

CHAPTER 1

INTRODUCTION

1.1 Background and Preliminary Description of the Physical Setting for this *Draft Guidebook*

The South Coast region of Santa Barbara County extends west to east along the coast from Point Conception to Rincon Creek. It extends south to north from the crest of the Santa Ynez Mountains to the Santa Barbara Channel. Over 40 stream ecosystems can be found in this area. (Figures 1.1 and 1.2). As with many of the other classes of waters or wetlands that occur in the south coast region of Santa Barbara County (*e.g.*, estuaries, ponds, tidal waters, marshes *etc.*), stream ecosystems perform several types of hydrologic, geochemical, plant community, and faunal support/habitat “functions.” For the purposes of this *Draft Guidebook*, the term ecosystem “function” refers to processes that are necessary for the maintenance of an ecosystem such as primary production, nutrient cycling, decomposition, *etc.* (Brinson *et al.* 1995). Stated another way, “functions” are the things that ecosystems do, independent of human perceptions about value (Smith *et al.* 1995). For example, in the south coast region of Santa Barbara County, stream ecosystem functions include (1) sediment mobilization, storage, transport and deposition, (2) energy dissipation, (3) organic matter export, and (4) maintenance of the physical characteristics of living plant biomass or characteristic animal populations.

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In Santa Barbara County and elsewhere in the U.S., the functions that intact waters and wetlands perform are valuable to people who live, work, and recreate in the region (Mitsch & Gosselink 1993; Federal Clean Water Act 1987). Degradation of waters/wetlands often leads to diminished water quality, more frequent flooding, loss of intact native plant communities, and deterioration of native faunal communities. For example, as a consequence of their functioning, intact riverine waters and their associated wetlands (hereafter “waters/wetlands”) in the south coast region of Santa Barbara County (hereafter “SCSBC”) help to support the County’s diverse water resources, beach and near shore water quality, fish and wildlife populations, and agricultural, ranching, and tourism economies (Project Clean Water Annual Report 2000).

In recognition of the ecological and economic significance of SCSBC riverine waters/wetlands, many human activities that may have direct, indirect, or cumulative impacts on these systems are regulated under federal, state, and local laws (*e.g.*, Federal Clean Water Act Sections 404 and 401 1987, California State Streambed Alteration Program 2000, Santa Barbara County Coastal Plan Policies 9-37 and 9-38). The overall intent of this suite of regulations is to “restore and maintain the physical, chemical and biological integrity” of waters/wetland ecosystems (Federal Clean Water Act Sections 404 and 401 1987).

Riverine ecosystems in the SCSBC region, as a class of waters/wetlands, all occur in floodplains and riparian corridors in association with stream channels. However, they are highly diverse with respect to several intrinsic features. At a very basic level of organization, there are four subclasses of streams that occur on various geomorphic surfaces in the SCSBC region. They are:

*South Coast
Santa Barbara County
Riverine Waters/
Wetlands Subclasses*

1. High gradient streams on the Santa Ynez Mountain Front (*e.g.*, Cold Springs Creek)
2. Moderate gradient streams on dissected and undissected alluvial fan and debris flow surfaces (*e.g.*, the middle reaches of Mission Creek)
3. Low gradient streams on marine terrace and filled coastal basin surfaces (*e.g.*, the lower reaches of Carpinteria or Rincon Creeks)
4. Moderate to high gradient coastal streams on elevated terraces and bedrock fault block surfaces (*e.g.*, Lighthouse Creek in La Mesa Park)

Subclass 1:

High gradient - Cold Springs Creek



Subclass 2:

Moderate gradient - Romero Creek



Subclass 3:

