

How HGM Approach Differs from Others

- **Classification by functional properties**
 - » geomorphic setting; water sources; hydrodynamics
- **Critical identification of functions**
 - » all wetlands do not have the same functions
 - » levels of similar functions may vary among classes
- **Use of reference as standard of comparison**
 - » consists of comparative community and ecosystem ecology

Why Use Reference Wetlands?

- Everyone uses the same standard of comparison for assessment
- Relative, rather than absolute, measures allow
 - » better resolution
 - » better efficiency in time
 - » greater consistency in measurements

General Purposes of Reference Wetlands

- To establish boundaries on natural variation within regional subclasses in response to climate, physiography, biogeographic distributions, and other 'background' conditions.
- To provide the basis for deciding which wetlands are in the least altered condition.
- To use the least altered condition as the basis for detecting 'departures' due to impacts.
- To use self-sustaining ecosystems as templates for restoration.

Assumptions for Reference Wetlands

- Alterations that cause departures from reference standards lead to uncharacteristic levels of functioning, and are presumed to:
 - » not be sustainable
 - » cause one function to decrease at the expense of others.

Assumptions for Reference Wetlands

- Departure from existing conditions of a wetland, as indicated by changes in functions, can serve as a currency measure the degree of alteration.
- Departures can be positive or negative.

Reference Lexicon

- Reference domain
- Reference wetlands
- Reference sites
- Reference standards
- Reference standard sites
- Site potential
- Project target
- Project standards

Reference Domain

- All wetlands within a defined geographic region that belong to a single hydrogeomorphic subclass.

Example of Reference Domain

Biological Report 85(7.21)
July 1989

THE ECOLOGY OF ATLANTIC WHITE CEDAR WETLANDS: A COMMUNITY PROFILE

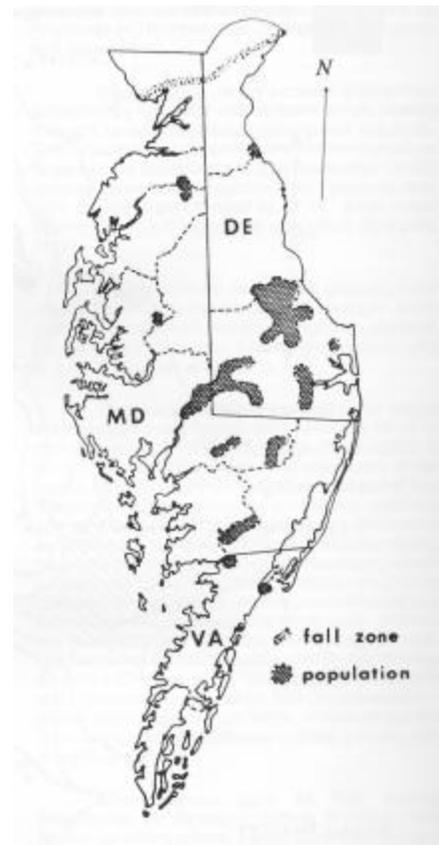


Fish and Wildlife Service
U.S. Department of the Interior

Domain too large and variable



Natural variation partitioned by reducing geographic range



Reference Wetlands

- Wetlands sites within the reference domain that encompass the known variation of the subclass
 - » so include a few outside (i.e., on the edges)
- They are used to scale variables, indicators, and functions relative to reference standards.
 - » part of the reference system includes altered sites, in part, to estimate departures due to degraded conditions

Reference Sites

- Reference wetlands and sites that previously supported wetlands.
- Former wetland sites may be restored to functioning wetland status.
 - » Restoration of these is likely to be more successful than creation

Reference Standards

- Metrics exhibited by a group of reference wetlands that correspond to natural or minimally altered conditions.
 - » Includes biologic and physical structure (e.g., hydrologic regime, basal area), species composition (e.g., indicator species, spatial scale of species richness), and many more.

Why Not Choose Sites that Have Maximum Levels of Functioning?

- Logical endpoints of maximizing functions (something you don't want to do):
 - » water storage capacity (wetter is better)
 - » sediment trapping (not sustainable)
 - » nutrient trapping (eutrophication)
 - » species enhancement (monocultures)
 - » rates of production (agriculture and silviculture)

Reference Standard Sites

- The sites from which reference standards are developed.
- They are judged to be functioning at levels appropriate for the subclass in a self-sustaining manner.

