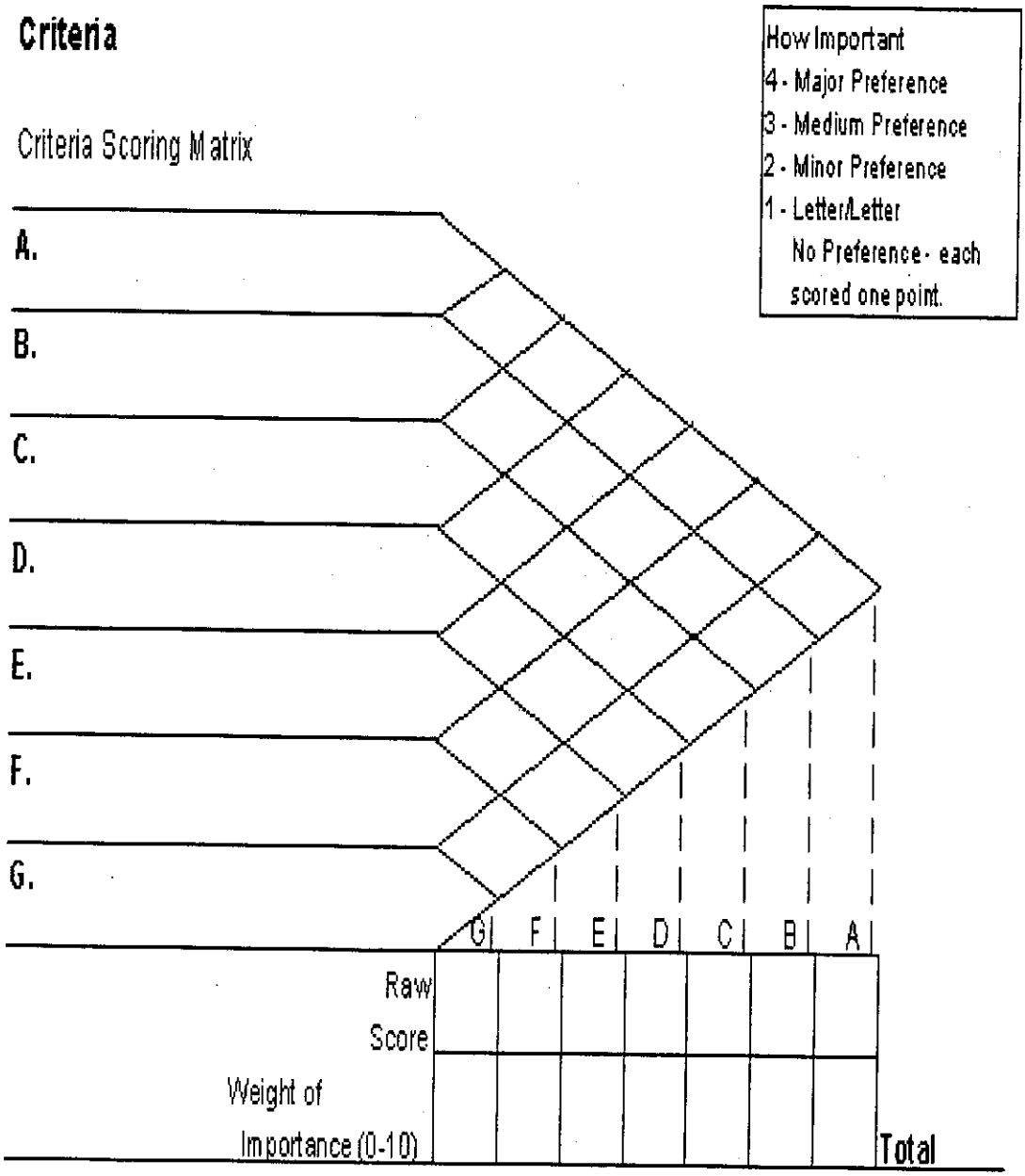
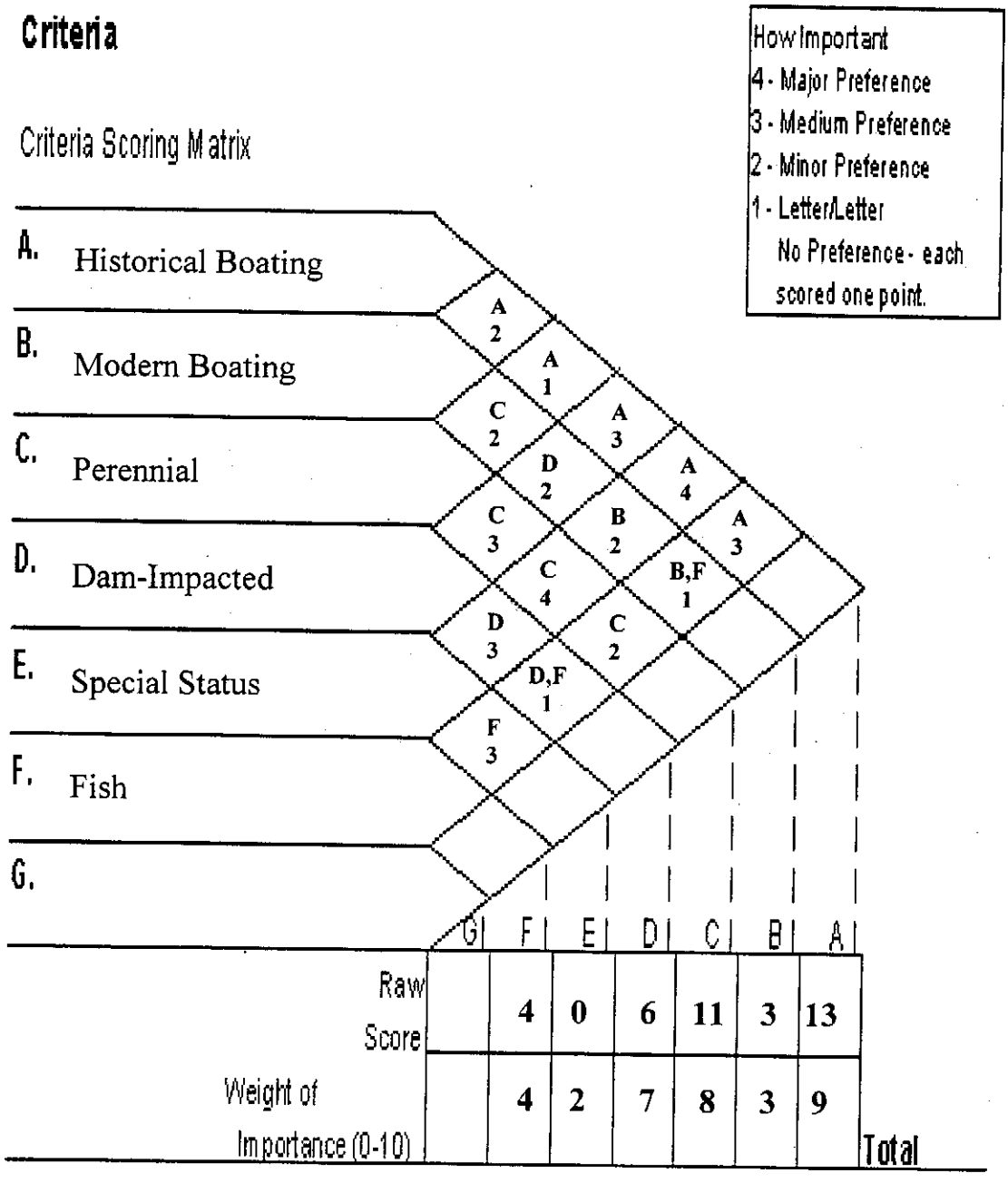


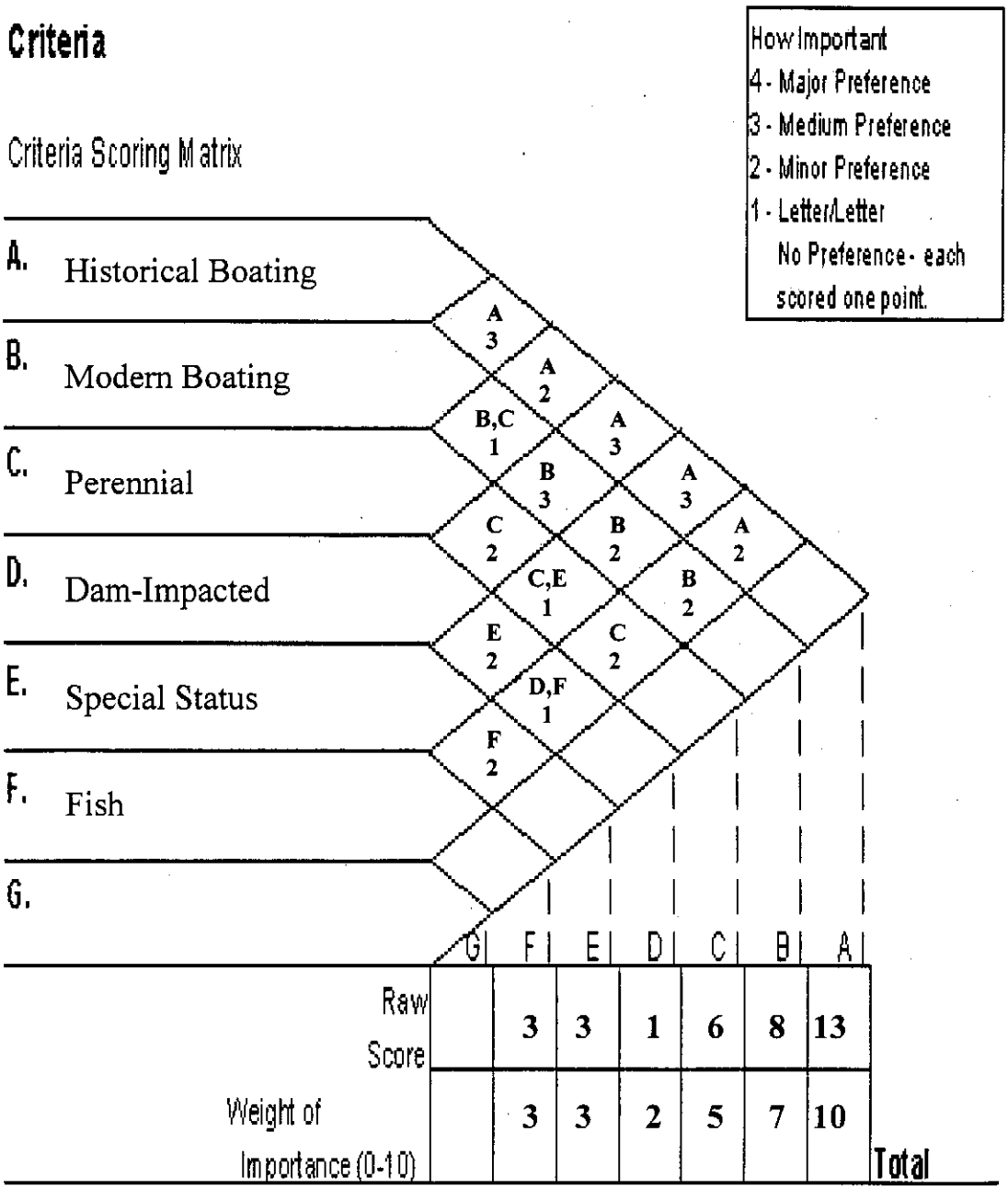
**Table B-1**
**Evaluation