Low gradient - Rincon Creek



Figure 1.1
Location map of the
South Coast Region of
Santa Barbara County

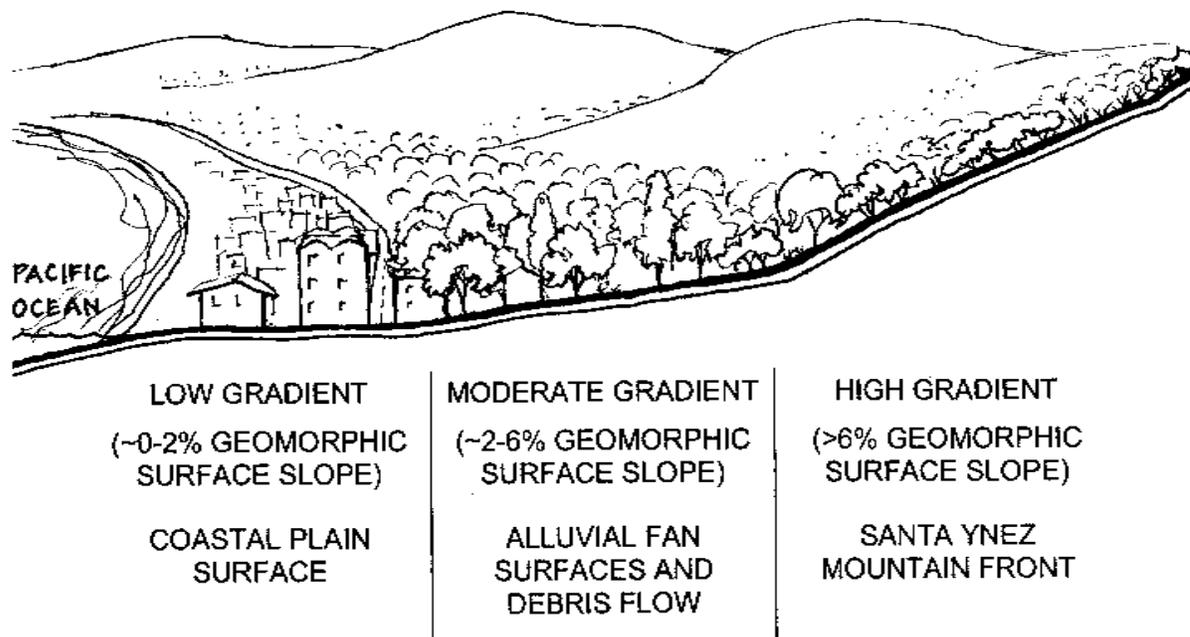


Subclass Definitions Because SCSBC geomorphic surfaces are arranged in relatively consistent ways throughout the SCSBC region (Dibblee 1987), the subclasses of streams introduced above tend to occur in relatively consistent landscape positions. Following are definitions for each subclass.