Site Potential

- The level of functioning achieved under least altered conditions given local constraints of disturbance history, land use, or other factors.
- Site potential may be equal to or less than levels of functioning established by reference standards.
 - » Urban restoration projects will have different endpoints and expectations than those in most rural settings, for example.

Project Target

- The level of functioning identified for a restoration or creation project.
- The project target must be consistent with eventual restoration or creation to reference standards or site potential.
- Project target is used to evaluate:
 - » whether a project reaches the target.
 - » whether a project is developing toward reference standards or site potential.

Project Standards

- Specifications and criteria used to guide the restoration or creation of sites for compensatory mitigation.
- Project standards should specify reasonable types and amounts of intervention if the project target is not being achieved.

Assumptions for Reference Wetlands

- Standards can be established to characterize ecosystems in their least altered condition
 - » All ecosystems exhibit variation in time and space.
 - » Classification “controls” variation so standards aren’t unreasonably broad.

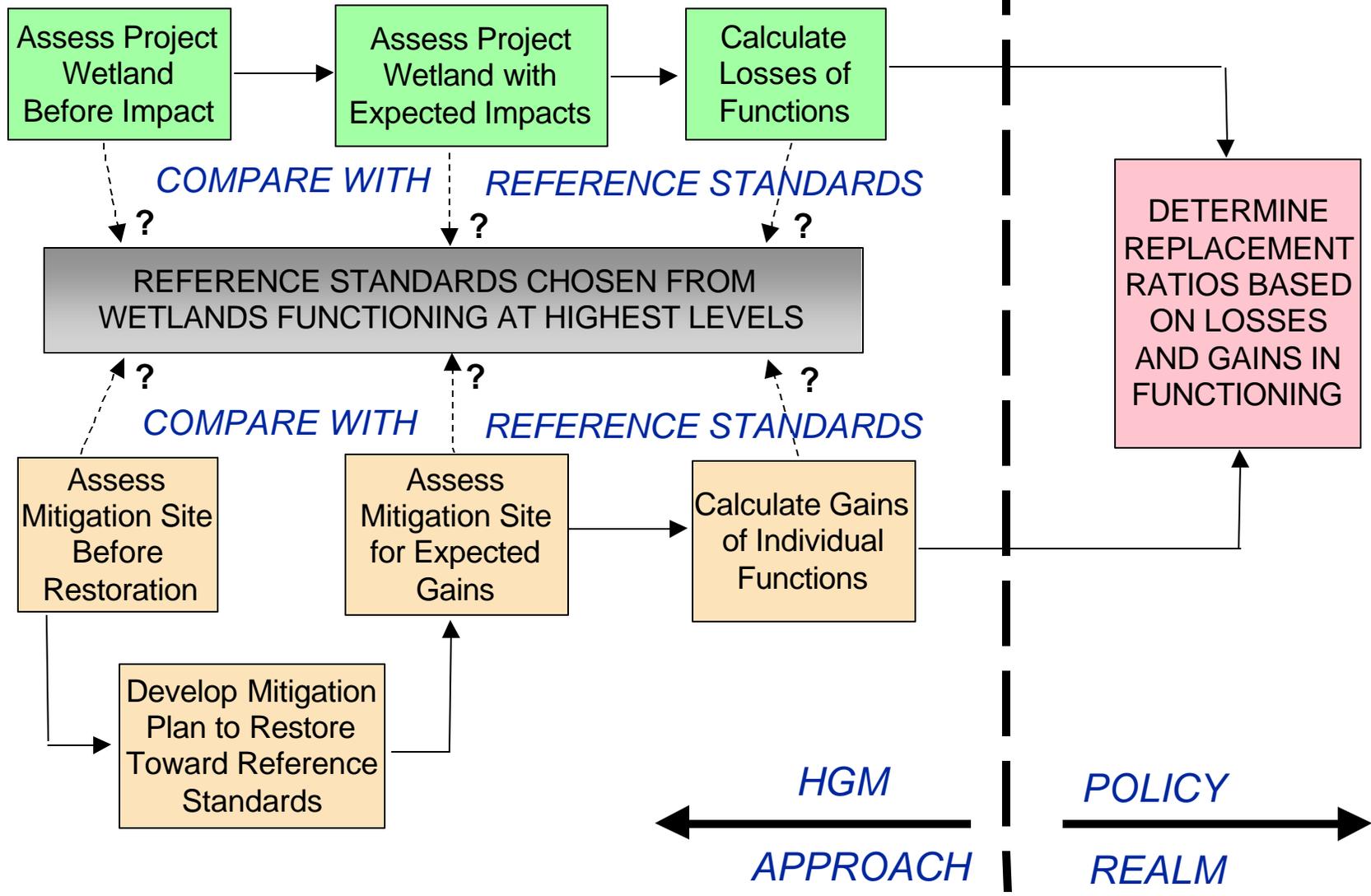
Assumptions for Reference Wetlands

- By partitioning natural variation through classification, variation due to impacts is more easily detected and measured.
- Many alterations cause a “change in state,” such as alteration from wetland to non-wetland conditions.

Assumptions for Reference Wetlands

- Ecosystems function optimally in their relatively unaltered condition, using their resources to self-perpetuate (i.e., they are sustainable units of the landscape).
- Unaltered ecosystems do not necessarily function at high levels; rather they have “characteristic” levels of functioning; they simply are being “all they can be.”

A central role of reference in assessment and restoration



Classification and Reference Can't be Separated

- Purpose is to allow distinction between natural variation and that caused by alteration by humans.
- A national template of 7 classes is proposed for guidance.
- Practical application requires that regional subclasses be identified.
- Regional subclasses are based on reference sites.

Example of Regional Subclasses

- Northern Prairie Depressional
 - » ephemeral
 - » temporary
 - » seasonal
 - » semipermanent
 - » permanent

Another example: Precipitation-dominated Wetlands on Discontinuous Permafrost in Interior Alaska