of Numerical Weights for the Six Criteria**

| Item No. | Description of Criterion | Participant No. | | | | | | | Average Weight | Recommended Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
| 1 | Historical Boating | 9 | 10 | 10 | 10 | 10 | 10 | 10 | 9.9 | 10 |
| 2 | Modern Boating | 3 | 7 | 10 | 9 | 7 | 10 | 7 | 7.6 | 8 |
| 3 | Perennial | 8 | 5 | 8 | 6 | 6 | 7 | 6 | 6.6 | 7 |
| 4 | Dam-Impacted | 7 | 2 | 4 | 2 | 4 | 5 | 3 | 3.9 | 4 |
| 5 | Special Status | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 2.1 | 2 |
| 6 | Fish | 4 | 3 | 6 | 3 | 3 | 3 | 5 | 3.9 | 4 |

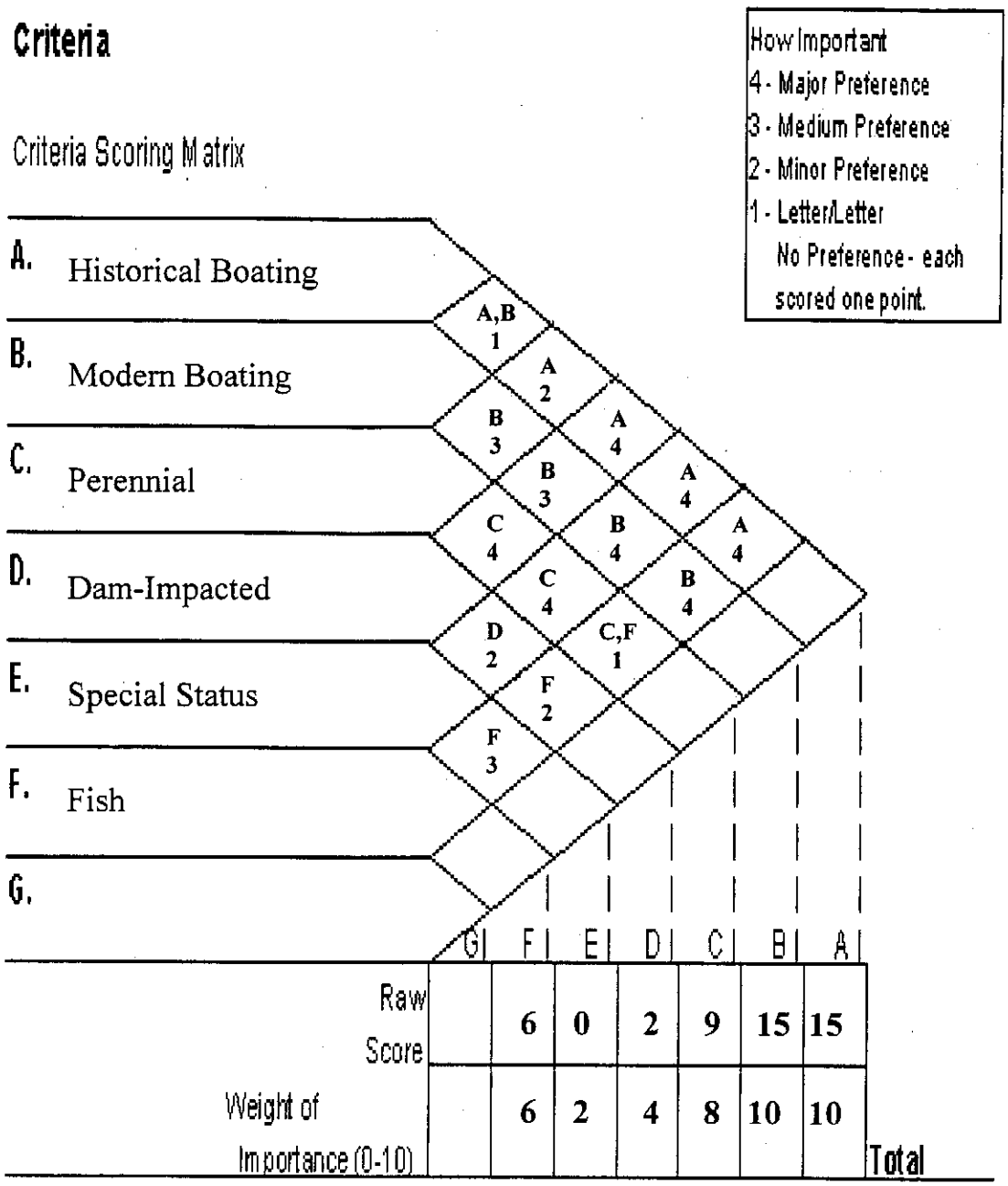
Participant No. 1



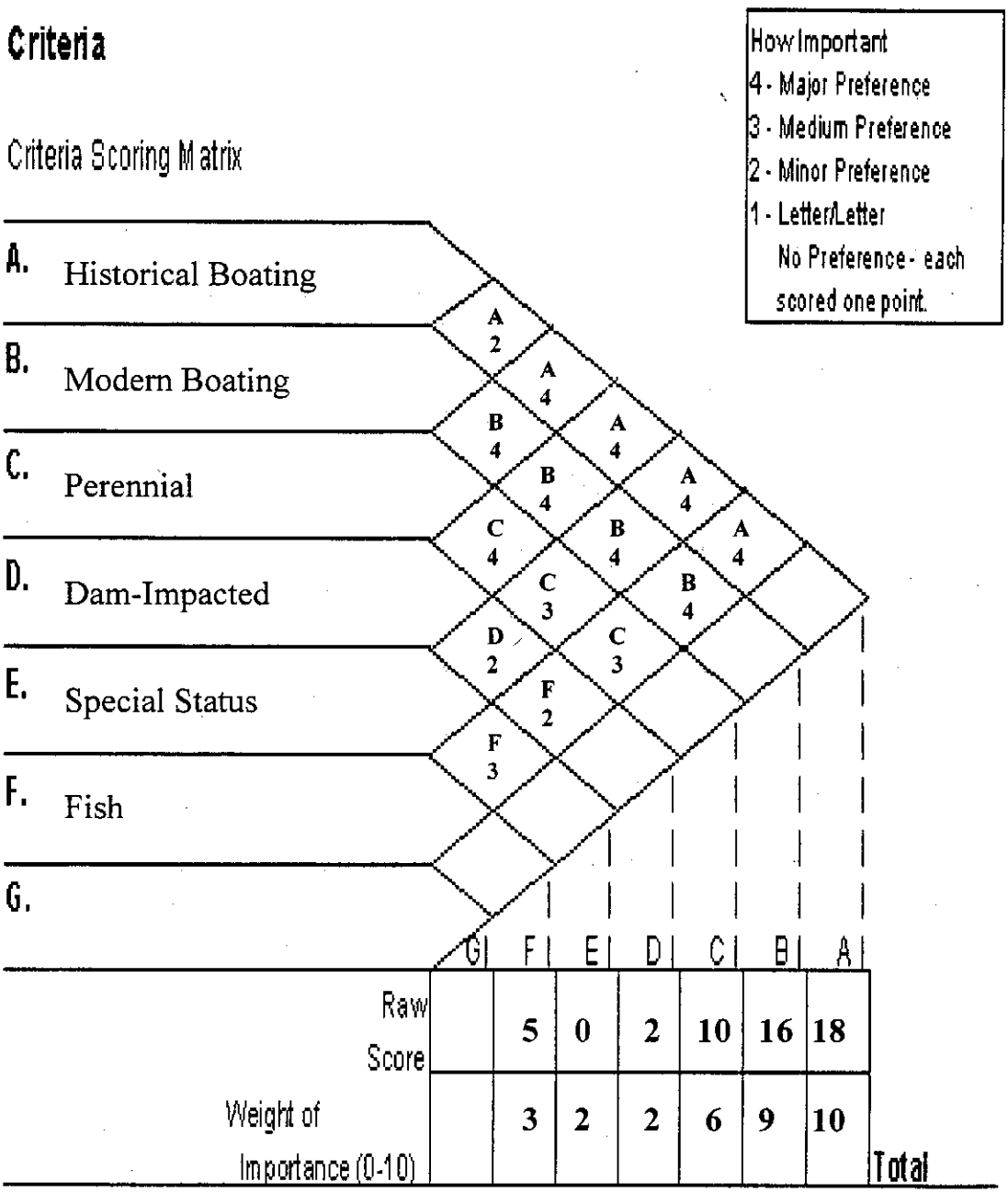
Participant No. 2



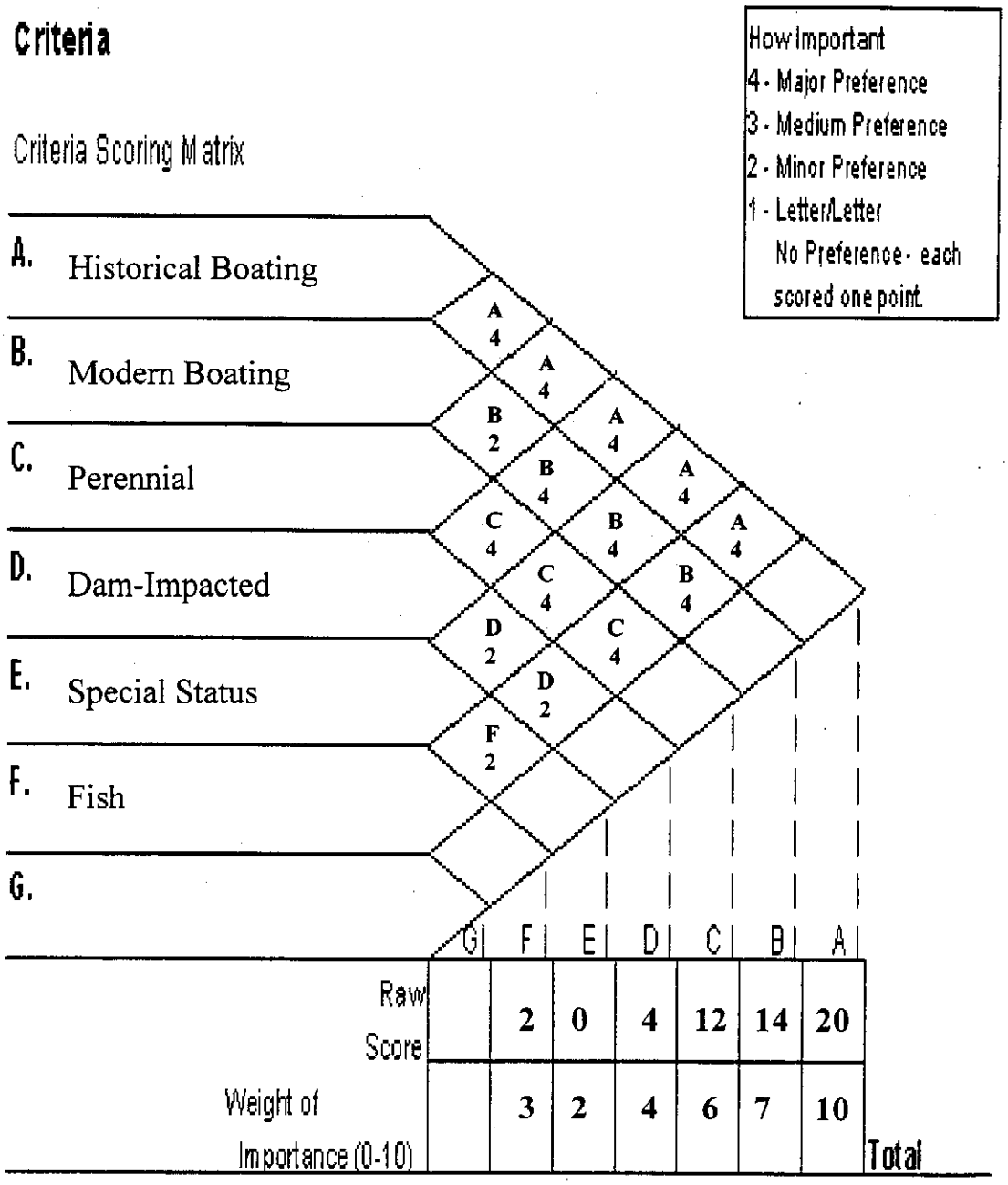