- Subclass 1:** Towards their headwardmost extent on the Santa Ynez Mountain Front, SCSBC stream ecosystems are very steep (*e.g.*, > 6% longitudinal slope) (Figure 1.3). They receive most of their water inputs from the surrounding (upland) landscape. At these relatively high elevations, high gradient stream reaches have virtually no floodplain. Rather, they exist as small, very steep channel networks and linear features that originate high in the publicly held chaparral landscapes of the Los Padres National Forest. Most high gradient stream reaches flow seasonally or intermittently; however, some like Cold Springs Creek, are perennial. With storm events, these High gradient stream reaches quickly convey water from the Santa Ynez Mountain Front to lower elevation reaches in the SCSBC landscape.
- High Gradient Stream Reaches*
- Subclass 2:** The second recognized subclass of south coast streams occurs on relatively Moderate gradient slopes (*e.g.*, 2% - 6%). These Moderate gradient stream reaches course through dissected and undissected debris and alluvial fan surfaces that can be concave, flat, or convex. Moderate gradient stream reaches can have intermittent, seasonal, or perennial flows. As these stream reaches flow over and through debris and alluvial fan surfaces, they also flow around or through geologic faults that may cause erratic and abrupt changes in their course (*e.g.*, Mission Creek).
- Moderate Gradient Stream Reaches*
- Subclass 3:** At lower elevations near their junction with the Santa Barbara Channel, Low gradient (*i.e.* <2% slope) stream reaches occur on marine terraces and filled coastal basin surfaces. These Low gradient stream reaches can be perennial, seasonal, or intermittent. At their lowermost (distal) ends, Low gradient reaches of south coast Santa Barbara County riverine waters/wetlands usually include tidally-influenced transition areas, where fresh water from the stream grades into brackish, and then into salt water. Several Low gradient reaches of south coast streams flow into large, tidally-influenced structural basins or estuaries (*esteros*) (*e.g.*, Carpinteria, Goleta, and Devereux Creeks) that are strongly influenced by oceanic tides. Low gradient stream reaches that do not flow into estuaries usually exhibit more direct connections with salt water and near shore habitats, with only minimal tidal influence near the stream mouth (*e.g.*, El Capitan Creek, Arroyo Paradon, Rincon Creek).
- Low Gradient Stream Reaches*
- Subclass 4:** The final subclass of SCSBC riverine ecosystem is the High gradient coastal streams that occur on elevated terraces and bedrock fault block surfaces (*e.g.*, Lighthouse Creek). These systems are relatively rare and, for reasons of limited budget and time, they are not the central focus of this *Draft Guidebook*. More complete definitions of each subclass of SCSBC stream ecosystem are provided in the Subclass Profile section of this *Draft Guidebook* (Chapter 4).
- High Gradient Coastal Streams*

All of the subclasses of streams introduced above exhibit characteristics of flow (*e.g.*, peak flows, base flows, *etc.*) that are highly irregular. These characteristics of highly irregular flow develop in direct response to the high climatic variation in the SCSBC region (Santa Barbara County 1999).

Figure 1.3 Cross-section of the South Coast Region of Santa Barbara County Showing the Location of Regional Subclasses of Riverine Waters/Wetlands Based on Gradient



1.2
Background on the
Administrative
Context and Objec-
tives for this
Draft Guidebook

Specific goals of the
Santa Barbara County
Project Clean Water
Program

Currently, the SCSBC region is experiencing rapid urban growth (Santa Barbara County Association of Governments 1994). At the same time and in response to public demand for cleaner stream, beach, and near-shore environments, the citizens of Santa Barbara County have committed to “Project Clean Water” (hereafter “PCW”). The primary mission of the PCW program is to “protect the public health and enhance environmental quality in County watersheds and at beaches” (Project Clean Water Annual Report 2000). Likewise, the specific goals of the PCW program (Project Clean Water Annual Report, 2000) are to:

1. Protect the health of the recreational public and the environment
2. Meet Federal Clean Water Act mandates through compliance with Phase II NPDES permit requirements and applicable regulations
3. Foster maximum public involvement and awareness
4. Establish stable funding source(s) for maintenance of the PCW activities outlined in items 1, 2, and 3 above.

As a part of the PCW program, local agencies (including City of Santa Barbara and Santa Barbara County professional staff and policy makers) and PCW cooperators have focused on the three most frequently occurring subclasses of SCSBC riverine waters/wetlands: 1) High gradient Santa Ynez Mountain front; 2) Moderate gradient alluvial fan/debris flow; and 3) Low gradient coastal plain riverine waters/wetlands. During the first year of the program, PCW staff recognized that achieving their program goals would require that SCSBC stream ecosystems be managed as integral parts of functioning watersheds and associated near-shore environments. PCW staff also recognized that, to date, there had been no comprehensive and systematic method for evaluation of the functioning of SCSBC streams. Consequently, PCW managers and cooperators identified the need for expanding local knowledge concerning the structure, functioning, and restoration potential of SCSBC stream ecosystems. Further, and especially in light of their charge to review and process many stream restoration and/or development proposals with potential impacts to riverine waters/wetlands, staff of several Santa Barbara County departments identified the need for a rapid, scientifically-based approach for assessing stream ecosystem functions.