- Hydrologic: soil profile integrity; soil thermal regime; surface and near surface water storage
- Biogeochemical: cycling of elements; compounds; organic carbon export
- Plant community: species composition; structure
- Animal: faunal habitat components; interspersions and connectivity.

Another example of regional subclasses -- North Carolina: coastal Carteret County

From draft of Stanfill & Sutter et al. (1999)

- Salt/Brackish Marsh 57000
- Freshwater marsh 810
- Estuarine Shrub-Scrub 7000
- Pocosin 42,000
- Bottomland hardwood 1900
- Riverine Swamp forest 5300
- depressional Swamp forest 2300
- Hardwood flat 7800
- Pine flat 39,000
- Managed Pineland 30,000
- Estuarine Forest 170
- Maritime Forest 190
- Headwater swamp 5600
- Human impacted 1700

Similarities between HGM and IBIs

- Both use “reference” as a basis of comparison.
- Relatively unaltered conditions should yield the highest “scores.”
- Biotic integrity and reference standard conditions are similar in principle.

Recommendations

- Maintain classification and reference establishment as part of the same process
 - » as such, ‘top-down’ classifications (i.e., national approaches) lose the reference component which is intrinsically ‘bottom-up’ (real sites = reference)
- Incorporate all available/relevant knowledge in establishing reference
 - » history of alterations, research, local knowledge, old maps, etc.

Recommendations, continued

- Measure structure (biological measures are a “given” in ecosystem assessment) to provide guidance for restoration
 - » restoration practitioners (i.e., those who ‘fix’ wetlands) need all the help they can get!
- Validate indicators, variables, processes, etc. through continued research-level efforts
 - » good science must underpin rapid, indicator-based approaches

Recommendations, concluded

- Keep a focus on objectives
 - » impact assessment
 - » condition evaluation
 - » ecosystem restoration
 - » interface with ecosystem/resource management practitioners
- Don't do it alone
- Start small and expand with experience

Desirable Characteristics of a Perfect Assessment (maintain a sense of humor)

- Must be scientifically valid (no gray areas allowed)
- Must be rapid and simple (can do it from your desktop)
- Shouldn't cost anything (it's free!)
- Won't offend anybody (self-esteem intact)
- Has a postmodern bias (gives you the answer you want)
- Will be fun to use (especially for volunteers)

Acknowledgments

Contributors:

**Lyndon C. Lee, Richard D. Rheinhardt,
Garrett G. Hollands, Dennis F.
Whigham, R. Daniel Smith, Wade B.
Nutter, and many others.**