Participant No. 3



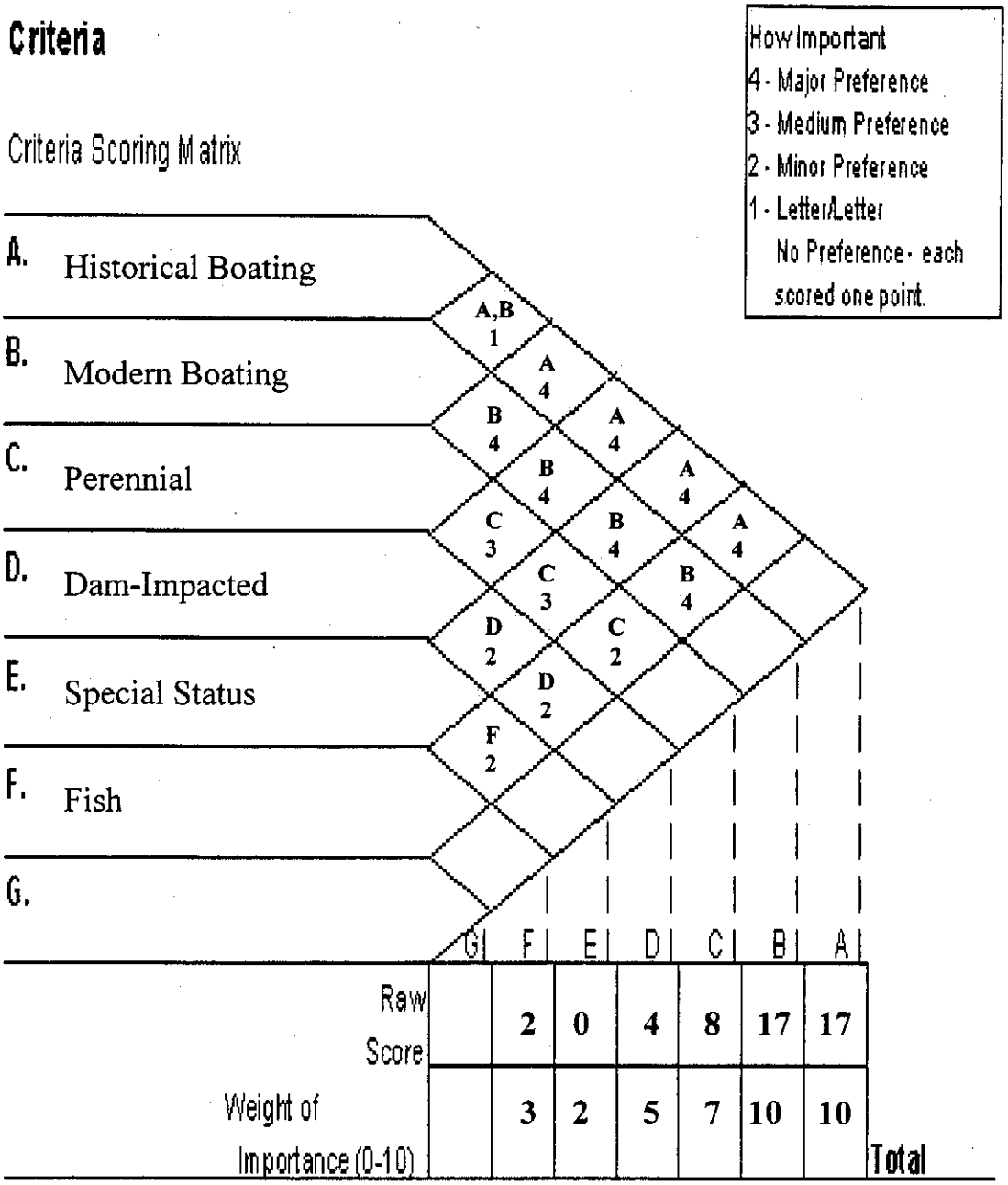
Participant No. 4



Participant No. 5



Participant No. 6



Participant No. 7