Specifically, the objectives of the functional assessment protocol envisioned by the County would include the following features:

Desired attributes of a functional assessment protocol for South Coast Santa Barbara Streams

1. A foundation in logic that is structured around a regional reference system
2. Emphasis on the suite of hydrologic, biogeochemical, plant community, and faunal support/habitat functions that SCSBC riverine ecosystems perform
3. A scientifically valid and defensible protocol in the eyes of the public, peers and regulatory agencies
4. Relatively rapid data collection and analysis protocol (*i.e.*, completion within one day by two people)
5. A methodology for the comparisons of “pre” and “post” restoration or development project ecosystem functioning
6. Model development in a manner that helps users recognize and distinguish among naturally variable conditions and those changes in ecosystem functioning SCSBC riverine waters/wetlands that result from human activities
7. Consistent results when used by adequately trained people with varying backgrounds
8. Consistent technical and administrative approaches for completing assessments and for documentation of results in the context of existing County, California State and Federal rules and regulations.

1.3 Rationale for Selection of the Hydrogeomorphic Assessment Methodology

Since 1998, some very fine efforts have been completed to provide inventories and assessments of waters/wetlands within portions of the SCSBC region (Page 1999; URS Corporation 2000). Prior to 1998, some research and inventory efforts focused on aspects of waters/wetlands near the SCSBC region (Keller and Capelli 1992, Florsheim *et al.* 1991, Rockwell *et al.* 1984, Mertes *et al.* 1995); or have inventoried a larger geographic region (*e.g.*, Ferren *et al.* 1995; 1996 a, b, c). However, to date, no widely accepted methods have been developed for Santa Barbara County waters/wetlands that accurately and consistently provide a means to assess changes, both gains and losses, in ecosystem functions. Consequently, the Santa Barbara County Water Agency, along with several other cooperating County, state, and federal agencies and organizations initiated a broad-based effort to develop a functional assessment approach for the south coast area of Santa Barbara County waters/wetlands; it is called the Hydrogeomorphic Approach to the assessment of the functions of riverine waters/wetlands or HGM.

HGM was selected by Project Clean Water, the U.S. Environmental Protection Agency, the National Wetland Science Training Cooperative (NWSTC), and several other cooperating agencies and organizations because it is based on the best available science. Specifically, HGM offers a relatively rapid, efficient, and reference-based method for assessment of changes in the functioning of waters/wetland ecosystems. This is particularly useful in support of regulatory processes (*e.g.*, CEQA¹/NEPA²) to evaluate project impacts and potential mitigation effectiveness. With some training and practice, HGM allows users to quickly distinguish between natural and human-induced changes in the functions of waters/wetlands ecosystems (Brinson 1993, Brinson *et al.* 1995). Development of an HGM system requires an interdisciplinary team approach. The HGM method departs from other functional assessment approaches in that it is based on:

Distinguishing Characteristics of the HGM Methodology

1. Recognition of differences among waters/wetlands (*i.e.*, classification)
2. Identification of functions performed by broadly circumscribed classes and subclasses of wetlands
3. Regionally developed reference systems (Brinson 1995, Brinson 1996).

1. California Environmental Quality Act
2. National Environmental Protection Act

1.4 Background On The National Initiative To Develop A Method For Assessment of Functions Of Waters/ Wetlands Using the HGM Approach

*The Clean Water Act
(CWA), Section 404
process*

President Clinton’s federal Wetlands Plan (1993) articulated the need for improvement of functional assessment techniques for waters/wetlands. In part, the Clinton plan represented an acceptance of and improvement on the “no net loss of waters/wetland area or function” objectives recommended by the National Wetlands Policy Forum (The Conservation Foundation 1988), and embraced by the Bush Administration in 1988. The main objective of the Clinton plan was to encourage development of scientifically valid and consistent approaches for assessment of ecosystem functions in the context of either the Clean Water Act (CWA), Section 404 process and/or state and local equivalents. The Section 404 process as presented in 404(b)(1) Guidelines (40 CFR Part 232 and 233) is comprised of six hierarchical steps:

1. Determination of the geographic extent of jurisdiction
2. Determination of water dependency
3. Evaluation of practicable alternatives
4. Impact assessment
5. Impact minimization
6. Mitigation

To a large extent, these steps are mimicked at California State and Santa Barbara County levels of jurisdiction in standing laws or policies that regulate or influence activities in SCSBC waters/wetlands (*Santa Barbara County Coastal Land Use Plan: land use element policies of the Santa Barbara County General Plan*). While all permit applications under Section 404 currently undergo some form of impact assessment, approximately 2% - 5% of the 14,000 permit applications received annually by the federal government require analyses of impacts that invoke rigorous, field-based functional assessments. In comparison, Santa Barbara County estimates a significant number of permits/plans projects /year that require analyses of impacts.

In the Federal Clean Water Act Section 404 Process, final evaluations of practicable alternatives, impacts, etc., are completed after “the geographic extent of waters of the U. S., including wetlands” has been delineated on a site, and after “administrative” determinations of water dependency and practicable alternatives have been made. Specifically, the HGM assessment protocol is designed to be used in the more technically focused stages of the Section 404 process, *i.e.*, detailed analyses of practicable alternatives, impact assessment, impact minimization, and mitigation (Figure 1.4).

In federal, state or local regulatory processes, HGM can be used as an impact assessment and/or predictive tool that can help project proponents, regulatory specialists, and managers suggest, and/or examine, alternatives for either development or restoration projects involving waters/wetlands (Step 3 in Figure 1.4). Furthermore, HGM can and has been used in a variety of different waters/wetlands management or regulatory processes at several different scales (Figure 1.5). For example, facets of the HGM approach (e.g., classification, identification of functions by HGM class) lend themselves to reconnaissance-level inventories. Standard HGM approaches can and have been used to minimize project impacts, to develop and condition restoration project targets or performance standards, and to trigger contingency measures when restoration project targets or standards are in jeopardy. Finally, a properly focused HGM effort can identify specific areas of concern in an impact assessment process, and thus target efforts for further, more detailed study or restoration.

*Overview of
HGM uses:*

- planning, reconnaissance-level inventories
- prioritizing sites for protection or restoration
- analyzing project alternatives to minimize impacts
- assessing project impacts for permitting and enforcement
- developing restoration project targets or performance standards
- triggering contingency measures when project targets are not being met
- identifying specific areas of concern in an impact assessment process

Figure 1.4
Administrative and
Technical Steps in the
Clean Water Act,
Section 404 Process

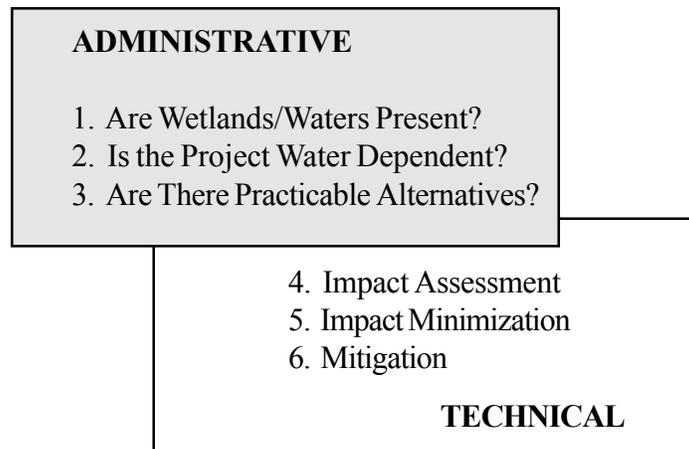
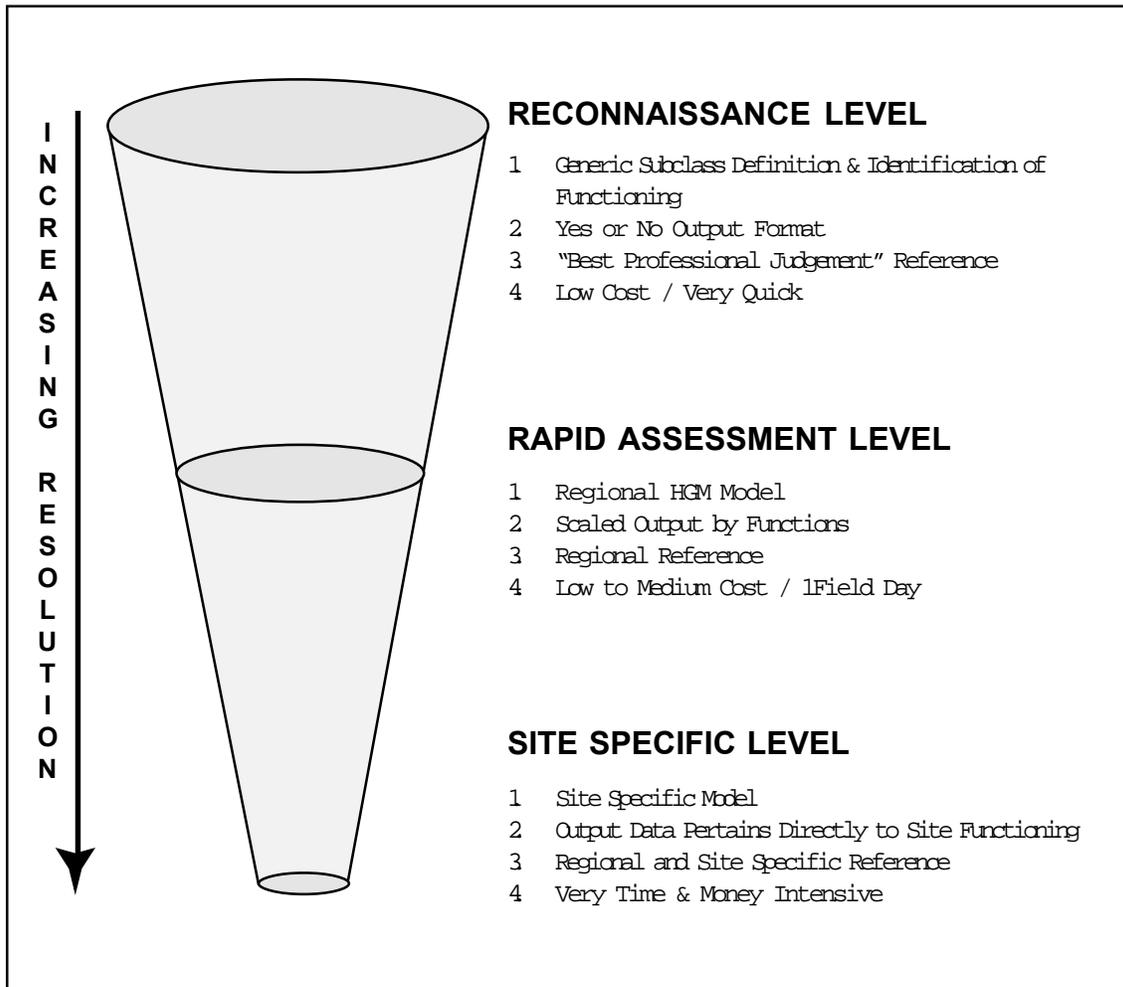


Figure 1.5 HGM Assessment Levels



1.5
How the HGM
Approach can be
Used in South Coast
Santa Barbara County

Uses of HGM
Methodology in South
Coast Santa Barbara
County

The HGM approach to assessing the functions of waters/wetlands has been developed as a management tool with specific applications in land use planning, restoration design, implementation of restoration projects, permitting, and monitoring. Some common uses of the HGM approach are:

1. Land use planning and land suitability assessment
2. Project impact assessment and impact minimization
3. Restoration design / prioritization of restoration acquisitions and management.
4. Development of monitoring protocols and contingency measures for restoration projects (Brinson 1993, Brinson *et al.* 1995, NWSTC 1996)

In the context of the SCSBC region, the HGM approach can be used by several County departments (*e.g.*, Planning, Flood Control and Water Agency technical and administrative staff) for the purposes of managing riverine waters/wetland resources. For example, should the County Planning or Flood Control departments have the need to stipulate or design mitigation of unavoidable impacts to riverine waters/wetlands, an HGM approach could be used to (a) measure primary and secondary impacts, (b) design appropriate restoration(s), and (c) demonstrate “success” of the restoration project, and thus completion of the required mitigation. Similarly, because Project Clean Water has limited resources to direct towards stream restoration efforts, an HGM approach could be used to compare (a) the restoration potential of several alternative sites and/or (b) the effectiveness of alternative restoration design approaches on a single site.

In particular, HGM has proven to be an effective tool for facilitating communication among individuals/groups with divergent goals for management of aquatic resources. In particular, HGM offers an objective mechanism to compare functional trade-offs of various design decisions. For example, all too often, interest groups want to maximize (*i.e.*, “enhance”) a particular ecosystem function to serve a single goal (*e.g.*, the “Friends of Clean Water” want to “maximize stormwater biofiltration” in SCSBC streams). While such enhancement may represent a publicly held “value,” the decision to use SCSBC stream ecosystems to filter stormwater may impinge upon maintenance of certain physical and biological characteristics of SCSBC aquatic habitats that relate directly to steelhead production. Used effectively, HGM can offer the technical platform to compare the “stormwater biofiltration enhancement”

option to several restoration alternatives that may offer some biofiltration functioning, while remaining more “friendly” to fish. Further, the reference system information offered in this *Draft Guidebook* can be used to facilitate design of restorations that are “fit” to the stream and watershed environments of the SCSBC. That is, restoration system information can be queried to develop specifications that focus on essential elements of restoration design such as channel width and depth, channel roughness, amount and placement of refractory wood, plant species mixes, *etc.*

The chapters that follow outline the functional basis to utilizing the Santa Barbara HGM Guidebook. They provide a wealth of information concerning the four groups of functions that have been identified by the authors to be important to riverine ecosystems in SCSBC:

*Four Functional
Groups Identified for
South Coast Santa
Barbara County*

1. hydrology
2. soil / biogeochemistry
3. plant communities
4. faunal support/habitat

The reference information presented can be used to guide restoration designs, or to structure monitoring efforts and contingency measures for mitigation of new project impacts.

The approach has limitations that are inherent in the measurement techniques of the variables used. Specifically, the evaluation of changes due to recurrent activities and/or small projects with minimal effects (either positive or negative) will not yield meaningful results with this approach.

1.6 Consistency with National Guidance on Development of HGM Guidebooks

The strategy that the lead federal agencies followed in developing the HGM approach is described in the *National Action Plan to Develop the Hydrogeomorphic Approach for Assessing Wetland Functions* (Federal Register: August 16, 1996 (Volume 61, Number 160, Pages 42593-42603); Federal Register: June 20, 1997 (Volume 62, Number 119, Pages 33607-33620). The *National Action Plan* was developed by a National Interagency Implementation Team (NIIT), that consists of representatives from the U.S. Army Corps of Engineers (Corps), the Environmental Protection Agency (EPA), the NRCS, the Federal Highways Administration (FHWA), and the Fish & Wildlife Service (USFWS). The current goal of the *National Action Plan* is to develop sufficient HGM assessment guidebooks to address 80% of the Section 404 permit workload requiring functional assessments in waters/wetlands. To achieve this goal, the NIIT estimates that approximately 25 to 30 regional subclass models must be developed. Given the magnitude of the effort and the need for interdisciplinary expertise, development of any HGM assessment guidebook will require participation from federal, state, tribal and local agencies, and from individuals in academe and the private sector.

This *Draft Guidebook* was developed to be consistent with the federal guidelines while also meeting the needs of local users. Since this guidebook was developed over a period of time when national guidance on development of HGM systems continues to be articulated and refined by NIIT, the sequence and timing of some tasks completed in development of this *Draft Guidebook* may differ from those outlined in the most current revisions of national guidance (Figure 1.6).

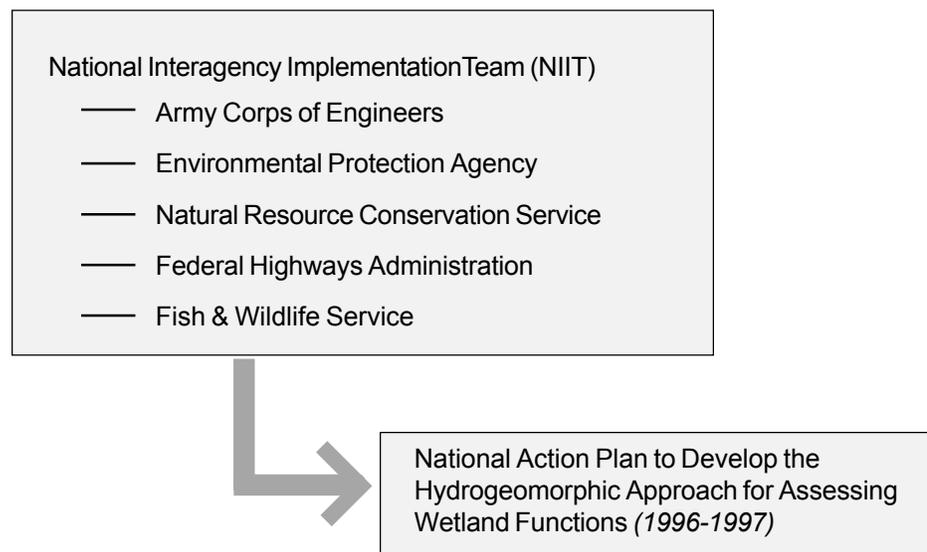


Figure 1.6
Recommended Steps
for Development of
HGM Guidebooks
(*Federal Register*
8/16/96)

Phase I: Organization of Regional Assessment Team:

- A. Identify A-team members
- B. Train members in HGM classification and assessment

Phase II: Identification of Regional Wetland Assessment Needs:

- A. Identify regional wetland subclasses
- B. Prioritize regional wetland subclasses
- C. Define reference domains
- D. Initiate literature review

Phase III: Draft Model Development:

- A. Review existing models of wetland functions
- B. Identify reference wetland sites
- C. Identify functions for each subclass
- D. Identify variables and measures
- E. Develop functional indices

Phase IV: Draft Regional Wetland Model Review:

- A. Obtain peer-review of draft model
- B. Conduct interagency and interdisciplinary workshop to critique model
- C. Revise model to reflect recommendations from peer-review and workshop
- D. Obtain second peer-review of draft model

Phase V: Model Scaling:

- A. Collect data from reference wetland sites
- B. Scale functional indices using reference wetland data
- C. Field test accuracy and sensitivity of functional indices

Phase VI: Draft Model Guidebook Publication:

- A. Develop Draft Model Guidebook
- B. Obtain peer-review of *Draft Guidebook*
- C. Publish as an Operational Draft of the Regional Wetland Subclass HGM Functional Assessment Guidebook to be used in the field

Phase VII: Implement Draft Model Guidebook:

- A. Identify users of HGM Functional Assessment
- B. Train users in HGM classification and evaluation
- C. Provide assistance to users

Phase VIII: Review and Revise Draft Model Guidebook